STUDY OF TOTAL IGE LEVELS AND EOSINOPHIL COUNT ACCORDING TO AGE AND GENDER IN PATIENTS WITH ALLERGIC RHINITIS

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ABSTRACT

Allergic Rhinitis is inflammatory chronic disease induced by an IgE-mediated reaction after allergen exposure in the nasal mucosa and is identified clinically by the presence of symptoms of nasal discharge, nasal itching, sneezing and/or nasal congestion. The present study was aimed to evaluate the level of serum total IgE and eosinophil percentage count and the effect of age and gender in allergic rhinitis. Total IgE and eosinophil count were done for 297 (171 males and 126 females) patients with allergic rhinitis their mean age was 34.68 ± 0.72 year and 50 (24 males and 26 females) healthy non-allergic individuals as control their mean age was 36.44 ± 1.99 years in the Allergy Specialized Center in Baghdad/AL-Resafa from January 2013 to November 2013. The incidence of allergic rhinitis among ages more than 20 years is more common. A significant (p<0.001) increased in the mean level of serum total IgE (271.46 ± 13.96 IU/ml) and eosinophil count percentage (4.48±0.14 %) in patients as compared to control (Total IgE 163.83± 25.65 IU/ml and Eosinophil count 2.32±0.18 %). Association of serum total IgE (>100 IU/ml) with gender was observed in 190 patients with allergic rhinitis (104 males, 86 females). Allergic rhinitis is associated with increased of serum total IgE and eosinophil counts and their relationship with age and gender. Serum total IgE and eosinophil counts could be helpful in the diagnosis of allergic rhinitis; all patients should be made these tests.

KEYWORDS: Serum total IgE, Eosinophils, Allergic rhinitis.
INTRODUCTION

Allergic rhinitis is an acute IgE mediated type 1 hypersensitivity reaction of nasal mucosa in response to antigenic substances (allergens) associated with episodic attacks of sneezing, watery rhinorrhea and watering of the eyes, patients also present tightness of chest due to subclinical bronchospasm.\(^1\) Allergic and hypersensitivity reactions are the results of immune response to allergens; this response is mediated by IgE antibody specific to the allergen. Mast cells, basophiles are activated after IgE bindings, starting a serious of cellular and molecular events that results in the clinical manifestation of allergic diseases.\(^2\) IgE determination is a valuable in the diagnosis of allergic diseases such as asthma, allergic rhinitis, urticaria, atopic dermatitis, and some parasitic infections leads to increased IgE levels.\(^3\) Among the non-infectious diseases associated with eosinophilia are allergic diseases, including allergic rhinitis, conjunctivitis, and asthma, eosinophils are present in involved tissues as well as often being increased in blood.\(^4\) The eosinophil is a multifunctional leukocyte playing a central role in Th2 mediated allergic diseases, parasitic killing and tissue repair.\(^5\) Recent studies have also pointed out eosinophil involvement in modulating both innate and adaptive immune responses.\(^6\)

Previous studies have demonstrated that the number of eosinophils is increased in blood and tissue in patients with atopic diseases.\(^7,\,8\) Many investigators have used total IgE and eosinophil count for evaluating allergic diseases.\(^9,10,11\)

MATERIALS AND METHODS

The study was carried out at the allergy specialized center in Baghdad/AL-Resafa from January 2013 to November 2013. The subjects were classified into two groups, 297 (171 males, 126 females) patients with allergic rhinitis (mean age 34.68 year old), and 50 (24 males, 26 females) healthy non-allergic individuals as control (mean age 36.44 year old). Both physical and clinical examinations were done for each subject and the information was recorded in a data sheet.

Blood samples were collected for estimation of serum total IgE by ELISA using kit from Euroimmune (Germany), the value over 100 IU / ml were considered high and the eosinophil counts were done by Beckman coulter analyzer, the percentage of eosinophil count below 4% was used as the reference value for normal levels of eosinophils.
Statistical Analysis
Statistical analysis was performed with SPSS version 22 software package (SPSS, Inc. Chicago) categorical variables. Results were expressed as mean ± SE. For all analysis, P value <0.001 was considered significant.

RESULTS
In the present study, 297 patients with allergic rhinitis, 171 (57.58%) males and 126 (42.42%) females, their mean age was 34.68± 0.72 years as compared to control group. The general characteristics of the studied groups are presented in table (1).

Table (1): General characteristic of the studied groups.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Controls</th>
<th>Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Number</td>
<td>50</td>
<td>297</td>
</tr>
<tr>
<td>Male</td>
<td>24 (48%)</td>
<td>171 (57.58%)</td>
</tr>
<tr>
<td>Female</td>
<td>26 (52%)</td>
<td>126 (42.42%)</td>
</tr>
<tr>
<td>Age (mean ± SE)</td>
<td>36.44± 1.99</td>
<td>34.68± 0.72</td>
</tr>
<tr>
<td>Age (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;20</td>
<td>3 (6%)</td>
<td>62 (20.87%)</td>
</tr>
<tr>
<td>21 – 30</td>
<td>19 (38%)</td>
<td>64 (21.55%)</td>
</tr>
<tr>
<td>31 – 40</td>
<td>12 (24%)</td>
<td>84 (28.28%)</td>
</tr>
<tr>
<td>41 – 50</td>
<td>5 (10%)</td>
<td>64 (21.55%)</td>
</tr>
<tr>
<td>&gt;50</td>
<td>11 (22%)</td>
<td>23 (7.75%)</td>
</tr>
</tbody>
</table>

A significantly (P<0.001) elevated in the mean serum total IgE (271.46 ± 13.96 IU /ml) and eosinophil counts percentage (4.48 ± 0.14 %) was observed in patients with allergic rhinitis as compared with controls as shown in table (2), figure (1,2). Total serum IgE levels >100 IU/ml was recorded in 104 (60.8 %) of males and 86 (68.75%) females in patients with allergic rhinitis, while 67 (39.2%) of males and 40 (31.75%) of females in patients group had serum total IgE below 100 IU/ml as illustrated in table (3).

Table (2): Mean ± SE of serum total IgE levels and Eosinophil counts between the groups.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Patients</th>
<th>P- value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total IgE (IU/ml)</td>
<td>163.83 ± 25.65</td>
<td>271.46 ± 13.96</td>
<td>0.003**</td>
</tr>
<tr>
<td>Eosinophil count</td>
<td>2.32 ± 0.18  %</td>
<td>4.48 ± 0.14  %</td>
<td>0.00**</td>
</tr>
</tbody>
</table>

** Highly Significant at the P<0.001
Figure (1): Total IgE levels between studied groups.

![Figure 1: Total IgE levels between studied groups.](image)

Figure (2): Eosinophil counts (%) between studied groups.

![Figure 2: Eosinophil counts (%) between studied groups.](image)

Table (3): Total IgE levels according to Gender in patients.

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. Patients</th>
<th>Total IgE &lt; 100 IU/ml</th>
<th>Total IgE &gt; 100 IU/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>171</td>
<td>67 (39.20 %)</td>
<td>104 (60.80 %)</td>
</tr>
<tr>
<td>Female</td>
<td>126</td>
<td>40 (31.75 %)</td>
<td>86 (68.75 %)</td>
</tr>
<tr>
<td>Total</td>
<td>297</td>
<td>107 (36.02 %)</td>
<td>190 (63.98 %)</td>
</tr>
</tbody>
</table>

Table (4) shows that of 297 patients in this study, 62 (20.87%) was < 20 years, 64(21.55%) between 21-30 year, 84(28.28%) between 31-40 year, 64(21.55%) between 41-50 year, and 23 (7.75%) patients was more than 50 year old. Also table (4) shows that the frequency of
patients with detectable levels of serum total IgE (> 100 IU/ml) gradually increased with age, with a maximum being observed in the 31-40 year old group and then decline in age more than 50 year.

Table (4): Total Serum IgE levels according to Age distribution in patients group.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Patients. No</th>
<th>Total IgE &lt; 100 IU/ml</th>
<th>Total IgE &gt; 100 IU/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>62 (20.87%)</td>
<td>24 (38.70 %)</td>
<td>38 (61.30%)</td>
</tr>
<tr>
<td>21 – 30</td>
<td>64 (21.55%)</td>
<td>28 (43.75 %)</td>
<td>36 (56.25 %)</td>
</tr>
<tr>
<td>31 – 40</td>
<td>84 (28.28%)</td>
<td>29 (34.52 %)</td>
<td>55 (65.48 %)</td>
</tr>
<tr>
<td>41 – 50</td>
<td>64 (21.55%)</td>
<td>24 (37.50 %)</td>
<td>40 (62.50 %)</td>
</tr>
<tr>
<td>&gt; 50</td>
<td>23 (7.75%)</td>
<td>8 (34.78 %)</td>
<td>15 (65.22 %)</td>
</tr>
<tr>
<td>Total</td>
<td>297 (100%)</td>
<td>113 (38.05%)</td>
<td>184 (61.95%)</td>
</tr>
</tbody>
</table>

DISCUSSION
Allergic diseases are characterized by the IgE-dependent release of mast cell-derived mediators and cellular infiltration particularly of activated eosinophils and T-lymphocytes\textsuperscript{[12]}. IgE not only provides protective immunity against helminth parasites but can also mediate type-1 hypersensitivity reactions that contribute to the pathogenesis of allergic diseases such as asthma, allergic rhinitis and atopic dermatitis\textsuperscript{[13]}.

Results of our study showed that allergic rhinitis was different in both the gender. Previous studies was done by Khan et al, 2013\textsuperscript{[14]} and Osman et al, 2007\textsuperscript{[15]} determine the effect of gender on allergic rhinitis.

According to our results allergic rhinitis and serum total IgE was decline with age after 50 years old, this was in agreement with the study of Mediaty and Neuber 2005\textsuperscript{[16]} who stated that total IgE decline with age in the general populations and there are significantly fewer cases of atopy among elderly subjects compared with younger subjects.

Aging is associated with modifications of the immune system, defines as immunosenescence, this could contribute to a reduce prevalence of allergic diseases in elderly populations\textsuperscript{[17]}. Another study showed that more than 40% of the old age patients with allergic rhinitis presented moderate-severe disease\textsuperscript{[18]}.

Our present findings are in agreement with previous study reporting rhinitis prevalence in adult\textsuperscript{[19]}. The prevalence of allergic diseases in elderly ranges from 5 to 10 % and appears to be rising, a gradual decline in immune function, and age-related changes in tissue structure.
influence the development of these disorders.\textsuperscript{[20]} Significantly higher mean serum total IgE levels was found in patients with allergic rhinitis compared to healthy non-allergic, these in agreement with previous studies.\textsuperscript{[21,22]} Chung \textit{et al.}\textsuperscript{[23]} showed that serum total IgE level is useful in the invitro diagnosis of allergic rhinitis.

Allergic diseases, such as allergic asthma, allergic rhinitis and atopic dermatitis are characterized by an increased number of eosinophil granulocytes in the circulating blood and degranulation in the target tissue is considered the major pathogenic event.\textsuperscript{[24]}

Eosinophils are known to be the main effector cells of allergic process, it is important both during the initial and later stages of allergic airway diseases.\textsuperscript{[25]} Bases on the results presented in this study, there is a significant increase in eosinophil count percentage in patients as compared with controls. Several studies have reported that higher serum total IgE levels and eosinophilia were present in patients with allergic rhinitis.\textsuperscript{[26,27]}

It has been shown that there is a positive correlation among serum total IgE level and eosinophil counts in allergic rhinitis.\textsuperscript{[28,29,30]} While Takahashi \textit{et al.}\textsuperscript{[31]} was reported that eosinophil count significantly higher only in asthma with rhinitis but not in allergic rhinitis alone. In general, eosinophil count and total IgE levels are high in allergic diseases.\textsuperscript{[32]}

\textbf{CONCLUSIONS}

Allergic rhinitis is associated with gender and age and increased of serum total IgE and eosinophil count percentage. Serum total IgE and eosinophil counts could be helpful for the diagnosis of allergic rhinitis, and all patients should be made these tests.

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