

Serum IgE levels in Nigerians with and without Allergic Rhinosinusitis

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ABSTRACT

Outcome objectives: To determine the serum Ig E levels in Nigerians with allergic rhinitis (AR), reference range of serum IgE in parasite free population and the upper limit of normal for IgE in Nigerians.

Methods: An observational study of 42 parasite free patients with AR and 50 matched controls in a Nigerian tertiary hospital between January – March, 2012. The serum IgE levels were measured using ELISA IgE pro-kit by MABTECH. The data were analysed using SPSS 17 and p- values < 0.05 were significant.

Result: The study comprised of 45.7% (42) males and 54.3% (50) females. The age of participant ranges between 10 months to 76 years with a mean of 31.98 ± 20 years. The mean age of the patients with AR was 28 ± 19 years while the mean age of controls was 36 ± 21 years ($t= 1.931$, $p = 0.115$). There was a wide variation in the serum IgE level of healthy participants. The range of serum IgE in controls and AR were 2.75 – 280 IU/ml and 126.4 -1280 IU/ml respectively. The mean of total IgE in patients with AR and controls were 508 ± 359 IU/ml and 158 ± 91 IU/ml respectively ($t = 6.649$, $p < 0.001$).

Conclusion: The mean serum IgE in AR was 508 ± 359 IU/ml. The reference range is 2.75-280 IU/ml and the upper limit of the normal values of IgE in the study population was fixed at 249 IU/ml. Serum IgE was significantly higher in AR patients than controls and also not affected by age and sex.

Keywords: Allergic rhinosinusitis, Immunoglobulin E, Nigerians

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INTRODUCTION

Nasal allergy or allergic rhinosinusitis is a symptomatic disorder of the nose induced after allergen exposure by an immunoglobulin E (IgE) - mediated inflammation of the membranes lining the nose (Bousquet et al, 2001). It occurs when an allergen, such as pollen, dust or animal dander (particles of shed skin and hair) is inhaled by an individual with a sensitized immune system (Sullivan et al, 2001). In such individuals, the allergen triggers the production of the antibody immunoglobulin E (IgE), which binds to mast cells and basophils containing histamine. This reaction results in an inflammatory response which can range from uncomfortable to dangerous. These reactions are acquired, predictable, and rapid. When caused by pollens of any plants, it is called "pollinosis", and if specifically caused by grass pollens, it is known as "hay fever".

Immunoglobulins are glycoprotein molecules that are produced by plasma cells in response to an immunogen and function as antibodies which play a key role in immune response. Immunoglobulin E (IgE) is a class of antibody (or immunoglobulin "isotype") found only in mammals. IgE is an evolutionary conserved member of the immunoglobulin (Ig) family. Although IgE titre is very low

(nano- to micrograms per ml range) accounting for only 0.05% of the Ig concentration (Winter et al., 2000) and typically the least abundant isotype compared to all other immunoglobulin classes, it is capable of triggering the most powerful immune reactions.

Nigerian study on IgE levels in normal and patients with allergic rhinitis are sparse hence, this observational study was carried out to determine IgE levels in parasite free patients with allergic rhinitis and controls recruited in southwestern Nigeria and to determine the reference values of this parameter in this local environment.

MATERIALS AND METHODS

Forty-two consecutive patients that present to the Ear, Nose and Throat (ENT) Department of the Obafemi Awolowo University Teaching Hospital complex (OAUTHC), Ile – Ife, Nigeria with a diagnosis of allergic rhinosinusitis and fifty controls (that needed the services of a specialist for a different reason) matched by age and sex with the patients and who satisfied the inclusion criteria were recruited to the study after obtaining written informed consent. Ethical clearance was obtained from the Ethical Committee of the institution. All patients and controls had their blood films examined for malaria parasite and stool samples examined for ova and other parasites. Demographic and clinical data were documented including nasal physical findings. 5ml of blood was drawn from the ante cubital vein of patients and controls into plain bottles and centrifuged after clot retraction. The serum was collected into plain bottles and stored at -80°C . Serum IgE levels were measured by quantitative enzyme –linked immunosorbent assay (pro-kit by MABTECH).

Data was analysed using the SPSS for windows software version 17 and the results were presented as means \pm standard deviations and percentages as applicable. Differences in Means were compared using Mann-Whitney U test. Association between the two groups was assessed using chi-squared statistics. P-values of < 0.05 were statistically significant.

Main outcome measures: The upper limit of normal for serum IgE level in this study will be taken as the mean + 2SD of the controls. This will be the cut-offs for this parasite-free population.

RESULTS

Age and Sex

Figure 1 show the age and sex distribution of the participants. Forty- two (45.65%) were males and fifty (54.35%) were females with a ratio of 1:1.2. The age range of patients enrolled in the study was 10 months to 76years with a mean age of 31.98 ± 20 years. The mean age of the patients with allergic rhinosinusitis was 28 ± 19 years while the mean age of controls was 36 ± 21 years. The difference in means of age was not statistically significant ($t = 1.931$, $p = 0.057$). Twenty five (27.2%) were children while sixty-seven (72.8%) were adults.

Out of the 42 patients with allergic rhinitis (AR), the age group 0-20years were 40.5% while those of 21-30years accounted for 28.6%. Table 1 show the sex distribution of patient with allergic RS.

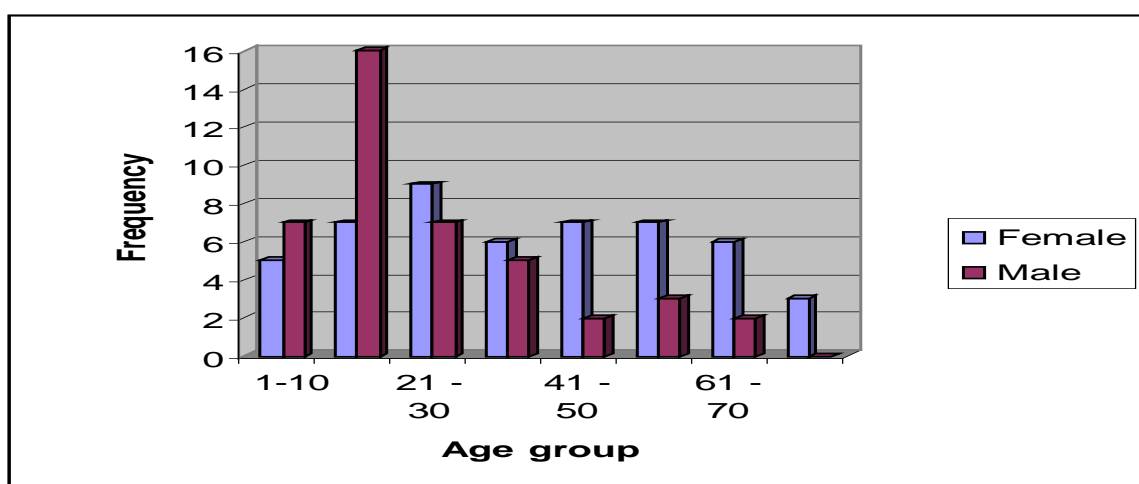


Fig. 1: Age and Sex distribution of participants.

TABLE 1: Sex distribution of patients with allergic rhinosinusitis and control

Sex	Allergic / Non allergic		Total (%)
	Allergic rhinosinusitis	No allergy	
Females	22 (23.91%)	28 (30.44%)	50 (54.35%)
Males	20 (21.74%)	22 (23.91%)	42 (45.65%)
Total	42 (45.65%)	50 (54.35%)	92 (100%)
p-value	0.732 (t = 0.344)		

Participants were group by age into: 1-10years, 11-20years, 21-30 years, 31-40years, 41-50years, 51-60years, 61-70years and 71-80years.

Immunoglobulin E (IgE)

The range of total serum IgE in patients with AR was 126.4 -1280 IU/ml while the range in controls was 2.75 – 280 IU/ml (Table 2). The total IgE level in females ranges between 2.75 and 1280 IU/ml; the range in female patients with AR was 140-1280 IU/ml while the range in female controls was 2.75- 280 IU/ml. The total IgE level in males ranged between 20 -1040 IU/ml while the range in male patients with AR and controls were between 126.4 – 1040 IU/ml and 20 -280 IU/ml respectively (Table 2).

The mean of total IgE in patients with AR and controls were 508 ± 359 IU/ml and 158 ± 91 IU/ml respectively. The difference in their mean was statistically significant ($t = 6.649$, $p < 0.001$). The mean of total IgE was 301 ± 309 IU/ml in females and 338 ± 304 IU/ml in males and this difference is not statistically significant ($t = 0.579$, $p = 0.564$; Table 3). The means of total IgE levels in children and adults were 319 ± 315 IU/ml and 318 ± 306 IU/ml. Table 4 shows that there

was no significant difference between the mean of total serum IgE levels in children compared to adults.

Figure 2 shows the IgE levels of allergic rhinitis patients and controls. The upper limit of normal range of total serum IgE levels was 249 IU/ml being the two standard deviations above mean of IgE for controls. This value was therefore used as the baseline IgE level for normal non allergic individuals and indicated by a horizontal line across. Thirty (71.4%) patients with allergic rhinitis had values above the cut off while only 11(22.0%) of the controls had values above 249 IU/ml (chi = 20.618; $p < 0.0001$).

TABLE 2: Ranges of total serum immunoglobulin E in Nigerians

Age (years)	Sex	IgE (IU/ml)	
		Allergic rhinitis	No allergy
Children	Male (n = 14)	160 – 1120	20 – 260
	Female (n= 11)	252.8 – 440	48 – 253
Overall range in children (n = 25)		160 – 1120	20 - 260
Adults	Male (n = 28)	126.4- 1040	31.6 – 280
	Female (n= 39)	140 – 1280	2.75 – 280
Overall range in adults (n = 67)		126.4-1280	2.75 - 280

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

Age	IgE (IU/ml)			
	Allergic rhinitis		No allergy	
	Female	Male	Female	Male
	n = 42		n = 50	
Children n =25	313 ± 86	628 ± 385	139 ± 91	121 ± 91
	523 ± 347		130 ± 88	
	319 ± 315			
Adults n = 67	540 ± 399	446 ± 331	147 ± 99	193 ± 75
	502 ± 370		167 ± 92	
	318 ± 306			
t ; p-value	t = 0.273; p = 0.785			

Table 4: Mean of total serum IgE in children compared with adult Nigerian population

Sex	IgE (IU/ml)	
	Allergic rhinitis n = 42	No allergy n =50
Females (n = 50)	499 ± 371	145 ± 96
Overall value in females	301± 309	
Males (n = 42)	519 ± 355	174 ± 84
Overall value in males	338 ± 304	
p-value	0.564 (t = 0.579)	

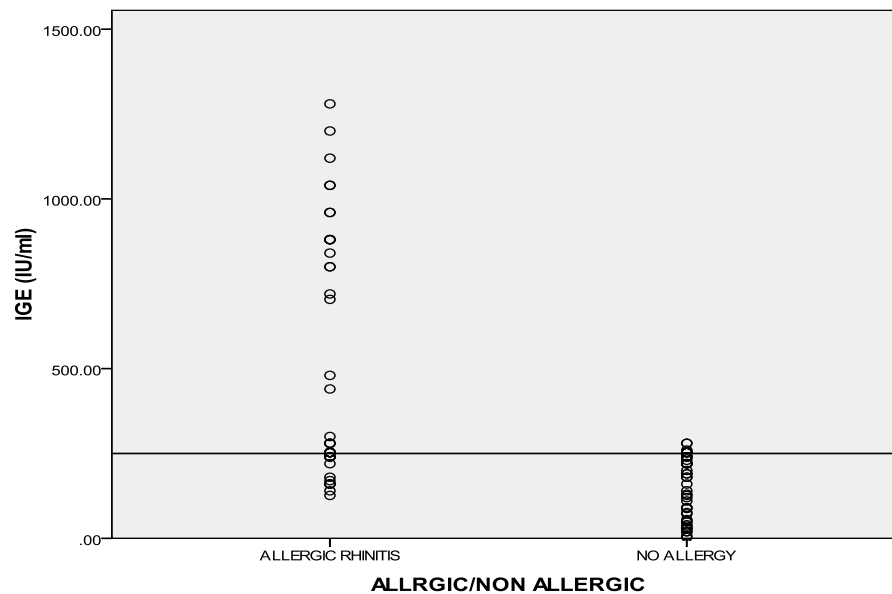


Fig. 2: IgE levels of allergic rhinitis patients and non allergic controls.

The horizontal line is showing the upper limit of the normal range of total IgE levels in the non allergic control group

DISCUSSION

In this study, out of the 42 patients with allergic rhinitis (AR), the age group 21-30years accounted for 28.6% while those of 0-20years were 40.5%. This shows that AR is a disease of children and young adult, which is at variance with works by Ibekwe *et al* (1990) and Mgbor & Mgbor (2006) that reported AR as a disease of adults. Other workers however agree to onset being under age 30, with a peak incidence in childhood and adolescence (Barbee *et al.*, 1981; Dykewicz *et al.*, 1998). It has also been reported that school-age children and adolescents are more likely to suffer from seasonal allergic rhinitis whereas adults tend to suffer from persistent allergic rhinitis (Charpin *et al.*, 1996).

Immunoglobulin E (IgE)

Total IgE level estimation provides evidence in support of atopy. 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 (Merret et al., 1980). The results of this study shows that the IgE levels in allergic rhinitis patients was grossly elevated and ranges between 126 - 1280 IU/ml with a mean of 508 ± 359 IU/ml while the reference value for healthy control without allergic rhinitis (children and adults) ranges between 2.75- 280 IU/ml with a mean of 158 ± 91 IU/ml. This difference is statistically significant ($t = 6.649$, $p < 0.001$). This study also shows that, the IgE levels of healthy non allergic adult ranged from 2.75 to 280 IU/ml with a mean of 167 ± 92 IU/ml. This is slightly lower than findings in India by Chowdary et al., (2003) where the total IgE levels in controls ranged from 10 IU/ml to 380 IU/ml with a mean of 180 IU/ml. The higher IgE level in the India normal controls is explained by the incidence of parasitic infestations in the controls as reported by the authors whereas those with parasitic infections were excluded from this study. Arinola (2008) also reported a higher total IgE of 31-700 IU/ml (mean of 281.2 ± 225.3) in normal adults without helminthiasis in his study at Ibadan, Nigeria. Although the subjects in his study were not asthmatic, it was not specified if they had any form of allergy which could have increased their serum IgE levels. The mean of total IgE was 38 ± 43 IU/ml in normal non allergic Caucasians which is lower than findings in this study (Bousquet et al., 1982), whereas IgE levels in normal non allergic adults in Iran ranges between 2 and 373 IU/ml (Shoormasti et al., 2010). This difference could be due to difference in geographic area, race and in the method used for the study.

Although the mean IgE in females with and without allergic rhinitis were lower than those in males, there was no statistically significant difference between the values for male and female ($t = 0.579$, $p > 0.05$). Some authors also reported a higher but insignificant level in males than females (Ezeamuzie *et al.*, 1999; Simoni *et al.*, 2001; Carosso *et al.*, 2007). Barbee et al. (1981) reported significant higher levels in males while others (Zetterstrom and Johansson, 1981; Shoormasti *et al.*,

2010) reported that there was no significant difference between male and female IgE levels. The IgE levels in females and males irrespective of presence or absence of allergy ranged between 2.75-1280 IU/ml with a mean of 301 IU/ml and 32-1040 IU/ml with a mean of 338 IU/ml respectively. The range is comparable to findings by Arinola (2008) where he reported total IgE ranges of 40 – 750 IU/ml in both sexes with a mean of 264 IU/ml and 309.9IU/ml in females and males respectively.

IgE levels did not differ between with age in this study ($t = 0.024$, $p > 0.05$). Other workers (Zetterstrom and Johansson, 1981; Kartasamita et al., 1994) also did not find significant difference between age groups, contrarily, Arinola (2008) and Barbee et al. (1981) found a significant difference between serum total IgE in children and adults. While Arinola (2008) found a higher value in adults, Barbee et al. (1981) found a higher value in children between 6-14 years.

Witting *et al.* (1980) reported that healthy, non-allergic adults have an expected IgE concentration of up to 120 IU/ml. From this study, the upper limit of the normal for total IgE was estimated to be 249 IU/ml for healthy Nigerians without parasitaemia and allergy. Although 22% (11) of controls had values beyond this cut off, it could be 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.

CONCLUSION

Serum IgE levels were significantly higher in Nigerian patients with nasal allergy than controls. The mean of total serum IgE in healthy and parasite-free Nigerians was 158 ± 91 IU/ml and the reference range was 2.75-280 IU/ml while the mean in patients with AR was 508 ± 359 IU/ml with a range between 126.4 -1280 IU/ml . The total IgE levels were not affected by sex and age. Although there was a wide variation in the serum IgE levels of healthy participants, the estimated upper limit of normal using mean \pm 2SD in parasite-free healthy Nigerian subjects without allergy was 249 IU/ml. This value was the defined cut-offs for this study. A larger sample population study

is ongoing to further establish the IgE levels in patients with nasal allergy and controls in the Nigerian population.

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