

## Original Research Article

# Relation between score for allergic rhinitis and immunoglobulin-E levels in the local population

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## ABSTRACT

**Background:** Allergic rhinitis (AR) is the most prevalent atopic disease in the world. It involves clinical hypersensitivity of the nasal mucosa to foreign substances mediated through immunoglobulin E antibodies. The quantitative Score for allergic rhinitis (SFAR) ranging between 0 and 16 has been in use from 2002.

**Methods:** 240 patients diagnosed with Persistent allergic rhinitis (PAR) were taken to be part of the study after proper consent irrespective of the severity of symptoms. Each patient filled out the SFAR form before the treatment commenced. Serum IgE levels were noted and treatment was started which included oral and topical antihistamines, oral leukotriene receptor antagonists along with intranasal steroids. The IgE values were assessed along with the SFAR values side by side to look for any association.

**Results:** It was noted that the individuals with identified triggers of allergy and those with a positive family history of allergy had a considerable higher IgE value as compared to those who did not. The ones with a trigger identified as a cause had a 54.88% higher IgE value. The ones with positive family history had 47.12% higher IgE than the ones without a history of allergy.

**Conclusions:** Patients with well-defined trigger agents of allergy and positive family history of allergy are at a higher risk as they have a higher IgE value. They should be advised regular follow-ups and be monitored closely.

**Keywords:** Allergic rhinitis, Score for allergic rhinitis, Immunoglobulin E, Corticosteroids, Antihistamines

## INTRODUCTION

Allergic rhinitis (AR) is a common atopic disorder which represents a considerable burden on individual patients and the society. It has immense importance because of its prevalence, impact on quality of life, sleep, work and school performance and also has intricate links with other co-morbidities.<sup>1</sup>

It is mediated through immunoglobulin E (IgE) which confers hypersensitivity of the nasal mucosa to various triggers. Conventionally, AR is classified into Perennial and Seasonal variants based on the duration of exposure and the symptoms noticed.<sup>2</sup> The common allergens for Perennial AR include indoor ones such as house-dust mite,

molds, and animal dander whereas the outdoor ones, such as tree pollen, grass pollen, weed pollen, and molds are the triggers for seasonal AR.<sup>3</sup> However, many patients become sensitized to both perennial and seasonal AR triggers. In 2001, the conventional variants were replaced by Intermittent Allergic Rhinitis (IAR) and Persistent allergic rhinitis (PAR), respectively by WHO.<sup>4</sup>

According to the this, IAR refers to symptoms present for less than 4 days a week or for less than 4 consecutive weeks. Persistent Allergic Rhinitis refers to symptoms present for more than 4 days a week and for more than 4 consecutive weeks, with the realization that patients usually suffer almost every day. The underlying pathogenesis in AR is well studied. Before the onset of

AR, there is initial low-dose exposure of nasal mucosa to allergy triggering substances wherein the antigen presenting cells (APC) presents partially digested antigenic epitopes to T lymphocytes inducing sensitization. This immune response induces production of specific IgE antibodies which bind to the basophils which migrate to nasal mucosa and become mast cells. On subsequent exposure to the offending allergen, the IgE antibodies on the surface of the mast cells forms cross links which culminates in degranulation of inflammatory mediators by these cells.

The inflammatory mediators include bradykinin, serotonin, eotaxin and others which act on blood vessels, mucous glands and nerve endings leading to various clinical manifestations (sneezing, pruritus, rhinorrhoea and nasal obstruction) that characterize AR. There are geographical triggers for allergic sensitization varies geographically highlighting the importance of identifying the causative trigger and instructing the patients to avoid such exposures. Most of these patients will have a familial predisposition and are associated with atopy as evidenced by increased IgE levels in their serum. The IgE levels can be estimated by various methods. There are various methods to identify the IgE in the blood. The normal value for an adult is 100-120 IU/ml according to standard studies based on the Paper-disc radioimmunoassay technique (PRIST).<sup>5</sup>

A clinical scoring system SFAR was first developed in 2002 for the diagnosis as well as quantification and assessment of the severity of symptoms of AR. It also helps as an epidemiological surveillance tool for AR in the population studies. It consists of detailed 8-point questionnaire which scores a patient from 0 to 16 based on parameters. A SFAR score of  $\geq 7$  satisfactorily discriminates between the patients with and without AR.<sup>6</sup> Current treatment options for AR include oral H<sub>1</sub> antihistamines (OAHs) and intranasal corticosteroids. These agents may be used as mono therapy or in combination, depending on the symptoms and the patient's response to therapy. The principal side-effect of OAH is sedation and it can be minimized by the use of second generation OAHs which cannot and generation OAHs have become treatment of choice in AR. Alternatively, corticosteroids owing to their potent anti-inflammatory effects can replace OAHs as potent first line agents for AR.<sup>7</sup> More recently, immunotherapy by subcutaneous or sublingual routes have proven its efficacy for the treatment

of AR. The selection of the candidates for immunotherapy is based on many factors including the affordability of the patients.<sup>8</sup> In this study, we have analyzed the association between IgE levels and SFAR in patients with AR.

The objective of this study was to identify whether a known source of allergy and a family history can prove to be relevant in the diagnosis of AR.

## METHODS

The study included consequent patients attending the outpatient department of otorhinolaryngology at RVM Institute of Medical Sciences, Telangana, India with complaints of recurrent sneezing, facial pain, headache, nasal discharge and nasal obstruction. The study was held from July 2019 to December 2020 over a period of 18 months. Specifically, patients >18 years of age with clinical diagnosis of PAR irrespective of the severity of symptoms were included in the study. Patients with polyposis secondary to AR, sinusitis, asthma, other systemic disorders were excluded from the study. Each patient was enrolled into the study after taking consent.

### Study design

The study design was observational study.

### Sample size

The sample size was 240 (based on older studies and patient load).

### Statistical analysis

All statistical analyses were performed using SPSS Statistics 19 for Windows (IBM Corp., Armonk, NY, USA). A thorough clinical history and examination with application of SFAR scoring system (Table 1) was done on the patients to diagnose AR before subjecting them to any treatment. The diagnosis of AR was rendered only when the SFAR score were  $\geq 7$ . In these AR patients 5 cc of whole blood was collected under aseptic precautions in a plain vacutainer for the evaluation of IgE levels by PRIST instrument. The normal serum IgE values for an adult-ranges between 100-120 IU/ml. The IgE levels >120IU/ml is considered as elevated. The association between SFAR score and IgE levels of these patients were analyzed.

**Table 1: Score for allergic rhinitis chart.**

Discriminators	Score	Cumulative score
<b>Blocked nose, runny nose, sneezing in past year</b>	1 for each symptom	3
<b>Months of the year</b>	1 for perennial 1 for pollen season	5
<b>Nasal symptoms with itchy eyes</b>	2	7
<b>Triggers</b>		9
Pollens, house dust mites, dust	2	
Epithelia (cat, dog)	1	

Continued.

Discriminators	Score	Cumulative score
Perceived allergic status	2	11
Previous positive allergic tests	2	13
Previous diagnosis of allergy	1	14
Familial history of allergy	2	16
Total points		16

## RESULTS

A total of 240 patients were included in the study. The distribution of male and female patients was 147 and 93 respectively. The majority of patients belonged to age 31-40 group (Figure 1). In general, 183/240 i.e.; 76.25% of the patients with AR had increased serum IgE levels. Among these patients those with identified triggers of allergy were 201/240 i.e.; 83.75% and those with a positive family history of allergy were 162/240 i.e.; 67.5%. They had considerable higher IgE levels as compared to those who did not. Those patients with pollen and dust as an identified trigger agent had an average IgE value of 528.79 IU/ml and those with no identifiable trigger agent had an average IgE value of 238.54 IU/ml.

Although both groups were diagnosed with PAR, the ones with a trigger had a 54.88% higher IgE value (Table 2). Those patients with a positive family history of AR had an average IgE of 602.34 IU/ml while the ones with no family history had an average IgE of 318.48 IU/ml, a 47.12% increase (Table 2). In contrast other variables of the SFAR score did not demonstrate significant difference in IgE levels.

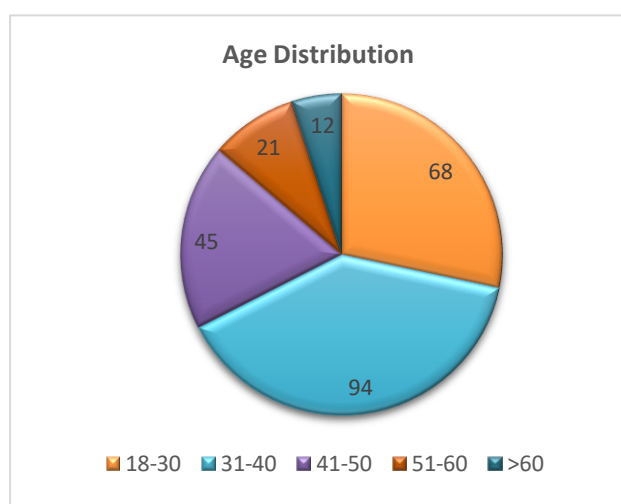


Figure 1: Distribution based on age.

Table 2: Association between SFAR and IgE.

Discriminators	Serum IgE (IU/ml)
Pollen and dust as an identified trigger agent	528.79
No trigger agent identified	238.54
Positive family history	602.34
No family history	318.48

## DISCUSSION

IgE constitutes a very small fraction of the total antibody amount in human serum, but its biological activity is enhanced by specific cell surface receptors whose affinity can vary in strength.<sup>5</sup> Earliest studies of Serum IgE levels were done in Scandinavia. Johansson reported IgE findings in 49 children and 125 adults as early as 1968 based on the examination of sera from subjects determined to be 'non-allergic' by RAST. These data show four values over 1,000 rig/ml (about 500 IU/ml) in 20 to 30 years old subjects and a gradual decline of normal values from 15 to 70 years of age.<sup>9</sup> Kjellman et al reported that in 207 healthy Swedish children aged 0 to 14 years, IgE levels showed the geometric mean to be the highest in the 10 to 14-years bracket (20 to 23 IU/ml).<sup>10</sup>

Routine measurements of serum IgE levels in allergic patients or patients suspected of having allergic disease are helpful in assessing presence and severity of atopic sensitization. The separation of allergic from nonallergic rhinitis, eczema, or urticaria is less easily accomplished by determining serum IgE levels, because of the greater overlap of average serum IgE levels in these conditions and in normal individuals. However, high levels are significantly more common in all allergic conditions than in normal populations.<sup>7</sup>

The AR and its impact on asthma (ARIA) guidelines recommended that patients with moderate and severe allergic rhinitis should be treated optimally by using a combination of antihistamines and intranasal corticosteroid spray.<sup>11</sup> However, when this therapy failed to have the desired effect, it is challenging to decide on the next course of action especially at the primary care setting where the option is rather limited.<sup>12</sup> The serum IgE is a direct indicator of the allergic status of a person. After sensitization, on re-exposure to the specific allergen cross-linking of adjacent IgE molecules on mast cells occurs leads to the release of inflammatory mediators. These cause clinical manifestations of the disease. Thus, a higher value of IgE means more cross-linking bands and this becomes a direct indicator that the person is atopic in some regard or the other. In our study, higher IgE values were noted in patients with a positive history of allergy or those who could identify a particular agent causing allergic symptoms. Thus, the SFAR becomes a potent tool to observe an association of IgE to various determinants.

Both OAH and intranasal corticosteroids have demonstrated efficacy in improving efficacy in treating daytime and night-time symptoms of AR.<sup>13</sup> Montelukast is more effective than placebo in treating the overall

symptoms of allergic rhinitis. It is more effective than OAH in treating patients with allergic rhinitis with nocturnal symptoms while the combined therapy of montelukast and OAH is superior to either montelukast or OAH.<sup>14</sup> Even in the absence of a medical visit, the SFAR is a useful standardized questionnaire that helps in screening of AR. It aids in gathering information necessary for the identification of AR.<sup>15</sup> Treatment of AR involves a comprehensive approach, including environmental control measures, pharmacotherapy and if indicated, allergen immunotherapy.<sup>16</sup> Since this is not a single focal disease, it becomes important to understand the severity and find high risk individuals early for better management. Thus, IgE and SFAR become important in the diagnosis and management of AR. The SFAR is more important in rural populations since it becomes all the more difficult in such places to get investigations done on a large scale.<sup>17</sup>

The limitation of the study included the fact that we could not start Immunotherapy at our centre due to financial restrictions posed and had to send the patient to other centres.

## CONCLUSION

SFAR is a potent tool for the pre-assessment of patients suffering from AR because it gives us details pertaining to past history, known allergic states, family history and trigger agents. We have used this in collaboration with the Serum IgE in all patients to identify high risk cases who might need a longer course of treatment as compared to the others. Patients with well-defined trigger agents and positive family history of allergy are at a higher risk for perennial symptoms as they have a higher IgE value. They should be advised regular follow-ups and be monitored closely. In such individuals, early administration of the latest mode of management i.e.; Immunotherapy can be started much sooner.

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