



ASSOCIATION BETWEEN THE SERUM LEVEL OF TOTAL IMMUNOGLOBIN E AND SEVERITY OF ATOPIC DERMATITIS IN CHILDREN

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ABSTRACT

Introduction: Atopic dermatitis (AD) is associated with immunoglobulin E antibody (IgE). It is thought that the serum level of total IgE is associated with disease severity.

Objectives: To investigate the relationship between the serum level of total IgE and disease severity in AD children.

Method: A cross-sectional study was conducted on AD patients from July 2018 to July 2019. Disease severity was classified into mild, moderate, or severe disease. The serum level of total IgE was regarded as normal or high using age-based cut-offs.

Result: Among 90 AD patients, 42.2%, 26.7%, and 31.1% had mild, moderate, and severe disease, respectively. Sixty-one (67.8%) patients had a normal IgE level. The proportions of patients with normal IgE level was 97.4%, 79.1%, and 17.9% in the mild, moderate, and severe group, respectively. However, the proportions of patients with increased IgE level at 3 above's was 2.6%, 20.9%, and 82.1%, respectively ($p < 0.001$).

Conclusion: A high serum level of total IgE is associated with more severe atopic dermatitis.

Key words: total IgE, atopic dermatitis.

1. INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory skin disease that is common in children and also occurs in adults. The disease

has a very early onset with more than 60% of the cases in the first year of life and 85% before the age of five [1]. In October 2003, the World Allergy Organization (WAO) proposed replacing the term "atopic dermatitis" with "eczema". Eczema is divided into two groups: atopic eczema and non-atopic eczema [2], and atopic eczema is characterized by an high level of total immunoglobulin E (IgE), positive skin prick test, and presence of specific IgE antibodies [4]. Non-

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atopic eczema accounts for about 10%-45% of eczema and is not associated with allergic respiratory diseases such as asthma or allergic rhinitis [4]. [5]. Children with AD who have a high level of IgE are usually very sensitive to food and air allergens and have higher risk of severe AD and anaphylaxis [5]. In a meta-analysis, Flohr et al found that patients with AD with atopic factor had a worse long-term prognosis [6]. Therefore, determining whether AD patients have atopic factor can guide doctors in planning patient management, such as use of immunotherapy or prevention of allergen exposure, and long-term prognosis [4]. Owing to the lack of evidence in Vietnam, we conducted this study to determine the serum level of IgE in Vietnamese AD patients.

2. SUBJECTS AND METHODS

2.1. Study design

We conducted a cross-sectional study on atopic dermatitis patients aged 2–12 years presenting to the National Hospital of Dermatology and Venereology (NHDV) from July 2018 to July 2019. AD was diagnosed using the Hanifin and Rajka's diagnostic criteria [1], [7]. Other inclusion criteria included no signs of respiratory atopy (asthma, allergic rhinitis) at the time of recruitment and no treatment within the past two weeks. All patients provided consent before participation in the study.

2.2. Study procedures

Eligible patients were interviewed for history of allergy and examined for clinical signs and severity of AD. The severity was assessed by the SCORAD index and classified into mild, moderate, or severe disease [8].

A blood sample was collected for total IgE measurement (done by enzyme-linked immunosorbent assay). The normal serum levels of IgE in children aged 2-5, 6-9, and 10-12 years were < 60, < 155, and < 199 IU/mL, respectively.

2.3. Data analysis

Data were analyzed by SPSS 16.0. Categorical data were described as number (percentage) and tested for differences by the chi-square test. Continuous variables including age and serum level of IgE was described as mean (standard deviation, SD) or median (min-max) and were compared among severity using the *t*-test, ANOVA, or Kruskal-Wallis test where appropriate.

3. RESULTS

3.1. Patient characteristics

We recruited a total of 90 patients. Thirty-three patients (36.7%) were female, and the mean age was 6.98 ± 2.69 years. Based on the SCORAD index, the percentage of mild, moderate, and severe AD was 42.2%, 26.7%, and 31.1%, respectively. Table 1 and Figure 1, 2 present patient characteristics of the three severity groups. No statistical difference was found in all characteristics.

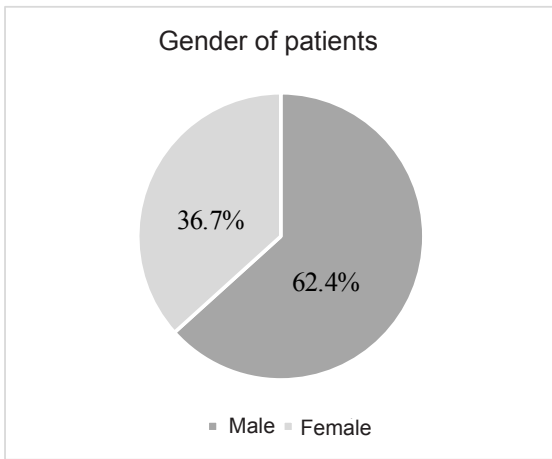


Figure 1. Gender of patients

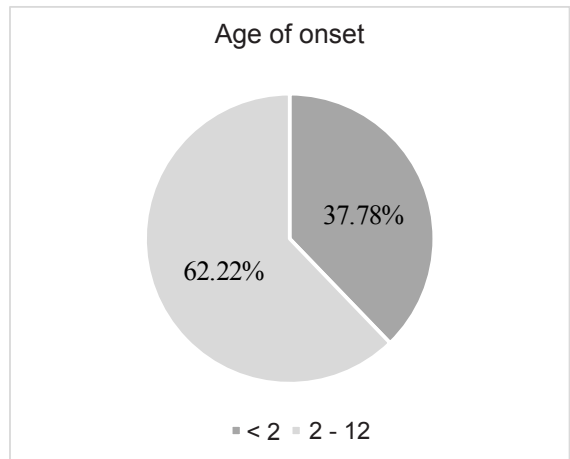


Figure 2. Age of onset AD

Table 1. Patient characteristics

	Total (n = 90)	Mild (n = 38)	Moderate (n = 24)	Severe (n = 28)	p
Age, median [Q1,Q3]	7.00 [5.00,9.00]	7.00 [5.25,9.75]	8.00 [5.75,10.00]	6.00 [4.00,8.00]	0.188
Age group, n (%)					
2-5 years	29 (32.2)	10 (26.3)	6 (25.0)	13 (46.4)	0.277
6-9 years	41 (45.6)	18 (47.4)	11 (45.8)	12 (42.9)	
10-12 years	20 (22.2)	10 (26.3)	7 (29.2)	3 (10.7)	

SD: standard deviation, Q1: first quartile, Q3: third quartile. Categorical and continuous variables were tested for difference using the chi-square test and the Kruskal-Wallis test.

3.2. Serum level of total IgE

Among 90 patients, 29 (32.2%) patients had a high level of total IgE. Table 2 presents patient characteristics of the two IgE group (normal and high level). Patients with a high IgE level were younger and had more severe disease (all differences were significant).

Table 2. Normal and high IgE group

	Normal IgE level (n = 61)	High IgE level (n = 29)	p
Female, n (%)	23 (37.70)	10 (34.48)	0.950
Age, median [Q1,Q3]	8.00 [6.00,10.00]	5.00 [4.00,7.00]	< 0.001
Age group, n (%)			
2-5 years	11 (18.03)	18 (62.07)	
6-9 years	31 (50.82)	10 (34.48)	< 0.001
10-12 years	19 (31.15)	1 (3.45)	
Onset before 2 years of age, n (%)	20 (33.33)	14 (48.28)	0.260
Severity, n (%)			
Mild	37 (60.66)	1 (3.45)	
Moderate	19 (31.15)	5 (17.24)	< 0.001
Severe	5 (8.20)	23 (79.31)	
IgE, median [Q1, Q3]	34.60 [17.00,74.17]	156.41 [109.30,255.21]	< 0.001

SD: standard deviation, Q1: first quartile, Q3: third quartile. Categorical and continuous variables were tested for difference using the chi-square test and the Kruskal-Wallis test. Statistically significant p-values were in bold.

When grouped by age group and disease severity, the levels of total IgE appeared to be higher in more severe patients and did not differ among age groups. However, due to the small number of samples, we could not test for significant difference.

Table 3. High level of total IgE group by age groups and severity of AD

	2-5 years	6-9 years	10-12 years
Mild	77.9 [77.9,77.9]	-	-
Moderate	79.6 [68.5,98.6]	156.4 [156.4,156.4]	-
Severe	141.0 [109.3,269.9]	189.1 [179.8,255.2]	376.8 [376.8,376.8]

Table 4. Normal level of total IgE group by age groups and severity of AD

	2-5 years	6-9 years	10-12 years
Mild	24.2 [13.0,34.0]	19.4 [9.9,40.6]	24.4 [16.5,49.5]
Moderate	55.4 [54.5,56.3]	66.7 [42.1,79.2]	75.3 [60.7,89.5]
Severe	-	86.1 [83.3,119.7]	149.4 [134.3,164.4]

All data were described in median [first quartile, third quartile].



4. DISCUSSION

In this study, we investigated the relationship between the serum level of total IgE and the severity of atopic dermatitis in children. Because serum IgE level is affected by different factors (for example, it has different age-based cut-offs), we examined the relationship between IgE, disease severity and other factors. The fact that no significant difference was found suggesting the similarity between disease severity regarding characteristics.

The result shown that patients in the high IgE group had significantly more severe disease. While unable to test for statistical difference, when stratified by age groups and disease severity, the levels of IgE appeared to be higher in severe patients. Although patients in the high IgE group were significantly older, we had examined its association with disease severity and found that they did not have an association; therefore, age was probably not a confounder. In two studies of Laske N et al, high levels of IgE were also shown to be significantly associated with severe AD [8]. In a meta-analysis, Flohr et al showed that the severity of AD was positively associated with the number of positive skin prick tests and/or IgE antibody levels in 7 out of 8 studies [6].

Some studies have shown that AD children with a high level of IgE have higher risk of food and air allergen sensitivity and anaphylaxis [5], [6]. Therefore, determining whether AD patients have atopic factor is important in patient management, and this can be done by measuring the serum level of IgE [4].

5. CONCLUSION

In children aged 2-12 years, a high serum level of total IgE is associated with more severe atopic

dermatitis. Measuring the serum level of total IgE can be useful in the diagnosis of atopic dermatitis.

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