SERUM IGE LEVELS AND SEVERITY OF ATOPIC DERMATITIS

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ABSTRACT

INTRODUCTION: Atopic dermatitis is an itchy, chronic relapsing, inflammatory skin condition with typical flexural distribution. The eruption is frequently associated with other atopic conditions in the individual or other family members . It is associated with increased production of serum IgE levels. The objective of this study is to evaluate whether serum IgE levels correlate with the severity of atopic dermatitis (AD) based on Three Item Severity (TIS) Score of AD

MATERIAL AND METHODS: This is a hospital based observational study carried out from June 2014 to January 2015. Eighty two atopic dermatitis patients aged ≤ 20 years were recruited from the OPD of Dermatology Department of Gandaki Medical College, and the AD severity was evaluated using TIS score (Three Item Severity score). Concentrations of serum total IgE were measured and compared with controls.

RESULTS: The mean age of our study group comprising of 82 patients was 9.03±5.6 years. The overall TIS score was 5.74±2.02.To find out the correlation between the disease severity and IgE level, one way ANOVA test was used. There was no statistical difference between the IgE levels of controls and the patients with mild disease but there was a significant correlation between severity of disease (between mild, moderate and severe AD) and the levels of serum IgE. ($P<0.05$)

CONCLUSION: Serum IgE is an useful indicator for predicting severity of atopic dermatitis in young patients.

KEY WORDS: Atopic dermatitis; Serum IgE levels

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INTRODUCTION

Atopic dermatitis is an itchy, chronically relapsing, inflammatory skin condition. The rash is characterized by itchy papules which become excoriated and lichenified, and typically have a flexural distribution. The eruption is frequently associated with other atopic conditions in the individual or other family members.[1-3] It has a characteristic morphology and age-related distribution pattern of the involved skin and is associated with pruritus. Genetic factors play an important role, and the pathogenesis is attributable to specific immune and inflammatory mechanisms. Although the word "atopic" is in the name, association with atopy is not an essential criterion for atopic dermatitis (AD). So, patients diagnosed with AD can be atopic or non-atopic.[4] The main immunoglobulin abnormality is increased production of IgE. This results in the presence of many antigen-specific IgE species to ingested or inhaled antigens and, mostly an increase in total serum IgE. About 80% of patients with atopic dermatitis have increased amount of total IgE.[5]

MATERIAL AND METHODS

The study was conducted in the Department of Dermatology & Venereology, Gandaki Medical College, Pokhara, Nepal from June 2014 to Jan 2015. Patients belonging to both sexes and aged upto 20 years were included. Written informed consent and ethical clearance was taken. Patients with other dermatological and systemic problems and age more than twenty were excluded. In this study we included the patients of atopic dermatitis with varying severity. A total of 82 patients were included and 'The UK refinement of Hanifin and Rajka's diagnostic criteria' was used to diagnose cases of atopic dermatitis.[6]

None of the patients received any systemic corticosteroid or immunomodulatory treatment before being enrolled in the study. We classified the patients as mild, moderate or severe using the TIS score (Three Item Severity score). It is a simplified system, based on the evaluation of erythema, oedema/papulation and excoriation on a scale from 0 to 3. The TIS score is the sum of 3 intensity items scored on a scale from 0 to 3. Each item should be scored on the most representative lesion. The range of the TIS score lies between 0 and 9. Based on this system, AD can be classified as mild (total score 324), moderate (from >4 to <8) and severe (from >8-9).[7] A written consent was taken from the patient and parents for the study. In addition to routine investigations, relevant investigations where required, were also carried out. These included scraping for fungus, swabs for culture & sensitivity and histopathology. Sera of all these patients were tested for IgE levels by ELISA and their levels were graded to correlate with severity of the disease. Required number of age-matched controls were also investigated. All the findings were recorded on a preformed proforma. Data were collected and analysed using statistical software, SPSS Statistics, version 21. A 'p' value <0.05 was considered statistically significant.

RESULTS

In this study, we recruited 82 patients which comprised of 32 males (39%) and 50 females (61%); male to female ratio being 0.64. The mean age was 9.03±5.6years (range 6 months to 20 years). According to the severity of the disease, 28 patients had mild AD, 30 patients had moderate and 24 had severe disease. Around 50% of the patients were aged between 1 to 10 years, infants comprised less than 10% of the study group, the rest ranging from 11 to 20 years. The overall TIS score was 5.74 ± 2.02, 5 patients scored 7 while 16 patients scored 8.

Table 1: Gender wise age distribution

Age Group	Male	Female	Total
<1	2	4	6
1-5	9	11	20
6-10	6	15	21
11-15	7	14	21
>15	8	6	14
Total	**32**	**50**	**82**

Table 2: Disease severity in patients of different age groups

Severity of Disease	Age group					Total
	<1	1-5	6-10	11-15	>15	
Mild	1	8	6	7	6	28
Moderate	2	6	8	10	4	30
Severe	3	6	7	4	4	24
Total	**6**	**20**	**21**	**21**	**14**	**82**

We divided the patients into three groups (mild, moderate and severe) based on the severity of AD using The TIS score.[7] In the first group, there were 28 patients, likewise 30 and 24 in the other two groups respectively. Twenty-four healthy

controls were also included in our study. The mean value of serum IgE for mild, moderate and severe disease were 153.89±49.71 IU/ml, 217.03±113.50 IU/ml and 319.50±197.78 IU/ml respectively (Table 3)

Table 3: Mean IgE values of cases and control

Group	Number	Mean	Std.Deviation	95% CI* for Mean	
				Lower bound	Upper bound
Controls	24	126.75	39.986	109.87	143.63
Mild	28	153.89	49.710	134.62	173.17
Moderate	30	217.03	113.501	174.65	259.42
Severe	24	319.50	197.784	235.98	403.02

**CI-Confidence Interval*

To find out the correlation between the disease severity and IgE level we used one way ANOVA test. A statistically positive correlation between the severity of disease and the level of IgE was found. (p value<0.05) When we compared the IgE level of controls and the patients, there was no statistical difference between the controls and the patients with mild disease but there was a significant statistical difference between mild, moderate and severe disease (p value<0.05) as depicted below in Table 4. As shown in Fig.1, an inclining curvilinear graph is seen as the severity of the disease increases.

Table 4: Comparison between various groups and controls

Comparison between cases and controls		Mean Difference	p-Value
Controls	Mild	-27.1429	.403
	Moderate	**-90.2833**	**.005**
	Severe	**-192.7500**	**.001**
Mild	Controls	27.1429	.403
	Moderate	**-63.1405**	**.041**
	Severe	**-165.6071**	**.001**
Moderate	Controls	**90.2833**	**.005**
	Mild	**63.1405**	**.041**
	Severe	**-102.4667**	**.002**
Severe	Controls	**192.7500**	**.001**
	Mild	**165.6071**	**.001**
	Moderate	**102.4667**	**.002**

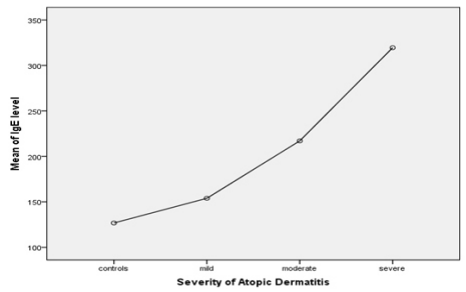

Figure 1: Correlation of disease severity and the mean level of IgE(IU/ml)

DISCUSSION

Immunoglobulin E (IgE) has a unique position among immunoglobulins. It is present in human serum in very small amount, its serum concentration may increase several folds in response to specific stimuli.[8,9] The levels are raised in allergic diseases like allergic rhinitis, allergic bronchial asthma, atopic dermatitis and urticaria.[10-16] **A** child with atopy produces IgE antibodies after exposure to some environmental allergens.[17] Elevated serum IgE level occurs in around 80% of patients with atopic dermatitis and are directed against a variety of antigens e.g. pollens, moulds, foodstuff, house dust mites and bacterial antigens. Patients with atopic dermatitis show positive Prick test and RAST to food allergens such as egg, milk, wheat, fish, soya and peanuts.[18-21] In atopic dermatitis the partial loss of the cutaneous barrier function, due to low ceramide levels and reduced filaggrin function, facilitates the transepidermal water loss and the penetration of environmental antigens, resulting in a specific, IgE-driven, allergic skin inflammation.[22,23]

IgE activates key effector cell types involved in allergic inflammation and its contribution to some of other allergic diseases in which patients are sensitized to allergens and have elevated levels of IgE.[24] The result of the present study in which the severity of atopic dermatitis correlating with the IgE level is in accordance with the study conducted by Ahmed *et al.* The authors concluded that children suffering from atopic dermatitis had raised serum level of IgE, which also correlated well with severity of the disease. In their study, only mild and severe disease group had a significant correlation with the IgE levels. (p value<0.001) The authors did not compare the values of the patients with that of controls, rather they divided IgE levels into three groups ,cut off being 87 IU/ml.[25] Dhar *et al*. carried out a study on 102 atopic patients and found that IgE levels in these patients were significantly higher than that of the controls.[26] Similar findings with additional association to respiratory disease were observed by Johnson *et al.*[27] In a case control study of 2,201 East German school children aged 5 to 14 years, the investigators found elevated serum levels of total IgE and IgE specific to various aeroallergens in 75% children with AD; this was significantly higher than those without AD (36.3%).[28] In another study of 345 children (mean age, 2.9 years), it was found that children with AD had a higher prevalence (about 80%) of sensitization to food and a medium

prevalence (about 40%) to aeroallergens and also the mean serum IgE level in children with high SCORAD quartile was significantly higher than in the low SCORAD quartile (5443 kU/l *vs.* 488 kU/l, p value < 0.001).[29] In yet another multicenter study of a German birth cohort, investigators followed 1,314 children from birth to 7 years of age and determined serum IgE antibodies specific to food allergens (cow's milk, egg white, soya bean and wheat) and inhalant allergens (house dust mite, cat dander, mixed-grass, and birch pollen) by using an immunoassay. They found a strong association of AD with elevated total and specific IgE levels at the age of 2. The association was higher at younger age: 41% of children with sensitization at age 1 had AD, whereas only 27% children with onset of sensitization after age 2 had AD.[30]

In a prospective study comprising 50 patients of AD, 88% were found to have elevated levels of serum IgE with the highest elevation seen in those between the ages of 10 to 20 years. This study also noted an age dependence in the pattern of sensitization. 65% of the children under the age of 10 were positive to one or more food allergens; sensitivity to food allergens was more common in those below 10, while that to aeroallergens was more common in the older age children.[31] According to Hon *et al.*, the total serum IgE level divided by the age-specific upper limit correlated well with the extent and intensity of AD as per SCORAD scores.[32]

CONCLUSION

The present study shows that the level of IgE correlates remarkably with the severity of atopic dermatitis. Further studies with greater sample size are needed to consolidate our findings.

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