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The Effect of Atopy on Asthma Severity and Asthma Control in Children with Asthma

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ABSTRACT:

The effect of atopy on asthma severity and asthma control in children with asthma

Objective: Asthma is the most common chronic inflammatory disease of airways in children worldwide. It was speculated that in the presence of atopy, asthma severity and control show alteration. In this study we aim to investigate the association between atopy and asthma control and asthma severity.

Material and Methods: Children between 6-17 years of age with diagnosis of persistent asthma, being followed in pediatric allergy and pulmonology clinics between November 2015 and January 2016 were involved. At enrollment, sociodemographic and asthmatic characteristics were investigated and asthma severity were determined and asthma control test (ACT) were administered.In order to determine the presence of atopy, the IgE levels, skin prick test and inhalant panel tests were obtained from the records. The IgE levels, skin prick tests, and inhalant panel tests were compared to asthma severity and asthma control.

Results: Out of 106 patients, 60 (56.6%) were male and 46 (43.0%) were female. The mean age was 11.2±2.7 years. There was no association between the presence of atopy and asthma control (p=0.764). The serum IgE levels, skin prick tests and serum specific inhalant allergens were significantly high in patients with severe persistant asthma (p=0.022).

Conclusion: There is an association between the presence of atopy and asthma severity but there is no association between the presence of atopy and asthma control.

Keywords: Asthma control test, asthma severity, inhalant allergen, skin prick test

ÖZET:

Astım tanısı ile izlenen çocuklarda atopinin astım şiddeti ve kontrolü üzerine etkisi

Amaç: Astım çocukluk çağında dünyada en sık görülen kronik havayolu inflamatuvar hastalıklarından biridir. Atopi varlığında astım şiddeti ve kontrolünün değişiklikler gösterdiği ileri sürülmektedir. Biz bu çalışmada astım tanısı ile izlenen çocuklarda atopinin astım şiddeti ve kontrolü üzerine etkisini inceledik.

Gereç ve Yöntem: Kasım 2015-Ocak 2016 tarihleri arasında alerji ve çocuk göğüs hastalıkları kliniğinde astım tanısı ile izlenen yaşları 6-17 yıl arasında olan olgular alındı. Tüm olguların demografik ve klinik özellikleri kayıt altına alındıktan sonra astım şiddeti belirlendi ve astım kontrol testi (AKT) uygulandı. Atopi varlığını belirlemek üzere IgE düzeyleri, deri prik testi ve inhalan panel testi sonuçları kayıt altına alındı. Olguların deri prik testi, IgE yüksekliği ve inhalan panel pozitifliği ile astım kontrol düzeyi ve astım şiddeti kıyaslandı.

Bulgular: Çalışma 60'i (%56.6) erkek, 46'sı (%43.0) kız olmak üzere toplam 106 hasta ile yapıldı. Yaş ortalaması 11.2±2.7 yıl idi. Atopi varlığı ile astım kontrol düzeyi arasında anlamlı bir ilişki saptanmadı. (p=0.764). Ağır persistan astımlı vakalarda IgE yüksekliği, cilt testi ve inhalen panel pozitifliği anlamlı olarak yüksekti (p=0.022).

Sonuç: Atopi varlığı ile astım kontrol düzeyi arasında bir ilişki saptanmazken atopi varlığı ile astım şiddeti arasında anlamlı bir ilişki saptadık.

Anahtar kelimeler: Astım kontrol testi, astım şiddeti, inhalan panel, deri prik testi

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INTDORUCTION

Asthma is the hypersensitivity of the respiratory tract characterized by repeated vigorous wheezing, coughing, shortness of breath, and chest pain episodes as a result of the different severe constrictions in the bronchi due to chronic inflammation involving many cells and mediators in the airways (1). Atopy in childhood asthma has an important role in immunopathogenesis and severity of the disease. In the literature, skin test positivity to inhaled allergens is found to be associated with increased asthma severity (2-13). However, there are also publications suggesting that the presence of atopy does not affect asthma control (14,15). In this study, we planned to investigate the relationship between atopy and asthma severity and control level.

MATERIAL AND METHOD

A total of 106 patients between the ages of 6-17 years who were diagnosed with asthma according to the guidelines of the American National Asthma Education and Prevention Program (NAEPP), and followed in the Pediatric Pulmonary Diseases and Pediatric Allergy Outpatient Clinic in Istanbul Şişli Hamidiye Etfal Training and Research Hospital between November 2015 and January 2016 were included in the study. Age-matched asthma control test (ACT) was performed, following the patient follow-up form and demographic and clinical characteristics of asthma were recorded. Cases who were detected to have a chronic disease other than asthma diagnosis (cystic fibrosis, bronchopulmonary dysplasia, tuberculosis, congenital malformation causing narrowing of intrathoracic airways, primary ciliary dyskinesia, immunodeficiency syndromes, congenital heart disease) were not included in the study.

Demographic characteristics such as age, gender, height, weight and smoking cessation at home, influenza vaccine, presence of allergic rhinitis, family history of atopy were questioned in the patient follow-up form. The cases were screened for total IgE levels, eosinophilia, presence of specific inhaled allergen, skin prick test results. Asthma severity, asthma control and asthma treatment were recorded.

In our study, patients' asthma severity and control was assessed according to the 2007 NAEPP guidelines (16). Patients who received regular treatment for asthma were classified as intermittent, mild persistent, moderate, and severe persistent asthma according to the NAEPP guideline, taking into account the state of their complaints during the last 4-8 weeks. The asthma control test (ACT) is in Turkish and an easy-to-use questionnaire that has reliability and validity (17,18). There are 2 different tests for children aged 4-11 years and ≥12 years, according to age groups. Asthma control test (ACT) for children aged 4-11 years: Asthma symptoms in the last 4 weeks are assessed. Children respond to the first 4 questions themselves, while the person in charge of the child's care responds to the last 3 questions. The child answers the questions by using a response scale ranging from a sad face to a smiling face. The highest score is 27, and the lowest score is 0. Patients with a score of 19 points or less in total were considered uncontrolled asthma, and patients with a score of 20 points or more were considered asthma under control. Asthma control test (ACT) for children 12 years and over: It is a self-administered test consisting of 5 questions, scored by 1 to 5. The highest score is 25, and the lowest score is 5. The score obtained indicates that the disease is in complete control with 25 points, in partial control with 20-24 points, and with 19 points or less, not in control.

SPSS 15.0 for Windows program was used for statistical analysis. Descriptive statistics were given as follows: the numerical form and percentage for categorical variables; mean, standard deviation, minimum, maximum for numerical variables. Since the numerical variable did not satisfy the normal distribution condition, the Mann-Whitney U test was used for independent two-group comparisons and Kruskal Wallis test was used for multiple group comparisons. Subgroup analyzes were performed with Mann Whitney U test and corrected with Bonferroni correction. Relations between numerical values were analyzed with Spearman Correlation Analysis since they did not provide parametric test conditions. The ratios of categorical variables among the groups were tested by Chi-square analysis. Monte

Table-1: Demographic and Clinical Characteristics of Patients

		Mean±SD (Min-Max)	
Age (years)		11.2±2.7 (6-17)	
		n	**%**
Gender	Male	61	57.0
	KızFemale	46	43.0
BMI	Underweight	9	8.3
	Normal	82	77.1
	Overwegiht	12	11.5
	Obese	3	3.1
Attack in the last one year	Present	66	62.0
Smoke exposure	Present	59	55.3
Asthma severity	Mild persistant	45	42.5
	Moderate persistant	48	45.3
	Severe persistant	13	12.3
Flu vaccine	Present	5	4.7
Allergic rhinitis	Present	46	43.8
Family history of atopy	Present	43	40.0
Treatment	ICS	9	8.5
	ICS+LABA	1	0.9
	ICS+montelukast	53	50.0
	ICS+LABA+montelukast	43	40.6
Nasal steroid	Present	64	60.6

Carlo Simulation applied when conditions were not met. Statistical significance level (alpha) was considered as $p<0.05$.

RESULTS

The demographic and clinical characteristics of the cases included in the study are shown in Table-1. The study was performed with 106 cases, of whom 46 were female (43.0%) and 60 were male (56.6%). The ages of the cases ranged from 6 to 17 years, with a mean value of 11.2±2.7 years. According to the body mass index (BMI), 9 (8.3%) cases were weak, 82 (77.1%) were normal, 12 (11.5%) were overweight and 3 (3.1%) were obese. Fifty-nine cases (55.3%) had exposure to smoking at home, and 43 (40.0%) had atopy in the family. Forty-five cases were considered as mild persistent asthma (42.5%), 48 as moderate (45.3%), and 13 as severe persistent (12.3%) asthma. In 66 of the cases (62.0%) there was at least one wheezing episode and in 46 (43.8%) allergic rhinitis in the last 1 year. Only 5 cases (4.7%) reported flu vaccine. When asthma treatments were examined, 9 (8.5%) patients were receiving only inhaled corticosteroids (ICS), 1 (0.9%) patient was receiving ICS + long-acting inhaled beta agonist (LABA), 53 (50.0%) patients were receiving ICS + montelukast, and 43 (40.6%) were receiving ICS+LABA+montelukast treatment. Sixty-four cases (60.6%) were receiving nasal steroid therapy.

Table-2: Allergy Test Results of Cases

		n	%
Eosinophilia	Present	29	27.5
Total IgE	Present	59	55.6
Inhalant screen	Poz	64	60.0
Skin prick test	Poz	71	66.9
Dust allergy	Present	66	62.3
Cat-dog allergy	Present	23	22.1
Fungus	Present	2	2.6
Pollen allergy	Present	10	9.1

The results of the allergy tests of the cases are shown in Table-2. Eosinophilia was found in 29 of the cases (27.5%), total IgE elevation in 59 (55.6%), inhalant screen positivity in 64 (60%) and skin prick test positivity in 71 (66.9%). Skin prick test results showed dust allergy in 66 (62.3%) cases, (pet) cat-dog allergy in 23 (22.1%), inhaled fungus allergy in 2 (2.6%), and pollen allergy in 10 (9.1%).

The relationship between the demographics and

Table-3: Comparison of ACT Interpretation by Demographic and Clinical Features

		ACT Interpretation						
		Not under control		Partially under control		Under control		
		n	%	n	%	n	%	p
Gender	Male	51	58.0	5	45.4	4	57.1	0.929
	Female	37	42.0	6	54.6	3	42.9	
BMI	Underweight	8	8.6	1	9.1	0	0.0	0.586
	Normal	66	75.3	9	81.8	7	100	
	Overweight	12	13.6	0	0.0	0	0.0	
	Obese	2	2.5	1	9.1	0	0.0	
Attack in the last one year	Present	63	69.8	3	16.7	0	0.0	0.007
Smoke exposure	Present	54	55.8	5	57.1	0	0.0	0.830
Asthma Severity	Mild persistant	35	39.8	5	41.7	5	83.3	0.429
	Moderate persistant	41	46.6	6	50.0	1	16.7	
	Severe persistant	12	13.6	1	8.3	0	0.0	
Flu vaccine	Present	4	4.5	1	8.3	0	0.0	0.632
Eosinophilia	Present	17	20.5	4	33.3	8	66.7	0.052
Allergic rhinitis	Present	36	41.4	4	36.4	6	85.7	0.073
Total IgE	High	50	54.1	5	50.0	7	100	0.228
Family history of atopy	Present	36	38.8	5	45.5	3	50.0	0.739

Table-4: Comparison of Asthma Severity by Demographic and Clinical Features

		Asthma Severity						
		Mild persistant		Moderate persistant		Severe persistant		
		n	%	n	%	n	%	p
Gender	Male	27	60.0	25	52.1	9	69.2	0.491
	Female	18	40.0	23	47.9	4	30.8	
BMI	Underweight	5	10.5	3	6.5	1	8.3	0.237
	Normal	34	78.9	39	86.0	8	58.3	
	Overweight	3	5.3	5	11.1	4	33.3	
	Obese	3	5.3	1	2.2	0	0.0	
Attack in the last one year	Present	27	60.0	30	63.6	8	62.5	1.000
Smoke exposure	Present	30	67.6	24	51.3	4	33.3	0.096
Flu vaccine	Present	1	2.2	4	8.3	0	0.0	0.343
Eosinophilia	Present	10	21.7	13	27.3	5	40.0	0.648
Allergic rhinitis	Present	19	41.9	19	39.6	8	61.5	0.395
Total IgE	Present	28	62.5	19	42.2	10	76.9	0.041
Ailede atopi	Var	15	33.3	22	45.7	5	41.7	0.496

clinical features of asthma of the cases and the level of asthma control is examined in Table-3. There is no significant relationship between asthma control level and gender, BMI, exposure to smoking, asthma severity, flu vaccine status, eosinophilia, presence of allergic rhinitis, family atopy presence, and high total IgE levels (p>0.05). On the other hand, cases in which asthma is not under control have a significantly higher incidence of having episodes of wheezing at least once in the last one year (p=0.007).

The relationship between the demographics and clinical characteristics of asthma of the cases and the severity of asthma is examined in Table-4. There is no significant relationship between asthma severity level and gender, BMI, at least one episode of wheezing in the last 1 year, cigarette exposure, flu vaccine, eosinophilia, allergic rhinitis, and family history of atopy (p>0.05). Total IgE levels in patients with severe persistent asthma were significantly higher (p=0.041).

The relationship between the allergy tests of the cases and the level of asthma control is given in Table-5. There is no significant relationship between asthma control level and inhalant screen positivity,

Table-5: Comparison of Patients Allergy Test Results with ACT Interpretation

		ACT Interpretation						
		Not under control		Partially under control		Under control		
		n	%	n	%	n	%	p
Inhalant screen	Present	50	58.0	7	58.3	7	100	0.228
Skin prick test	Present	58	66.1	6	50.0	7	100	0.107
Dust allergy	Present	55	62.9	6	50.0	5	71.4	0.753
Cat-dog allergy	Present	19	21.0	1	12.5	3	42.9	0.409
Fungus	Present	2	3.2	0	0.0	0	0.0	1.000
Pollen allergy	Present	6	6.5	0	0.0	3	42.9	0.024

Table-6: Comparison of Patients Allergy Tests and Asthma Severity

		Asthma Severity						
		Mild persistant		Moderate persistant		Severe persistant		
		n	%	n	%	n	%	p
Inhalant screen	Poz	27	60.5	25	50.0	12	92.3	0.022
Skin prick test	Poz	29	64.4	30	62.5	12	92.3	0.028
Cat-dog allergy	Present	9	18.8	11	22.9	3	22.2	0.915
Fungus	Present	0	0.0	2	5.7	0	0.0	0.609
Pollen allergy	Present	7	15.6	3	5.7	0	0.0	0.374

skin prick test positivity, dust allergy, cat-dog allergy and fungus allergy ($p>0.05$). In cases where asthma is under control, there is significant pollen allergy, with a few number of cases ($p=0.024$).

The relationship between allergy tests of cases and severity of asthma is examined in Table-6. There is a significant correlation between asthma severity and positivity of inhalant screen and skin prick test positivity ($p<0.05$). Screen positivity and skin prick test positivity were significantly higher in patients with severe asthma ($p=0.022$, $p=0.028$).

CONCLUSION

Asthma is the most common chronic lower respiratory tract disease of childhood, affecting physical, emotional and social aspects of life. Asthma has a low quality in terms of mortality, but it has high prevalence in terms of morbidity and chronicity (19,20). In childhood asthma, atopy has an important role in immunopathogenesis and the severity of the disease (21). The results of studies investigating the relationship between atopy presence and severity of asthma and control levels are contradictory and we could not detect a significant relationship between presence of atopy and asthma control level in our study, but we found significantly higher levels of IgE, skin prick test positivity rates and presence of inhaled allergens in severe asthmatic cases.

It is suggested in some of the studies which address the relationship between asthma control level and presence of atopy, that presence of atopy do not affect the asthma control (14,15). Schwindt et al., however, found a decrease in asthma control levels with an increase in total and specific inhaled allergen sensitization during the 8-week follow-up period of 114 asthmatic patients (22). We found no relationship between presence of atopy and asthma control level in our study. In the group with asthma under control, pollen allergy was significantly higher, with a very low number of samples.

Approximately two-thirds of asthmatic patients have a respiratory allergic sensitization with positive skin prick test and serum specific IgE levels, consistent with our study (23). There are many studies in the literature suggesting that atopy is associated with low lung function, asthma severity, and intensive medication use for asthma (2-8). In a study conducted by Arroyave et al. in 546 adolescents, it was suggested that the presence of atopy didn't have an effect on

asthma control, whereas an increase in asthma severity was detected (24). In a study conducted by Morphew et al. on 1627 children aged 2-18 years, there was a relationship between inhalant allergen sensitization and skin prick test positivity and asthma severity; whereas rate of well-controlled asthma was found significantly higher in cases with skin test positivity (25). In a study conducted by Castro Rodrigez et al. with 237 asthmatic children atopy was found to be associated with severe episodes of atopic asthma leading to application to emergency room and the use of oral corticosteroids in the last one year (7). In the study of Wever et al., the sensitivity to the inhalant allergen was detected to be related to recurrent attacks (4). In the study of Gürkan et al., it has been determined that house dust and cat-dog allergy positivity in the skin prick test increases the risk of severe persistant asthma (5). In our study, we found a statistically significant relationship between asthma severity and skin prick test, inhalant screen positivity and IgE elevation. We found that skin prick test positivity, inhalant screen positivity and high IgE ratios were significantly higher in patients with severe persistant asthma. A recent study of 832 children aged 5-17 years suggests that atopy is associated with low lung function, asthma severity, and intensive asthma medication use, whereas obesity is not associated with asthma severity (26). Similarly, we did not find a relationship between obesity and asthma severity and control in our study.

The factors that limit our study are as follows: absence of pulmonary function tests of our cases, the cases we follow in our clinic to not represent the general asthmatic population, and number of samples. In conclusion, we think that the presence of atopy increases the severity of asthma, but it is not related to the asthma control level.

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