Serum IgE of Allergic Rhinitis (AR) with or without Asthma in Sokoto, North Western Nigeria.

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Abstract

Objectives: *To determine the serum IgE levels in allergic rhinitis with or without asthma compared to Control group.*

Methods: *A Laboratory based prospective study of 90 Allergic rhinitis (AR) patients with or without asthma and 80 matched controls in a Nigerian tertiary hospital between April, 2015 – December, 2015. The serum IgE levels were measured using ELISA IgE pro-kit byAcubind(USA). The data were analysed using SPSS 20 and p-values < 0.05 were considered significant.*

Result: *The study group comprised of 37 (41.1%) males and (53) 58.9% females. The age of participants ranges from 17 years to 52 years with a mean of 27.61 ± 6.88 years. The mean age of the patients with AR was 28.58 ± 7.29 years while the mean age of controls was 26.53 ± 6.27 (t= 31.026, p = 0.465). There was a wide variation in the serum IgE level of healthy participants. The range of serum IgE in AR and control were 8.02 – 763.70 IU/ml and 0.92 - 468.50 IU/ml respectively. The mean of total IgE in patients with AR and controls were 252.00 ±.60 IU/ml and 106.48 ± 117.95 IU/ml respectively (t = 5.174 , p < 0.001).*

Conclusion: *The mean serum IgE in AR was 252.00 ± 225.60 IU/ml. Serum IgE was significantly higher in AR patients than controls. The difference in the mean serum IgE between the male and female patients did not show statistical significance.*

Keywords: *Allergic rhinitis, Serum Imunoglobulin E.*

I. Introduction

Allergic rhinitis is the most common immunologic disease and is the commonest chronic disease experienced by humans[1]. Allergic rhinitis is an IgE mediated hypersensitivity reaction in nasal mucosa which is characterized by bouts of sneezing, nasal itching, watery nasal discharge and a sensation of nasal obstruction[2]. Depending on the part of the world, the prevalence of or the rate of symptoms attributed to allergic rhinoconjuctivitis ranges from 1.4 to 39.7% of the population[2]. In a recent hospital based study carried out in Nigeria, the prevalence of allergic rhinitis was 31.6%.[4]In addition to its primary effect, inhalant allergy of the upper respiratory tract might affect the development and clinical course of other disease conditions such as sinusitis, otitis media and asthma[4].

Allergy involves the production of a special class of antibody called immunoglobulin E (IgE) which has only been found in mammals[5]. This soluble factor (IgE) found in the serum or plasma of patients has been found to be responsible for the symptoms of allergic diseases[6]. Serum IgE has been identified as a key molecule in mediating type I hypersensitivity reactions for a long time[6]. These antibodies are bound to specific cells called mast cells, found in the skin, lungs and in many other tissues[7].

IgE determination is valuable in the diagnostic assessment of patients with established or suspected allergic diseases[7,8]. It is seen that circulating IgE levels are increased in atopic individuals. Studies have shown a relationship between allergens and asthma and findings represent a strong association between specific immunoglobulin E antibodies or total IgE and the allergic conditions[6]. Increased serum IgE may be due to increased IgE dependent processes, as well as involvement of cellular components of the immune system[9]. Allergic rhinitis and asthma have similar immunological mechanisms and it is possible that the factors contributing to the increase in total IgE plasma levels in asthma are involved in the same process in allergic rhinitis [10,11]. Barrenas et al,[12] demonstrated that the production of specific inflammatory proteins, although influenced by seasonality, is higher in male patients than in female patients suffering from allergic rhinitis, even after treatment with anti-inflammatory drugs.From literature search, we have not identified any study on serum IgE in patients with allergic rhinitis conducted in from Northwestern Nigeria, thus this prospective observational study was carried out to determine IgE levels in patients with allergic rhinitis with or without asthma vis-à-vis a control group to determine the reference values of this parameter in this region of Nigeria.

II. Materials And Methods

Subjects were recruited from UsmanuDanfodiyo University Teaching Hospital, Sokoto (ENT Department, General Outpatient Clinic, Pulmonology Clinic, including students within the hospital environment) with symptoms of allergic rhinitis with or without asthma, from March 2015 to December 2015 after ethical clearance was obtained from the Research and Ethics Committee of the same hospital. Informed consent was obtained from the participants. The clinical history of the patient, family history of the disease and physical examination of the ear, nose and throat were recorded. The cardinal symptoms of allergic rhinitis considered were nasal congestion; watery rhinorrhea; paroxysmal sneezing and pruritus of the nose, palate and/or eyes.The control group also included students and staff within UDUTH environment.Only adult patients from ≥18 years of age were enrolled.Exclusion criteria were: Patients who were on antihistamine and those who have sino-nasal mass. Five milliliters (5 ml) sample of peripheral blood was drawn from each participant by venous puncture, then placed in a vacuum tube without anticoagulant and centrifuged after clot retraction. The serum was collected into plain bottles and stored at -4^0C. Serum IgE levels were estimated for both groups by ELISA using kits from Acubind (USA). The standard protocol as mentioned in the kits was thus followed for quantitation of IgE in IU/ml. The reference value of serum IgE in the commercial kit used was ≤ 200 IU/ml.

Data was analysed using the Statistical Product and Service Solutions version 20 (IBM - SPSS Inc., Chicago, IL). The results were presented as means ± standard deviations and percentages as applicable. Differences in Means were compared using t-test. Association between the two groups was assessed using chi-squared statistics. P-values of < 0.05 were statistically significant.

III. Results

A total of 170 participants (90 patients and 80 controls) were recruited. Data from the participants enrolled in this study is shown in Table 1. The mean age of the patients having allergic rhinitis with or without asthma was 28.58 ± 7.29 years with ages ranging from 18 – 52 years, while that of the controls was 26.53 ± 6.27 years with ages ranging from 17 – 47 years (t = 31.026, p = 0.465). Among the Participants in the Study group, 37 (41.1%) were males while 53 (58.9%) were females with a male : female ratio of 1:1.4. Among the Participants in the Study group, 67.8% were in the age group of 21 – 30 years.

Table 1: Demographic profile of participants

		Patients	Controls
Age (Years)	Mean (±SD)	28.58 ± 7.29	26.53 ± 6.27
	Median	27.00	25.00
Sex	Females	53 (58.9%)	23 (28.8%)
	Males	37 (41.1%)	57 (71.2%)
	Total	90	80

Table 2: The Mean values of total serum IgE among participants

	IgE (IU/ml)	Range	Independent t –test
Patients (N = 90)	252.00 ±225.60	8.02 - 763.70	t = 5.174, p < 0.001.
Controls (N = 80)	106.48 ±117.95	0.92 - 468.50	

The mean value of total IgE in patients and controls were 252.00 ± 225.60 IU/ml and 106.48 ± 117.95 IU/ml respectively. The difference in their mean was statistically significant (Table 2).The upper limit of normal range of total serum IgE levels was 224.43 IU/ml, being the two standard deviations above mean of IgE for controls (Table 2). This value was therefore used as the baseline (reference) IgE level for normal non allergic individuals. The normal reference range from the commercial ELISA kits was ≤ 200 IU/ml.

Table 3: The Mean levels of total serum IgE in female and male participants

IgE (IU/ml)	Patients		Controls	
	Male	Female	Male	Female
Mean ±S.D	262.27 ± 233.08	244.83 ± 222.20	121.89 ± 130.84	68.31 ± 65.18
Range	17.46 – 727.40	8.02 – 753.70	3.48 – 468.50	0.92 – 288.80
Independent t-test	t = 1.865, p = 0.066		t = 0.359, p = 0.720	

The mean of total IgE was 262.27 ± 233.08 IU/ml in males and 244.26 ± 222.20 IU/ml in females and this difference was not statistically significant (Table 3).

Table 4: Comparing Serum IgE among participants using Reference value of 225 IU/ml.

	Serum IgE (IU/ml)		Test statistics	
	≤ 225 IU/ml N (%)	> 225 IU/ml N (%)	x^2	p value
Patients (90)	49 (54.4)	41 (45.6)		
Controls (80)	71 (88.7)	9 (11.3)	24.008	< 0.0001*

* **Significant**

From Table 4, forty one (45.6%) patients had values above the cut off while only 9 (11.3%) of the controls had values above 225 IU/ml, and the difference was statistically significant (p < 0.0001).

Table 5: Serum IgE in male and female participants using Reference value of 225 IU/ml.

IgE (IU/ml)	Patients		Controls		Test statistics	
	Male N (%)	Female N (%)	Male N (%)	Female N (%)	x^2	p value
≤ 225 IU/ml	19 (51.4)	30 (56.6)	49 (86.0)	22 (95.7)	0.242	0.623
> 225 IU/ml	18 (48.6)	23 (43.4)	8 (14.0)	1 (4.3)	1.540	0.215

Table 5 shows 18 (48.6%) males and 23 (43.4%) females among the patients had Serum IgE above the reference value. Though the percentage of males was higher than females, but the difference was not statistically significant (p = 0.623).
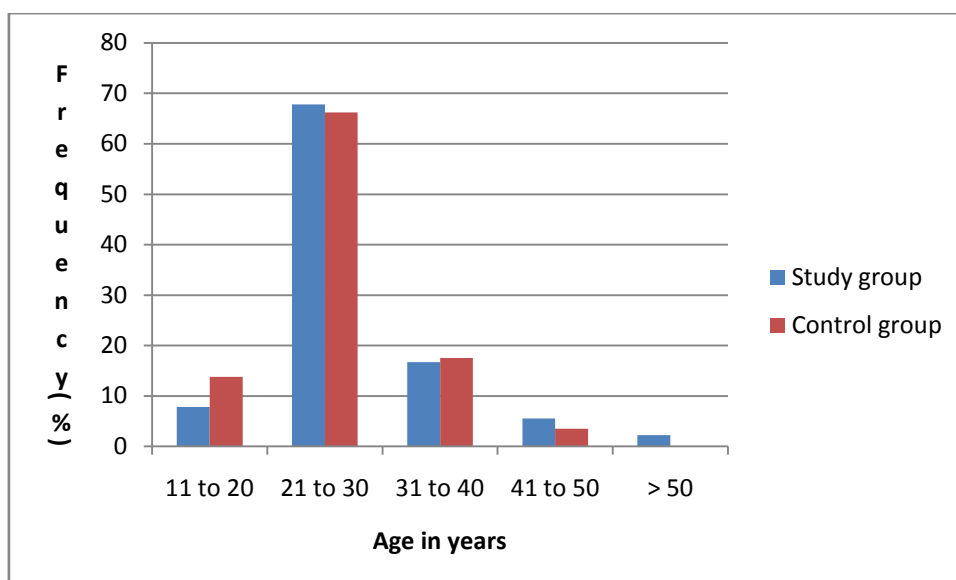

Figure 1: Bar Chart showing the age groups of participants

Figure 1 shows that the most frequently observed age group among study and control groups was 21 – 30 years.

IV. Discussion

It has been documented that circulating IgE levels are increased in atopic individuals.[13] Patients with atopic disease include allergic asthma, allergic rhinitis, atopic dermatitis and urticaria, show the presence of IgE in serum[13]. Serum IgE concentration at birth is about 0.22 IU/ml, it reaches the adult value at 14 years of age and decline after the age of 70 years due to decreased number of identifiable atopies[14]. Fewer male patients (41.1%) were enrolled in the study compared with the number of females (58.9%) enrolled. The reasons why men seek medical attention less often relative to women are not completely understood. This may be due to the poor health seeking behaviour observed in men, as some men do not see the need to keep hospital appointments let alone participate in a study[15].

In this study, 75.6% of the patients were ≤ 30years of age. A similar figure was also reported by Chanda et al[16] in India and Bakhshaee et al[17] in Iran. Although the onset of allergic rhinitis can occur at any time in life, it has been documented that 70% of these develop before 30 years of age.[18] However, Mgbor& Mgbor[19] and Ibekwe et al[20] in their studies, reported AR as a disease of adults. This study shows that the serum IgE levels in the patients (allergic rhinitis with or without asthma) was grossly elevated and ranges between 8.0 – 753.7 IU/ml with a mean of 252 ± 225.6 IU/ml while the reference value for controls without allergic rhinitis ranges between 0.9 – 468.5 IU/ml with a mean of 106.5 ± 117.95 IU/ml. This difference was statistically significant (t = 5.174, p <0.001). The mean in the controls is lower than that reported by Arinola (2008)[21] and Eziyi[22] where

the mean was 281.2 ± 225.3IU/ml and 167+ 92IU/ml in normal adults without helminthiasis in their studies at Ibadan and Ife respectively, Nigeria. Though higher mean of 180 IU/ml was also reported in India by Chowdary et al.[23], this was attributed to the incidence of parasitic infestations in the controls. However, the mean of total IgE was 38 ± 43 IU/ml in normal non-allergic Caucasians as reported by Bousquet et al[24]., which is lower than findings in this study.

This difference could be due to difference in geographic area, race and in the method used for the study.[22]The results from this study also showed that almost half; 41(45.6%) of the patients had elevated serum IgE above the reference value (i.e ≥ 225 IU/ml), while only 9 (11.3%) had increased serum IgE from the control group. This was statistically significant (p < 0.001). This is in agreement with studies done in Nigeria by Eziyi et al[22] and Farida et al[25] in Islamabad which showed that the serum IgE levels were significantly higher in patients with nasal allergy than controls.[22,25] Although 22% of controls had values beyond the reference value in the study by Eziyi et al[22], it was explained by the fact that the test for parasitaemia was inexhaustible and some patients who may have been treated recently will still have high level of immunoglobulin E.

Sudha et al[26] noted the importance of serum IgE levels, that the degree of inflammation in allergic conditions directly correlates with the proportion of IgE concentration in circulation. Significant increase in total IgE was observed in different allergic groups when compared to normal controls.

The mean IgE of male patients in this study (262.3 ± 233.1 IU/ml) was higher than the value of female patients (244.8 ± 222.2 IU/ml), however the difference was not statistically significant (p = 0.720). Similar findings was noted by Eziyi et al[22] in Nigeria and Fereidounia et al[27] in Iran where males had higher mean IgE, but not statistically significant. Couto et al[28] observed that males had significantly elevated mean IgE when compared to females in their study. It has been observed that males with asthma present higher total IgE plasma levels compared with female patients[29]. In addition, adolescents and adult males with bronchial asthma exhibit higher plasma levels of total IgE in response to environmental allergens[30]. The reasons underlying these differences are not completely understood. Allergic rhinitis and asthma have similar immunological mechanisms and it is possible that the factors contributing to the increase in total IgE plasma levels in asthma are involved in the same process in allergic rhinitis[10,11]. Barrenas et al.[12] demonstrated that the production of specific inflammatory proteins, although influenced by seasonality, is higher in male patients than in female patients suffering from allergic rhinitis, even after treatment with anti-inflammatory drugs.Yamamoto et al. [31] reported that differences associated with sex are important during the initiation of allergic rhinitis in mice. It is possible that the involvement of IL-4 in the immunological mechanisms regulating the production of IgE antibodies influences the high rates of IgE expression in males compared with females [32].

V. Conclusion

This study is not without certain limitations and the results must be considered preliminary, as the diagnosis of allergic rhinitis was essentially clinical. However, the study highlights the importance of total IgE which has been considered as a significant marker of allergic conditions.In conclusion, this study demonstrates that total IgE plasma levels significantly discriminate between patients having allergic rhinitis with or without asthma compared to healthy control group. Evaluating total IgE plasma levels can be useful to identify patients at risk of allergic rhinitis.

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