

## ORIGINAL ARTICLE

## Serum IgE Levels and Total Eosinophil Count in Allergic Rhinitis

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## ABSTRACT

**Objective:** To determine the significance of Serum IgE Level and Total Eosinophil Count in establishing diagnosis of Allergic Rhinitis.

**Study Design:** A descriptive study.

**Place and Duration of Study:** ENT Department Islamabad Medical Complex, from December 2016 to December 2018.

**Materials and Methods:** A total of 200 patients diagnosed clinically as 'Allergic Rhinitis', were selected by convenient sampling. Clinical diagnosis was made on the basis of history and complete ENT examination and findings recorded. Detailed history for intermittent or persistent symptoms of nasal congestion, watery rhinorrhea, nasal itching with sneezing and ocular symptoms as paroxysmal redness, itching and watering of eyes was taken. Detailed physical examination including complete ENT examination carried out and a record of presence of post nasal drip, hypertrophic pale or bluish boggy mucosa covered with thin secretion was made. Blood samples were taken for Serum IgE Levels and Total Eosinophil Count. The data was analyzed for frequencies by SPSS 24. Since the data was not parametric, non-parametric tests were applied.

**Results:** Gender distribution showed a male predominance with males 58.5% (117) and females 41.5% (83). Most of the patients were among the age group 3<sup>rd</sup> to 5<sup>th</sup> decades. Serum IgE was raised in 152 (76%) patients, while Total Eosinophil Counts were raised in 104 (52%) patients. Serum IgE levels were found significant as  $p \leq 0.50$ , while Total Eosinophil Count was not found significant as  $p \geq 0.50$ .

**Conclusion:** Serum IgE Levels and Total Eosinophil Counts are good reflector of Allergic Rhinitis. Although Serum IgE levels appear to be very significant in diagnosing Allergic Rhinitis, Total Eosinophil Count has yet to be established as a significant diagnostic tool. Being expensive tests, only Serum IgE levels should be advised in patients with suspicion of Allergic Rhinitis, and Total Eosinophil Count should not be advised routinely.

**Key Words:** Allergic Rhinitis, Serum IgE Levels, Total Eosinophil Count.

## Introduction

Rhinitis is defined as inflammation of the nasal mucosa resulting in nasal congestion, rhinorrhea, itching of the nasal mucosa, and sneezing. It may occur as a result of infection, allergy, vasomotor imbalance (NARES), and may be drug induced or idiopathic.

The term 'Allergy' was first introduced by Clemens von Pirquet in 1906.<sup>1</sup> Allergic Rhinitis is defined as IgE mediated inflammation of the nasal mucosa.<sup>2</sup> It is the

most common cause of chronic rhinitis and affects 10-20 % of the population.<sup>3</sup> Previously it was considered as a localized disease but now it has been acknowledged as a part of a systemic disorder. The close functional and immunological relationship between the upper and lower respiratory tracts, on provocation, not only causes inflammation in the upper respiratory tract but also involves the lower respiratory tract. Therefore, mostly it accompanies allergic asthma and eczema.<sup>4</sup> In an atopic individual, whenever the nasal mucosa comes in contact with certain allergens, the inflammatory cells including the mast cells, B cells, T cells, eosinophils and macrophages infiltrate the nasal mucosa. The T cells release the cytokines that result in production of the IgE by the plasma cells.<sup>5</sup> The IgE binds with the mast cells resulting in release of the inflammatory mediators like histamine and leukotrienes, that are responsible for the inflammatory reaction causing vascular dilatation, increased vascular permeability,

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watery rhinorrhea, mucus secretion and smooth muscle contraction.<sup>6</sup> In the next stage, these mediators induce a further cellular inflammatory response, the late phase response, responsible for recurrent nasal congestion.<sup>7</sup>

Allergic rhinitis may be divided into two types; intermittent or persistent, as previously described as seasonal and perennial.<sup>8</sup> On the basis of severity it may be divided into mild, moderate and severe forms for management purposes. Traditionally the diagnosis is clinical, on the basis of history and physical examination. History of nasal congestion, itching, and sneezing, watery rhinorrhea, along with itchiness, redness and watering of eyes is fairly common.<sup>9</sup> In most of the cases there is an association with asthma. There may be a positive family history. Certain environmental factors as dust, pollens, humidity, fumes, exposure to furred animals, tobacco, fumes or intake of drugs as beta blockers, NSAIDs, aspirin, ACE inhibitors, certain hormones may be the triggering factors.<sup>10</sup> Physical examination may reveal a transverse nasal crease on the dorsum (allergic salute), dark circles around the eyes (allergic shiners), turbinate hypertrophy with pale or bluish boggy mucosa covered by thin watery secretion, nasal polyps, post nasal drip, prominent lymphoid follicles on posterior pharyngeal wall (cobble stoning), adeno-tonsillar hypertrophy, OME, wheeze, skin eczema etc.

Besides the history and physical examination, certain Allergic Tests are also carried out to reach the diagnosis, as the clinical features may appear similar in other types of non-infective rhinitis. These tests include skin prick tests for specific allergens. Allergen specific IgE tests (RASTs/ ELISA) are considered equally effective in reaching the diagnosis as they indicate atopy, but are considered a bit expensive.<sup>11</sup> Since there is an established association of eosinophilia with allergic respiratory disease, nasal smears for eosinophilia and systemic eosinophilia are also considered an important investigative tool for the diagnosis of allergic rhinitis.<sup>12</sup>

Although Allergic Rhinitis badly affects the quality of life of the patients, most of them do not appreciate this and do not seek treatment. Even the primary physicians fail to diagnose these patients hence some sort of screening tests need to be carried out in such patients with such a longstanding history.<sup>13</sup>

So far we have not seen any study that could show how accurate is the diagnosis of Allergic Rhinitis made on the basis of history and physical examination.<sup>14</sup> Moreover, there are not many studies on the diagnosis of Allergic Rhinitis. As most of these patients are managed on the basis of clinical diagnosis, and are subjected to a life-long anti allergic treatment, a need was felt that this long term treatment should be advised evidence based, after confirming the diagnosis on the basis of laboratory tests. This was the rationale behind the present study with an objective to determine the significance of Serum IgE Level and Total Eosinophil Count in establishing diagnosis of Allergic Rhinitis.

### Materials and Methods

A descriptive study was carried out in Islamabad Medical Complex ENT Department from December 2016 to December 2018. Approval of Hospital Ethical Committee for this study was taken beforehand. A total of 200 patients diagnosed clinically as 'Allergic Rhinitis', were selected by convenient sampling after taking informed consent from them for this study. Clinical diagnosis was made on the basis of history and complete ENT examination and findings recorded on a preformed Performa. Detailed history for intermittent or persistent symptoms of nasal congestion, watery rhinorrhea, nasal itching with sneezing and ocular symptoms as paroxysmal redness, itching and watering of eyes was taken. Detailed physical examination including complete ENT examination carried out and a record of presence of post nasal drip, hypertrophic pale or bluish boggy mucosa covered with thin secretion was made.

Inclusion criteria comprised of at least three of the following symptoms: nasal congestion, watery rhinorrhea, itching of nose with sneezing, post nasal drip, whether intermittently or persistently, for at least two years. Presence of turbinate hypertrophy with pale or bluish boggy mucosa covered by thin secretions was recorded. Exclusion criteria included any active infection or trauma of respiratory tract, local use of steroid nasal spray or drops, intake of systemic steroids, antihistamine, montelukast or mast cell stabilizers in past one month, age below 12 years or above seventy years, and pregnancy.

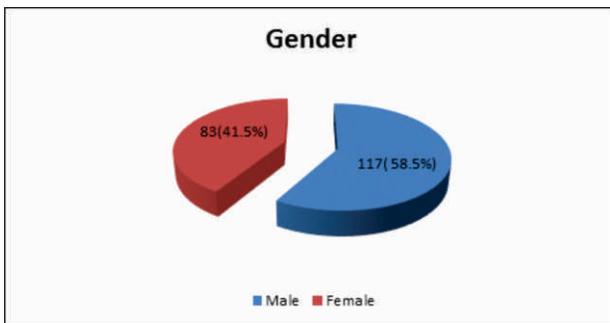
Patients were called one month after cessation of any local or systemic medicine intake for their

symptoms. Blood samples were taken for Serum IgE Levels and Total Eosinophil Count. Serum IgE levels were measured by chemi-luminescent micro particle immunoassay (CMIA) Cobas Methodology, while Total Eosinophil Counts were measured by Cell Dyn Ruby Methodology: MAPSS.

The data were analyzed for frequencies by SPSS 24. Since the data was not parametric, non-parametric tests were applied.

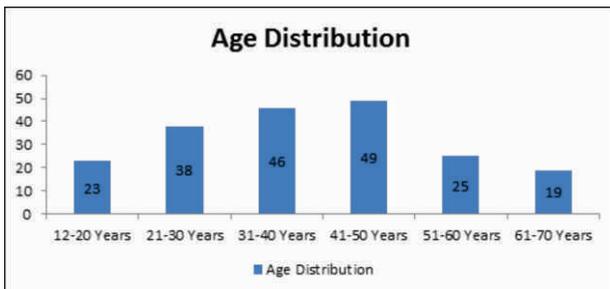
**Results**

In our study the Gender distribution shows a male predominance with males 58.5% (117) and females 41.5% (83) as shown in Figure: 1



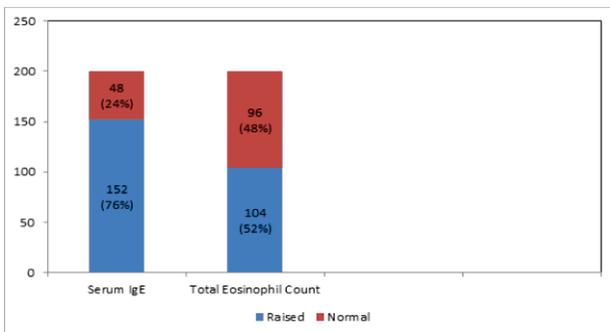
**Fig 1: Gender Distribution (n= 200)**

Most of the patients were among the age group 3<sup>rd</sup> to 5<sup>th</sup> decade as shown in the Figure: 2.



**Fig 2: Age Distribution (n= 200)**

Serum IgE was raised in 152 (76%) patients, while Total Eosinophil Counts were raised in 104 (52%) patients as given in Figure 3.



**Fig 3: Serum IgE Level & Total Eosinophil Count (n= 200)**

One-sample Binomial Test (Non parametric) shows Significance level to be 0.50. Serum IgE levels were found significant as  $p \leq 0.50$ , while Total Eosinophil Count was not found significant as  $p \geq 0.50$ .

**Discussion**

Allergic Rhinitis is one of the commonest chronic disorders that affect the quality of life badly.<sup>15</sup> Though it is quite common with an incidence of 10-20% of population suffering from it, the diagnosis presents a significant challenge due to similarity of its clinical picture with other forms of non-infective rhinitis.<sup>16</sup>

Our study shows gender distribution with a male predominance. Similarly a study by Jagadeeshwar et al (2001) also shows a male predominance in patients with Allergic Rhinitis.<sup>17</sup> Jung et al (2011) also show a male predominance among patients with Allergic Rhinitis.<sup>18</sup> But in another study carried out by Khan (2013) shows a female predominance in patients with Allergic Rhinitis.<sup>19</sup> But our study results can be explained as convenience sampling was done. In our study, the incidence seems to be more in patients of 3<sup>rd</sup> to 5<sup>th</sup> decades.<sup>20</sup> Wheatley & Togias (2015) show it to peak its prevalence in the 3<sup>rd</sup> and 4<sup>th</sup> decades.<sup>21</sup> Muddaiah & Venkatarangaih (2020) also show an increased incidence in age group 3<sup>rd</sup> to 4<sup>th</sup> decades. Droste et al (1996) also shows an increased incidence in the 5<sup>th</sup> decade with a male predominance.<sup>22</sup> Although the patients were selected on the basis of convenience sampling, the disease appears to have similar age incidence even in other studies.

Being an allergic disorder, Allergic Rhinitis has a well-established association with eosinophils. In our study, raised Eosinophil count has been observed in only 52% of the patients, and thus it fails to appear as a significant indicator of Allergic Rhinitis. Similar to our observations, Patel & Nagpal (2014) also observe that although there is a strong correlation with nasal smear eosinophilia but Allergic Rhinitis has absolutely no correlation with systemic eosinophilia.<sup>23</sup> But another study by Mostafa et al (2020) reveals that the Absolute Eosinophil Count was positive in 70.4% patients with Allergic Rhinitis, so it is considered a good indicator of the disease.<sup>24</sup> Baldacci et al (2001) also consider Serum Eosinophil Count as an important though less used investigation for monitoring the clinical course of AR.<sup>25</sup> Another

study by Prabakaran et al (2018) shows that in case of only nasal symptoms, the Total Eosinophil Counts do not go beyond normal range, but when nasal symptoms are associated with respiratory symptoms then Serum Eosinophil levels are found elevated.<sup>26</sup> In another study, Sharma et al (2019) in a study claim Serum Eosinophil Counts and Serum IgE Levels as reliable investigation tools for the diagnosis of Allergic Rhinitis.<sup>27</sup> Interestingly, in a study by Poznanovic & Kingdom (2007) a correlation between raised eosinophil count and mucosal sinus disease on CT scan has been established while no correlation was found with raised IgE levels.<sup>28</sup> This finding points towards significance of raised eosinophil counts during an active sinus disease. In yet another study, Koh et al (2013) also showed a positive relationship between allergic disease and Serum IgE levels as well as Total Eosinophil Count.<sup>29</sup> On these various findings we can infer that a High Eosinophil Count may be present during an active disease, otherwise it may not be very significant in diagnosing Allergic Rhinitis. Our study shows Serum IgE levels to be raised in 76% of the patients, which is very similar to the study by Vijayan et al (2019), in which they show a rise of Serum IgE in 80% of the patients.<sup>30</sup> In a study by Chaudhary et al (2017) S IgE levels were found to be raised in 100% of patients.<sup>2</sup> Another study by Chowdary et al (2003) also reveals raised S IgE in acute phase of Allergic Rhinitis, but Serum Eosinophils are not raised at all, although they recommend that S IgE and Serum Eosinophil Counts should be carried out in all the patients with suspicion of Allergic Rhinitis.<sup>11</sup> Satwani et al (2009) also claim S IgE to be a good predictor of Allergy especially in children.<sup>31</sup> Jung et al (2011) also claim Total Serum IgE as a strong predictor of Allergic Rhinitis.<sup>18</sup> Cakanlar et al (2015) also shows Total IgE as an important indicator of Allergic Rhinitis.<sup>32</sup> Hameed et al (2020) consider it obligatory to carry out Serum IgE in any patient with a clinical diagnosis of an allergic disorder.<sup>33</sup> In view of these studies, we can easily claim Serum IgE to be a significant indicator of Allergic Rhinitis.

Traditionally, the diagnosis of Allergic Rhinitis is made on the basis of history and clinical examination, and on the basis of response to empirical treatment.<sup>24</sup> Even the presence of specific IgE just points towards sensitization even among

asymptomatic people.<sup>34</sup> With all this evidence, we can infer that there is no single laboratory test that can replace clinical diagnosis of Allergic Rhinitis or considered superior to it and the diagnosis has to be made while considering both the clinical and laboratory based evidence.<sup>18</sup> In the light of above evidence we can recommend that in the presence of positive clinical evidence, the patients should undergo Serum IgE assays as it is positive in 76% of the patients. And only those patients in whom Serum IgE levels are raised, should be recommended long term anti allergic treatment.

Since the scope of our study is limited, carried on only 200 patients, it is further recommended that more studies need to be carried out at larger scales to find out a suitable and cost effective evidence based strategy and guidelines be made at national level for diagnosis of Allergic Rhinitis in patients needing long term anti-allergic treatment.

## Conclusion

Serum IgE Levels and Total Eosinophil Counts are a good reflector of the disease (Allergic Rhinitis). Although Serum IgE levels appear to be very significant in diagnosing Allergic Rhinitis, Total Eosinophil Count has yet to be established as a significant diagnostic tool. Being expensive tests, only Serum IgE levels should be advised in patients with clinical diagnosis of Allergic Rhinitis before advising long term anti allergic treatment.

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