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Evaluation of the Relationship between Laboratory Parameters and Allergy Tests in Children with Atopic Dermatitis

Atopik Dermatit Tanılı Çocuklarda Laboratuvar Parametrelerinin Alerji Testleri ile İlişkisinin Değerlendirilmesi

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ABSTRACT

Aim: The aim of this study was to evaluate the relationship between neutrophil lymphocyte ratio (NLR), platelet lymphocyte ratio (PLR), eosinophil lymphocyte ratio (ELR), serum total IgE values and allergy test positivity among children with atopic dermatitis (AD).

Material and Method: The study is a case-control type study in a retrospective design. Children aged 0-18 years with ADand applied to the pediatric allergy and immunology outpatient clinic of our hospital were included as the patient group. Children aged 0-18 years, who did not have any chronic diseases and applied to the pediatrics outpatient clinic of our hospital, were included as the control group. Children's sociodemographic characteristics, hemogram parameters, total IgE values, allergy history and allergy test positivity were evaluated. p<0.05 was accepted as the statistical significance level.

Results: The data of 193 children with AD were evaluated. 100 children were included as the control group. Eosinophil, lymphocyte, total IgE, ELR values were significantly higher in the patient group (p<0.05). The median values of PLR and ELR were higher in patients with allergy test positivity, but there was no statistical significance between the groups (p=0.268 and p=0.251, respectively). As the total IgE values were examined, the median total IgE value of the patients with a positive allergy test was 168.0 (2.0-6098.0), while this value was 37.0 (0-3577.0) in patients with a negative test (p<0.001).

Conclusion: Although there is no statistical significance, the fact that PLR and ELR values were higher in patients with AD with positive allergy test suggest that these values can be used as a marker to predict allergy test positivity. Evaluation of hemogram parameters, which is an easily accessible test among AD patients, is extremely important for physicians working in this field.

Keywords: Atopic dermatitis, children, allergy test, eosinophil lymphocyte ratio

ÖZ

Amaç: Bu çalışmanın amacı, atopik dermatitli (AD) çocuklarda nötrofil lenfosit oranı (NLO), trombosit lenfosit oranı (TLO), eozinofil lenfosit oranı (ELO) ve serum total IgE değerleri ile alerji testi pozitifliği arasındaki ilişkiyi değerlendirmektir.

Gereç ve Yöntem: Çalışma retrospektif dizaynda vaka kontrol tipi bir çalışmadır. Çalışmaya çocuk alerji ve immünoloji polikliniğine başvuran 0-18 yaş arası AD tanılı çocuklar dahil edildi. Kontrol grubu olarak hastanemiz çocuk polikliniğine başvuran, kronik hastalığı olmayan 0-18 yaş arası çocuklar alındı. Çocukların sosyodemografik özellikleri, hemogram parametreleri, total IgE değerleri, alerji öyküsü ve alerji testi pozitifliği değerlendirildi. p<0,05 istatistiksel anlamlılık düzeyi olarak kabul edildi.

Bulgular: Atopik dermatitli 193 çocuğun verileri değerlendirildi. Kontrol grubu olarak 100 çocuk dahil edildi. Eozinofil, lenfosit, total IgE, ELO değerleri hasta grubunda anlamlı olarak yüksekti (p<0,05). Alerji testi pozitif olan hastalarda ortanca TLO ve ELO değerleri daha yüksekti ancak gruplar arasında istatistiksel anlamlılık yoktu (sırasıyla p=0,268 ve p=0,251). Total IgE değerlerine bakıldığında alerji testi pozitif olan hastalarda ortanca total IgE değeri 168,0 (2,0-6098,0) iken, testi negatif olan hastalarda bu değer 37,0 (0-3577,0) bulundu (p<0,001).

Sonuç: İstatistiksel olarak anlamlı olmamakla birlikte, alerji testi pozitif olan atopik dermatitli hastalarda TLO ve ELO değerlerinin daha yüksek olması, bu değerlerin alerji testi pozitifliğini öngörmede bir belirteç olarak kullanılabileceğini düşündürmektedir. AD hastalarında kolaylıkla ulaşılabilen bir test olan hemogram parametrelerinin değerlendirilmesi bu alanda çalışan hekimler için son derece önemlidir.

Anahtar Kelimer: Atopik dermatit, çocuklar, alerji testi, eozinofil lenfosit oranı

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INTRODUCTION

Atopic dermatitis (AD) is the most common chronic inflammatory skin disease (1). AD is a recurrent and highly itchy dermatitis. Dryness of the skin, eczematous lesions and lichenification are also the clinical findings of AD (2). The prevalence of AD is increasing worldwide (3-5). Besides, the frequency of AD generally decreases with advancing age (6).

There is an impaired skin barrier in the pathophysiology of AD (7,8). Due to the disrupted skin barrier, irritants and allergens penetrate the skin. IL-4, IL-5, IL-12 cytokines and IFN-gamma are released through the overactive Th2 and Th1 response in acute and chronic lesions, respectively, due to the defective skin barrier. Thus, the inflammation process begins (2, 9). This inflammation is a neutrophilic and eosinophilic inflammation (10,11).

In a study conducted in pediatric patients with AD; total IgE, eosinophil, neutrophil lymphocyte ratio (NLR), platelet lymphocyte ratio (PLR), eosinophil lymphocyte ratio (ELR) levels were found to be higher in AD patients compared to the control group (12). In addition, in another study, it was reported that the relative eosinophil count and NLR values could be used to evaluate the severity of AD (13). Neutrophils, lymphocytes and platelets are important blood parameters involved in inflammation and can be quantified easily with accessible hemogram tests. Today, these laboratory parameters are used in many infectious and tumoral lesions. According to literature, these parameters are also extremely important both for the diagnosis and follow-up of patients with AD (12).

In the literature, it has been suggested to use NLR as a new marker for the presence of systemic inflammation (14). An increase in total IgE levels has also been reported in AD patients (15). In this context, it was aimed to evaluate the laboratory parameters of pediatric patients diagnosed with AD. Besides; the aim of this study was to examine the relationship between allergy test positivity and NLR, PLR, ELR and serum total IgE values that can be measured in peripheral blood.

MATERIAL AND METHOD

Research Design, Type and Sample

The study is a case-control study in a retrospective design. Data on pediatric patients aged 0-18 years with AD who applied to the Umraniye Training and Research Hospital Pediatric Allergy and Immunology outpatient clinic were examined retrospectively from the hospital's database. All patients with AD who applied to our clinic within the year 2022 (between January 2022-December 2022) were included in the study. In addition, children aged 0-18 years who applied to the pediatrics outpatient clinic of our hospital without any chronic disease or AD were also included in the study as the control group.

Measures

The sociodemographic characteristics (age, gender) of the children, hemogram parameters (neutrophil, eosinophil, lymphocyte, platelet), total IgE values, allergy history and allergy test positivity were evaluated within the scope of the study. Patients with positive allergen-specific IgE and/or skin tests were considered positive for the relevant allergen test.

Statistical Analysis

SPSS (Statistical Package for Social Sciences for Windows 25.0 program was used for the analysis and the recording of data. Descriptive data was presented wtih median, minimum, maximum values, numbers (n) and percentages (%). For the analysis of categorical data, Chi-square test was used. For the comprasion of continuous variables that non-normally distrubuted; Mann Whitney U test was used. The statistical significance level was set at p<0.05.

Ethics

Ethics committee approval was obtained from the Health Sciences University Ümraniye Training and Research Ethics Committee on 24/04/2023 with decision number 113.

RESULTS

The data of 193 children aged 0-18 years with AD were evaluated in the study. And, 100 children were included as the control group. Of the children with AD, 56.5% (n=109) were boys and 43.5% (n=84) were girls. Of the children in control group, 59.0% (n=59) were boys and 41.0% (n=41) were girls. Gender distribution of the patients and the control group was statistically similar (p=0.679). The median values of the age of the children with and without AD was 3 years (0-17) and 5 years (0-17), respectively (p=0.053).

When the laboratory values of the patients were examined; median values of white blood cell (WBC) and neutrophils were 8440.0 103mm3 (4240.0 ve 18900.0) and 3070.0 103/uL (610.0-13870.0), respectively. Absolute eosinophil and eosinophil (%) median values were 350.0 103/uL (10.0-2470.0) and 4.1% (0.2-25.8), respectively. The median values of lymphocytes, platelets and total IgE were 4110.0 103/uL (1280.0-13810.0), 329000.0 1103mm3 (51000.0-656000.0), 86.0 IU/mL (0-6098.0), respectively. In patients; eosinophil, lymphocyte and total IgE values were significantly higher than the control group (**Table 1**).

Table 1. Laboratuary parameters of the patients and control group			
	Patients	**Control group**	**P value**
	Median (min-max)	**Median (min-max)**	
WBC (10³ mm³)	8440.0 (4240.0-18900.0)	8370.0 (3050.0-21580.0)	0.529
Neutrophil (10³/uL)	3070.0 (610.0-13870.0)	2970.0 (300.0-8180.0)	0.261
Eosinophil (10³/uL)	350.0 (10.0-2470.0)	220.0 (0-4160.0)	0.002
Eosinophil (%)	4.1 (0.2-25.8)	3.0 (0-21.0)	0.001
Lymphocyte (10³/uL)	4110.0 (1280-13810.0)	3470.0 (1300.0-7870.0)	0.019
Platelet (10³ mm³)	329000.0 (51000.0-656000.0)	329000.0 (190000-734000)	0.832
Total IgE (IU/mL)	86.0 (0-6098.0)	31.0 (1.0-3633.0)	<0.001
WBC: White blood cell			

When the allergy test positivity of the patients was examined; house dust mite allergy was positive in 26.4% (n=51) of the patients. Egg allergy test was positive in 22.8% (n=44) of the patients, milk allergy test was positive in 9.3% (n=18) and peanut allergy test was positive in 6.7% (n=13) of the patients. The test positivity of the patients for other allergens is also shown in **Table 2**.

Table 2. Allergy test positivity of patients		
Allergy test positivity	**n**	**%**
House dust mite	51	26.4
Egg	44	22.8
Cat	20	10.4
Cow's milk	18	9.3
Pollen	17	8.8
Peanut	13	6.7
Hazelnut	11	5.7
Walnut	3	1.6
Pistachios	1	0.5

When allergy test results of the AD patients were evaluated, 52.3% (n=101) of the patients had a positive test for at least one allergen. NLR, PLR, ELR and total IgE values of patients with and without allergy test positivity were compared. While NLR median values were the same in both groups; the median values of PLR and ELR were higher in patients with allergy test positivity, but there was no statistical significance between the groups (p=0.268 and p=0.251, respectively). As the total IgE values were examined, while the median total IgE value of the patients with a positive allergy test was 168.0 IU/mL (2.0-6098.0), this value was 37.0 IU/mL (0-3577.0) in patients with a negative allergy test. This elevation in total IgE value in patients with positive allergy test was statistically significant (p<0.001) (**Table 3**).

Table 3. NLR, PLR, ELR and total IgE values of patients with and without test positivity			
	AD with test positivity (n=101)	**AD without test positivity (n=92)**	**P value**
	Median (min-max)	**Median (min-max)**	
NLR	0.67 (0.19-7.74)	0.67 (0.20-4.19)	0.807
PLR	89.62 (8.06-268.75)	84.24 (22.59-219.44)	0.268
ELR	0.09 (0.01-0.60)	0.07 (0-0.82)	0.251
Total IgE (IU/mL)	168.0 (2.0-6098.0)	37.0 (0-3577.0)	<0.001
AD: Atopic dermatitis, NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, ELR: eosinophil lymphocyte ratio			

NLR, PLR, and ELR values were calculated by dividing neutrophil, platelet, and eosinophil values by lymphocyte values, respectively. The median NLR, PLR, and ELR values of the patients were 0.67 (0.19-7.74), 87.30 (8.06-268.75), and 0.08 (0-0.82), respectively. The median NLR, PLR, and ELR values of the control group were 0.78 (0.0.06-5.53), 92.75 (43.91-365.52), and 0.06 (0-0.53), respectively. ELR values of AD patients were significantly higher than the control group (p=0.044). PLR value was also significantly higher in the control group (p=0.011) (**Table 4**).

Table 4. NLR, PLR and ELR values of the patients and control group			
	Patients	**Control group**	**P value**
	Median (min-max)	**Median (min-max)**	
NLR	0.67 (0.19-7.74)	0.78 (0.06-5.53)	0.880
PLR	87.30 (8.06-268.75)	92.75 (43.91-365.52)	0.011
ELR	0.08 (0-0.82)	0.06 (0-0.53)	0.044
NLR: neutrophil lymphocyte ratio, PLR: platelet lymphocyte ratio, ELR: eosinophil lymphocyte ratio			

DISCUSSION

In cases where inflammation accompanies chronic diseases, an increase in laboratory parameters indicating inflammation can be observed. Easily accessible and practical laboratory tests such as hemogram are used in the follow-up of many diseases. Hemogram markers such as WBC, neutrophils, and eosinophils have a great role both in the diagnosis and follow-up of AD patients. Evaluation of the level of NLR, ELR, and PLR parameters, which can be evaluated by hemogram in AD patients, will provide a practical approach in the diagnosis and follow-up process of the disease. The study carried out in this context and evaluated the relationship between laboratory parameters and allergy test positivity in AD, which is one of the most common allergic diseases in childhood and accompanied by inflammation. At the same time, NLR, PLR and ELR values were compared with the healthy control group.

In the literature, increased eosinophil values in both blood and tissue have been determined in patients with AD (16). Similarly, an increase in total IgE levels can be observed in AD patients, as in other allergic

diseases (17, 18). The patients with AD in our study had significantly higher eosinophil, lymphocyte and total IgE values compared to the control group. In a similar study conducted in pediatric patients with AD in our country, eosinophil and total IgE values of AD patients were found to be significantly higher than the control group (12). In another study, children with AD had significantly higher eosinophil values than the control group (17).

In our study, when the allergen sensitivity of AD patients was examined; house dust mite allergy was positive in 26.4% (n=51) of the patients. Of the patients, 22.8% (n=44) had egg allergy, 9.3% (n=18) had cow's milk, 6.7% (n=13) had peanut allergy. Similarly, positivity in house dust mite specific IgE value was observed most frequently in AD patients in the literature (19). In our study, there was no statistical significance between NLR, PLR and ELR values of AD patients with and without allergy test positivity. In addition, as expected, total IgE values were found to be significantly higher in patients with a positive allergy test. Although there is no statistical significance, the fact that PLR and ELR values were higher in patients with AD with positive allergy test suggests that these values can be used as a marker to predict test positivity. Further studies are needed in this regard.

There are data in the literature that NLR, ELR and PLR values can be used as inflammatory markers in many diseases such as cardiovascular diseases and inflammatory diseases (17, 20). In our study, the ELR value of AD patients was significantly higher than the control group. The PLR value of the control group was also significantly higher. No significant difference between the two groups was determined for the NLR value. In the literature, NLR and ELR values of pediatric patients with AD have been reported to be significantly higher than the control group (17). In the same study, no statistically significant difference was observed between the groups in terms of PLR values. The higher PLR values of the control group in our study may be due to potential confounding factors that may play a role in the study. In further studies evaluating also the severity of the disease, the utility of PLR as a clinical inflammatory marker in AD patients should be examined.

Limitations and Strengths

Conducting the study in a single center creates a limitation in terms of the generalizability of the study results. Another limitation of the study is that the clinical severity of the disease could affect the laboratory parameters, however the clinical severity of AD patients was not evaluated in the study. In addition, studies comparing NLR, PLR and ELR values in pediatric patients with AD are limited in the literature. This can be considered as the strength of our study.

CONCLUSION

In our study, laboratory parameters of pediatric patients with AD were evaluated. Eosinophil, lymphocyte and total IgE values were significantly higher in patients with AD when compared to the control group. In addition, the ELR value of AD patients was also significantly higher than the control group. Evaluation of laboratory parameters is extremely important in the diagnosis and follow-up of AD patients. Specific IgE values and skin prick tests are tests that can not be performed in every clinical center. Although there is no statistical significance, the fact that PLR and ELR values are higher in patients with AD with positive allergy test suggest that these parameters can be used as a marker predicting allergy test positivity. Evaluation of hemogram parameters, which is an easily accessible laboratory test in AD patients, is extremely important for physicians working in this field. In AD patients, further studies with large samples should be planned in which inflammatory markers, clinical severity of the disease, and response to treatment are evaluated.

ETHICAL DECLARATIONS

Ethics Committee Approval: Ethics committee approval was obtained from the Health Sciences University Ümraniye Training and Research Ethics Committee (Date: 24.04.2023 Decision No: 113).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

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