

Measurement of total serum IgE antibody in patients with atopic dermatitis

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ABSTRACT

Objectives: To estimate the difference in total serum IgE level between patients with atopic dermatitis (AD) and healthy control subjects and to correlate age and gender of patients, and severity of AD with total serum IgE level.

Patients and methods: This is a case-series study on 52 patients with AD, recruited from dermatology clinic at Al-Jumhoori teaching hospital in Mosul, during the first half of 2010. Twenty five healthy non-atopic subjects were recruited from same clinic as a control group.

Results: The total serum IgE level in patients with AD was 286.0 (SD 83.1) IU/ml; corresponding value in control group was 47.8 (SD 38.1) IU/ml. Thus, total serum IgE level was significantly higher in patients with AD than in control group ($p = 0.007$). The highest concentration of total serum IgE level was found among females ($p = 0.04$), age group 11-15 year ($p = 0.09$), and severe cases of AD ($p = 0.007$).

Conclusion: Majority of patients with AD have a raised total serum IgE level, which in turn correlates well with female gender, age group 11-15 year, and severity of disease.

الخلاصة

الأهداف: لقياس الفرق في قدر الكلوبين المناعي الكلي نوع (إي) بين المرضى المصابين بالتهاب الجلد الاستشرائي والأصحاء ولتحديد العلاقة بين جنس المرضى وعمرهم وشدة إصابتهم بالتهاب الجلد الاستشرائي مع قدر الكلوبين المناعي الكلي نوع (إي).

العينة وطريقة البحث: أجري البحث على سلسلة مكونة من 52 مريضاً ببدء التهاب الجلد الاستشرائي تم اختيارهم من بين مراجعي عيادة الأمراض الجلدية في مستشفى الزهراوي التعليمي في مدينة الموصل في النصف الأول من عام 2010 وقورنت النتائج مع النتائج المستخلصة من دراسة 25 شخصاً سليماً أختيروا كعينة ضابطة من نفس العيادة.

النتائج: أظهرت النتائج أن قدر الكلوبين المناعي الكلي نوع (إي) في دم المرضى المصابين بالتهاب الجلد الاستشرائي كان 286,0 وبانحراف معياري قدره 83,1 وحدة دولية لكل مل بينما قدره عند الأصحاء كان 47,8 وبانحراف معياري قدره 38,1 وحدة دولية لكل مل والفرق كان معنوياً دلالة معنوية (0,007) سجل أعلى قدر للكلوبين المناعي الكلي نوع (إي) (بين النساء) دلالة معنوية (0,04) وأيضاً في الفئة العمرية (11-15 سنة) دلالة معنوية (0,09) وكذلك في الحالات الشديدة من التهاب الجلد الاستشرائي دلالة معنوية (0,007).

الخلاصة: عانى معظم مرضى التهاب الجلد الاستشرائي من فرط إنتاج الكلوبين المناعي من نوع (إي) والذي يرتبط بشكل واضح مع الجنس النسوي والفئة العمرية 11-15 سنة وشدة المرض.

Atopic dermatitis (AD) is a chronic, remitting relapsing immune-mediated inflammatory skin condition. The main immunological abnormality is excessive formation of total IgE⁽¹⁾. Despite the extensive studies, picture of AD is still fragmented and controversies remain unsolved. Some of these controversies are the relationship of gender, age, and severity of AD with total serum IgE level. Gender of patient was the interest of many investigators but their conclusions were controversial^(2,3). From a clinical perspective, supported by epidemiological investigations, there is a decline with age in both incidence and severity of atopic diseases. This is in association with general humoral alteration manifested by decline in IgE level with age⁽⁴⁾. The severity of AD also has some positive correlation with serum IgE level, but this is not a consistent observation⁽⁵⁾. Hence, the current study was performed to elucidate the correlation between age, gender and the severity of AD with serum total IgE level. To the best of our knowledge, this is the first study of its kind from our locality.

Patients and methods

The study was conducted as a case-series study. Fifty two consecutive patients with atopic dermatitis were recruited from dermatology clinic at Al-Jumhoori teaching hospital in Mosul, from January to June 2010. The inclusion criteria adopted were clinical manifestations of AD when enrolled in the study and patients agreement. The following patients were excluded: patients with other allergic diseases, disease inducing higher serum IgE level, or patients using topical/ or systemic immune-modulator treatments.

The diagnosis of AD was based on fulfilling Hanifin and Rajka's major and minor criteria⁽⁶⁾. The severity of atopic dermatitis was based on the use of Six Areas, Six Signs Atopic Dermatitis (SASSAD) severity score⁽⁷⁾. The clinical severity was graded as mild (localized chronic forms with <10% of the body surface area involved), moderate (disseminated lesions over trunk and extremities), and severe forms (e.g., more generalized eczema).

Twenty five relatives of other patients, who attended the clinic and who have no history of

atopic diseases were asked to participate in this study, as a control group. They were matching patients in age and gender.

Five ml of blood was taken from both patients and control group for estimating total serum IgE antibody. The blood was left to clot at room temperature and then centrifuged at 3000 rpm. The total serum IgE antibody was measured by Enzyme Linked Immune-Fluorescent Assay technique (ELFA) performed by mini VIDAS. The kit was provided by bio Mérieux, France. The kit provided a quantitative in vitro assay for human total IgE antibody.

Statistical methods

Different descriptive statistical methods were used to summarize the data in this study. Independent two sample student T-test was used to compare the mean differences in total serum IgE level between patients and control group, also between male and female patients with AD. One way ANOVA test with post hoc dunnett's test were used to assess mean difference in total serum IgE level among different categories of severity of AD. Person linear regression test was used to evaluate age-associated changes in total serum IgE level. A p-value of <0.05 was considered significant. Statistical processing were conducted by the use of statistical package SPSS ver. 10 (SPSS inc, Chicago, Ill).

Results

The age of patients with AD ranged from 4 to 25 year with mean and standard deviation (SD) of 14.5 and 6.1 year respectively. There were 20 (38.5%) females and 32 (61.5%) males. The age of control group ranged 6 to 24 year with mean (SD) of 13.1 (5.5) year, and included 10 (40%) females and 15 (60%) males.

The mean total serum IgE level in patients with AD was 286.0 IU/ml (SD 83.1) and the corresponding value 47.8 IU/ml (SD 38.1) for control group table (1). The difference was statistically highly significant $P = 0.007$ (fig 1).

The mean total serum IgE level among females 356.2 IU/ml (SD 301.4) was higher than that in males 217.4 IU/ml (SD 266.9) and

the difference was statistically significant $P = 0.04$ (fig 2).

The scattered plot (fig 3) showed poor linear relation of age of patient with total serum IgE level ($r = 0.1$). After breaking down age into 5 years age groups, highest mean total serum IgE level 427.7 IU/ml (SD 412.3) was found among those (11-15) year age group, and the lowest 81.7 IU/ml (SD 44.4) was among those of (21-25) year age group (fig 4).

A statistically significant rise in the mean total serum IgE level was found with increasing severity of AD. Figure (5) showed two and half time rise in mean serum IgE level in severe cases of AD 432.3 IU/ml (SD 326.2) in comparison to mild cases 173.3 IU/ml (SD 219.8) and the difference was statistically significant ($p = 0.007$).

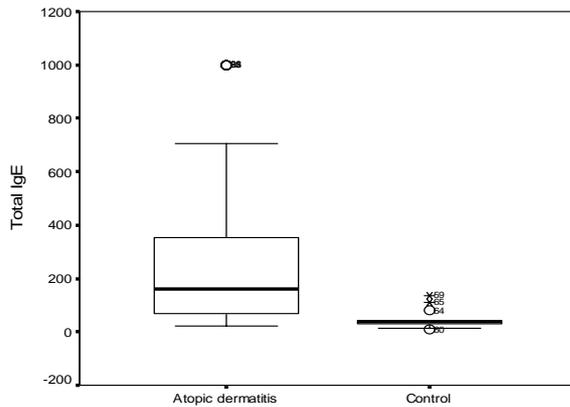


Figure (1): The difference in total serum IgE level (IU/ml) in between patients with atopic dermatitis and control group.

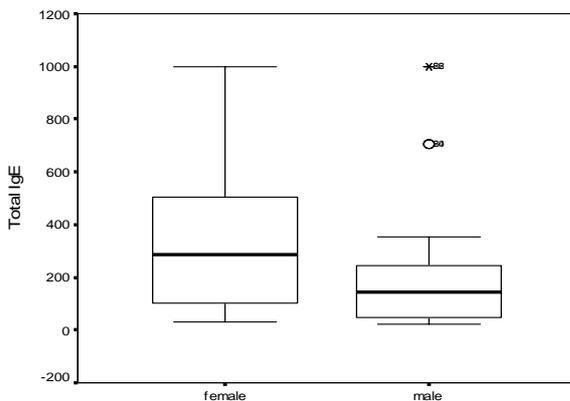


Figure (2): The difference in serum IgE level (IU/ml) between male and female patients with atopic dermatitis.

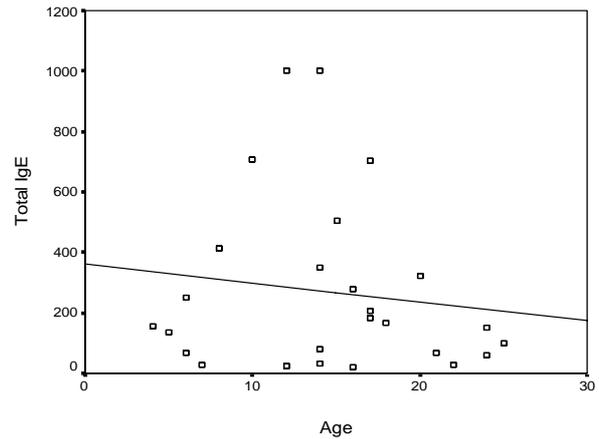


Figure (3): The relationship between total serum IgE level (IU/ml) and age of patients with atopic dermatitis.

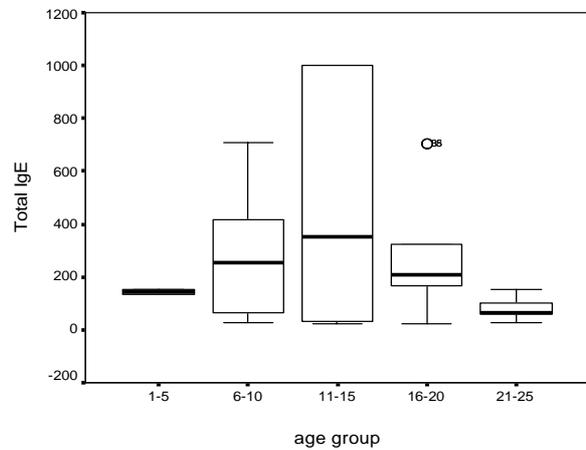


Figure (4): The relationship between total serum IgE level (IU/ml) and age group of patients with atopic dermatitis.

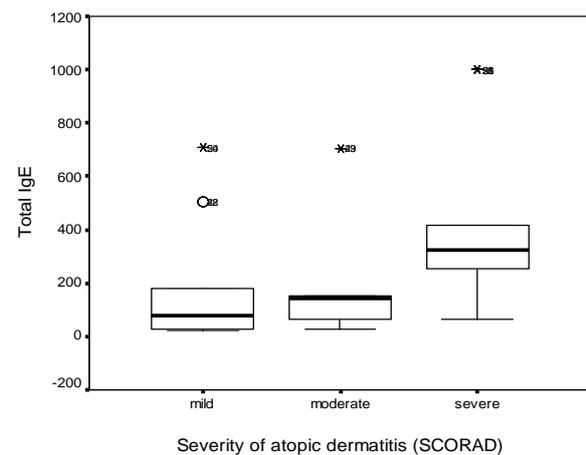


Figure (5): The level of total serum IgE (IU/ml) in patients with atopic dermatitis showing variation in severity.

Table (1): Correlation of total serum IgE (IU/ml) with different demographic and clinical variables in patients with atopic dermatitis.

Parameters	Mean (SD)	95% confidence interval	P-value
Gender			
Male	217.4 (266.9)	121.2-313.6	0.04
Female	356.2 (301.4)	215.1-497.3	
Age group			
1-5 years	144.9 (10.4)	128.3-161.5	0.09
6-10 years	293.5 (262.3)	105.9-481.9	
11-15 years	427.7 (412.3)	189.7-665.8*	
16-20 years	268.6 (206.2)	149.6-387.7	
21-25 years	81.7 (44.4)	49.9-113.5	
Severity of atopic dermatitis			
Mild	173.3 (219.8)	75.8-270.7	0.007
Moderate	207.2 (237.5)	56.3-358.1	
Severe	432.3 (326.2)	270.1-594.6's*	

*Significant difference at p-value 0.05 (Dunnett's post hoc test).

Discussion

The evidence for the central role of IgE in etiopathogenesis of AD was proved by several studies⁽¹⁻⁵⁾ including the current one. The results showed that mean total serum IgE level was six times higher among AD patients in comparison to control non-atopic subjects. According to manufacturer's reference figure, 100 IU/ml is considered as a cutoff value. In this study, total serum IgE level exceeded 100 IU/ml in 60% of patients. Raised IgE level was consistent with the findings of some studies and was slightly lower than that reported by others. Reported figures in the literature varied from 70%⁽⁸⁾ to 88%⁽⁹⁾ of atopic patients. These differences may be explained by the different chosen cutoff value, methods of estimating IgE, age of participants, and severity of disease. In the above mentioned

studies^(8,9), they used 75 IU/ml as a cutoff value, patients were younger and the proportion of severe cases was larger. Our findings revealed that normal serum IgE level do not rule out the presence of AD and that serum IgE may not be the only stimulus for signs and symptoms of AD, but definitely play an important role in their exacerbation.

Marked controversy was noted in the literature regarding the relation between gender and total serum IgE level. While Ahmed and Nasreen concluded absence of an association⁽⁸⁾, Johanson et al, concluded a statistically significant association⁽¹⁰⁾. Moreover, controversy can be noticed in the direction of association; while Siroux et al concluded male preponderance⁽³⁾ Johanson et al and the current study showed a female preponderance⁽¹⁰⁾. The dilemma of gender-IgE association requires a large population-based study.

The study revealed a gradual rise in total serum IgE level starting from the first year of age to reach its peak at age 11-15 years then, starts to decline. This pattern explains the failure of demonstrating linear relationship between age and IgE. This pattern is almost similar to the age-pattern reported by other investigators⁽¹¹⁾. The age at IgE decline lags behind that at clinical improvement⁽¹²⁾. In another word, many of the patients with AD showed clinical improvement (limited lesions, less severity, infrequent relapses, and long remission) at age 5-10 year, while serum IgE needs further five years to match the clinical improvement. This time gap, is probably due to tolerance and to the fact that cascade of immunological events becomes less easily provoked by exogenous and endogenous triggering factors.

The two and half folds rise in IgE among patients with severe AD in comparison to mild cases and the p -value of 0.007 support the hypothesis of association of severity of AD and total serum IgE level. Corresponding to the influence of severity of AD on serum IgE data in the literature are contradictory either showing no influence of severity⁽⁵⁾ or high level of correlation⁽¹³⁾. The negative association probably is attributed to: first, small sample

size that fails to illustrate statistical significance of difference; second, sampling error which does not cover the full spectrum of severity of the disease; and third, absence of objective measure of severity of AD as the available criteria are subjective with low inter-observer agreement. Probably, future studies showing the changes in total IgE after successful treatment will provide new insight to this association.

In conclusion, high level of total serum IgE was found in patients with AD, especially among females, in 11-15 year age group, and in severe cases of AD. Further studies to assess the total serum IgE level in follow up of patients with atopic dermatitis is highly recommended.

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