

Aeroallergen Sensitivity of Atopic Children in Alanya Region

Alanya Bölgesinde Atopik Çocuklarda Aeroalerjen Duyarlılığı

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Öz

Amaç: Alerjik hastalıklarda semptomları azaltmak ve yaşam kalitesini arttırmak için sorumlu alerjenleri belirlemek önemlidir. Bu nedenle bölgemizdeki alerjik hastalarda aeroalerjenlerin duyarlılığını ve sıklığını değerlendirmeyi amaçladık.

Hastalar ve Yöntem: Çalışmaya, Eylül 2017-Mart 2018 tarihleri arasında pediatrik alerji immünoloji polikliniğine başvuran 1078 hasta (2-18 yaş) dahil edildi. Deri prick testinde en az bir alerjik duyarlılık saptanan 642 hastanın klinik ve demografik özellikleri, total IgE düzeyleri, kandaki periferik eozinofil sayıları, aeroalerjen duyarlılıkları hasta dosyalarından retrospektif olarak değerlendirildi. Çalışma için Alanya Alaaddin Keykubat Üniversitesi Tıp Fakültesi Yerel Etik Kurulundan onay alındı.

Bulgular: Hastaların 642'sinde (%59.5) en az bir aeroalerjene karşı pozitif yanıt gözlemlendi. Hastaların %34.8'inde astım, %73.7'sinde alerjik rinit, %12.6'sında atopik dermatit ve %3'ünde kronik ürtiker tanısı vardı. 159 (%24.8) hastada birden fazla alerjik hastalık tanısı vardı. Pozitif cilt prick testi olan hastaların 368'i (%57.3) erkek, 274'ü (%42.7) kızdı. Yaş ortalaması 8.49±4.15 yıldır. En sık Akar duyarlılığı saptandı (%76.1). İkinci sıklıkta küf mantarları (51.8% *Alternaria alternata*, 41.7% *Claudosporum herbarum*) ve üçüncü sıklıkta grass ve cereal polen (39.8%) duyarlılığı gözlemlendi. Diğer aeroalerjen duyarlılık sıklıkları; yabani ot polen karışımı (%24.6), ağaç polen karışımı (%21.7), hamamböceği (%17.8), kedi tüyü (%31.2), zeytin ağacı (%20) olarak saptandı. Ortalama serum total IgE düzeyi 215.6 IU/ml ve ortalama eozinofil sayısı 410.63/mm³ idi.

Sonuç: Alerjik hastalıklarda sorumlu alerjenlerin tespit edilmesi semptomların kontrol edilmesi ve seçilmiş vakalarda immünoterapi şansı vererek hastalık seyrini değiştirebilmesi açısından önemlidir.

Anahtar Kelimeler: Alerjen, Atopi, Çocuk, Deri prik test

Abstract

Aim: It is important to identify allergens in reducing disease-related symptoms and improving quality of life in the allergic diseases. Therefore, we aimed to evaluate the frequency of aeroallergens in allergic patients in our region.

Patients and Methods: 1078 patients (2-18 years) who applied to the pediatric allergy immunology outpatient clinic between September 2017- March 2018 were included to the study. The demographic and clinical characteristics of 642 patients with at least one allergic sensitization in the skin prick test were evaluated retrospectively. Total IgE levels, peripheral eosinophil counts in the blood, aeroallergen sensitivities in skin prick test were evaluated from the patient's files. The study was approved by the Ethics Committee of the Alanya Alaaddin Keykubat Medical Faculty.

Results: In 642 of the patients (59.5%), a positive response was observed against at least one aeroallergen. Among patients, 34.8% had asthma, 73.7% had allergic rhinitis, 12.6% had atopic dermatitis, and 3% had chronic urticaria. 24.8% of the patients (159) had more than one allergic disease. When the evaluation of the patients with positive skin prick test, 57.3% were male and 42.7% were female. The mean age was 8.49 +/- 4.15 years. The sensitivity of house dust mites was the most common (76.1%). In the second and third frequency, molds (51.8% *Alternaria alternata*, 41.7% *Claudosporum herbarum*) and grass and cereal pollen (39.8%) sensitivity were observed. Other determined aeroallergen sensitivity frequencies were: weed pollen mixture (24.6%), trees pollen mixture (21.7%), cockroach (17.8%), cat hair (31.2%), olive tree (20%). The mean serum total IgE level was 215.6 IU/ml and the mean eosinophil count was 410.63/mm³.

Conclusion: Detection of responsible allergens is important to control symptoms and to give the chance the course of the disease with immunotherapy in the selected cases.

Key words: Allergen, Atopy, Children, Skin prick test

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INTRODUCTION

Allergy is a hypersensitivity reaction that occurs mostly by IgE and cell mediated mechanisms initiated by specific immunologic triggers. The prevalence of allergic rhinitis, asthma, atopic dermatitis, conjunctivitis and food allergy has increased in recent years (1).

Atopy is an important risk factor for the occurrence of allergic diseases. Atopy is a familial predisposition characterized by sensitization after exposure to allergens in childhood and adolescence and production of IgE. As a result, they may develop symptoms of rhinoconjunctivitis, eczema or asthma. Atopy is used for individuals sensitized to allergens, which are normally found in the environment, where everyone is exposed but the majority does not produce long-term IgE antibodies (2). The diagnosis of IgE-mediated allergies suspected by history and examination in childhood should be basis of validated tests such as skin prick tests, serum-specific IgE tests. Allergy tests are important in terms of avoidance of specific allergen, disease monitorization, treatment planning and specific immunotherapy. Accurate determination of the allergen (inhaler, food or drug) that produces the symptoms is important for making allergen focused logical avoidance plan and avoiding unnecessary elimination in negative tests (3). The appropriate avoidance from the responsible allergen may reduce the allergic load, for example, to improve lung function in asthmatic patients, normalize inflammation markers and decrease the necessity for medication (4).

GA2LEN skin test study III that is a large multicenter study, among the 3034 patients, 68.2% of them were found to be sensitized to at least one allergen. Eight allergens provide to determinate more than 95% of sensitized patients (grass pollen, house dust mites, birch pollen, cat epithel, Artemisia, olive pollen, cockroach and Alternaria) (5). In a study to invest geographical variation to environmental aeroallergens in the European Community Respiratory Health Survey I; there was substantial geographical variation in the prevalence of the nine allergens tested. Most common allergen sensitivities were against house dust mites, grass pollen and cat. Other allergens were less common (Cladosporium, Parietaria and common ragweed). There were significant differences in the prevalence of sensitizations between countries and also between centers within countries. Thus allergens vary according to geographical region, knowledge of sensitizations in the area is important

for the environmental measures should be taken (6). Regional epidemiological data for the allergens may help to management and avoiding of allergic diseases for that area. The aim of the study is to investigate the allergen sensitization of common respiratory allergens in atopic children in our province.

PATIENTS AND METHODS

Between September 2017 and March 2018, 1078 patients (2-18 years) who were admitted to the Pediatric Allergy Immunology outpatient clinic with a history of allergic disease and applied skin prick test were enrolled in the study. The demographic characteristics, diagnosis, total IgE levels, peripheral eosinophil counts, aeroallergen sensitivities of 642 patients who had sensitivity to at least one aeroallergen were evaluated retrospectively from the patient's files. The study was approved by the Local Ethical Committee of the Alanya Alaaddin Keykubat University Medical Faculty.

Skin prick tests were performed by the same nurse as previously described (3). As a positive control, histamine solution (1.7 mg/ml histamine hydrochloride), saline solution for negative control, standard allergen solutions for aero allergens (Allergopharma GmbH & Co. Hamburg/Germany) were used. Briefly, allergen solutions were dripped on the forearm. They were pricked with the lancet (Mizollen; H. Herenz GmbH, Hamburg/Germany) and evaluated 15 minutes later. Three mm or more enduration response according to negative control was considered as positive reaction. In skin prick test; House dust mites (*D. farinea*, *D. pteronyssinus*), grass and cereal pollens (Kentucky blue grass, Timothy grass, Meadow fescue, Rye grass, Velvet grass, Orchard grass, Barley, Oats, Wheat, Rye), weeds (Mugwort, Dandelion, Nettle, English plantain, Wall pellitory), early and mid-term blooming tree pollens (Alder, Elm, Hazel, Poplar, Willow, Birch, Beech, Oak, Plane tree), olive tree pollen, molds (*Alternaria alternata*, *Cladosporium herbarum*), cat hair, cockroach (*Blatella germanica*) sensitivities were evaluated. House dust mite sensitivity was defined as a positive reaction to at least one of Dermatofagoides allergens. Tree pollen sensitivity was defined as a positive reaction to at least one of the early or middle flowering trees. Fungal sensitivity was defined as a positive response to at least one of *Alternaria alternata* or *Cladosporium herbarum*.

RESULTS

In 642 of the patients (59.5%), a positive response

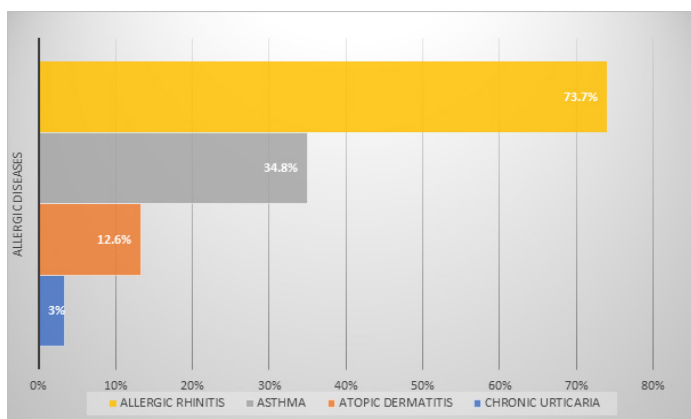


Figure 1. Diagnosis of the patients

was observed against at least one aeroallergen. In 480 (74.8%) cases, sensitivity to more than one aeroallergen was detected. When we look at the diagnoses of the cases, 34.8% had asthma, 73.7% had allergic rhinitis, 12.6% had atopic dermatitis, and 3% had chronic urticaria (Figure 1). Diagnostic distribution; 50.5% allergic rhinitis, 14.9% asthma, 7.5% atopic dermatitis, 3% chronic urticaria, 19% asthma + allergic rhinitis, 0.9% asthma + atopic dermatitis, 4.2% allergic rhinitis + atopic dermatitis. 57.3% of the patients with positive skin prick test were male and 42.7% were female. The mean age of the patients was 8.49 +/- 4.15 years. The sensitivity of house dust mites was the most common sensitivity (76.1%). The second frequency of molds (51.8% *Alternaria alternata*, 41.7% *Cladosporium herbarum*),

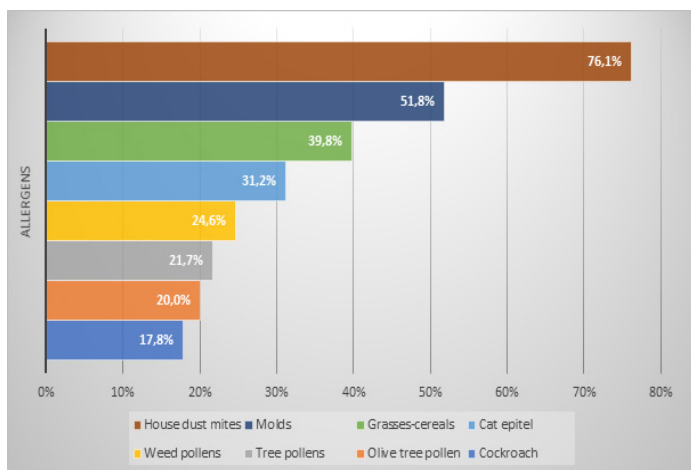


Figure 2. Distribution of aeorallergens

the third frequency of grass and cereal pollen (39.8%) sensitivity was observed. Other aeroallergen sensitivity frequencies; weed pollen mixture (24.6%), trees pollen mixture (21.7%), cockroach (17.8%), cat hair (31.2%), olive tree (20%) (Figure 2).

Serum total IgE level mean was found to be 215.6 IU/ml (median= 138 IU/ml) in 489 patients. Mean eosinophil counts in 542 patients was found to be 410.63/mm³ and median was 300/mm³. There was no significant difference in eosinophil and total IgE levels between the patient groups with allergic rhinitis, atopic dermatitis and chronic urticaria (p> 0.05). The mean eosinophils of patients who have asthma were higher than the patients without asthma and the difference was statistically significant (p <0.05). When we look at allergen sensitivities according to allergic diseases; house dust mites were the most common in all patient groups; molds were second, grasses and cereal pollens were third most common allergens. When the patients have allergic rhinitis compared to without allergic rhinitis, there was significant difference in terms of house dust mites and *Alternaria* (p <0.05). In patients with allergic rhinitis, the sensitivity of house dust mites and *Alternaria alternata* was found to be higher (p=0.02, p=0.03, respectively). There were no differences between the two groups in terms of other allergens. There were no significant differences in asthma, atopic dermatitis and chronic urticaria between the groups with and without disease in terms of allergen sensitivity.

DISCUSSION

The incidence of allergic diseases increased in the last decades (1). Asthma from allergic diseases is the most common chronic disease in childhood. Increased prevalence is also important in terms of morbidity, emergency applications, economic burden and missed school/work days due to hospital admission. Uncontrolled asthma is also important because of limiting physical activity and growth retardation (7). Allergic rhinitis, which is an allergic disease that usually starts in childhood, causes sleep disturbance, fatigue, headache, concentration difficulty, recurrent runny nose, itching and redness of the eyes and nose. It causes to decrease of quality of life with all these conditions (8). Patients with atopic dermatitis, another prevalent allergic disease in childhood, are irritable due to itching, and their skin is generally dry. Allergic rhinitis and asthma are often coexist (7,9). Some quality of life studies have found that atopic dermatitis has a greater

effect on the family than diabetes (10). Because of all these medical, economic and social effects, early recognition of allergic diseases and the effective treatment of responsible allergens are becoming increasingly important. Knowing the allergens that are commonly seen geographically is also important in terms of taking general environmental measures. 73.7% of the patients who were examined for atopy had allergic rhinitis, 34.8% had asthma, 12.6% had atopic dermatitis and 3% had chronic urticaria clinic. Diagnostic distribution was 50.5% allergic rhinitis, 14.9% asthma, 7.5% atopic dermatitis, 3% chronic urticaria, 19% asthma + allergic rhinitis, 0.9% asthma + atopic dermatitis, 4.2% allergic rhinitis + atopic dermatitis. In a study examining the aeroallergens sensitivity of atopic children in the Mediterranean region published in 2018, 57.8% of patients had asthma, 28% had allergic rhinitis, 10.9% had asthma + allergic rhinitis and 2.9% had atopic dermatitis (11). The reason for the high number of patients with asthma was the fact that the study was performed together with pediatric chest diseases.

In our study, the sensitivity of house dust mites was the most common (76.1%). The second frequency of molds (51.8% *Alternaria alternata*, 41.7% *Cladosporium herbarum*), the third frequency of grass and cereal pollens (39.8%) sensitivity was observed. Other aeroallergen sensitivity frequencies; weed pollen mixture (24.6%), trees pollen mixture (21.7%), cockroach (17.8%), cat hair (31.2%), olive tree (20%) was determined. Basaran et al (11) similarly, in the study carried out in atopic children in the Mediterranean Region, house dust mite sensitivity (69%) was observed most frequently, but second and third tree pollen (54.9%) and grass and cereal pollens (52.5%) were found to be sensitive. In the same study, animal epithelium mixture was found to be 45.3%, mold mixture 43.4%, weed pollen mixture 34.9%, cockroach 16.9%, olive tree pollen 6%. In that study, there was any difference in the allergen sensitivity according to the season. In our study, mite, molds, weeds, cockroach sensitivity rates were similar to Mediterranean Region, and olive tree pollen sensitivity was found to be higher. In a study conducted in 1037 atopic children in Mersin, the sensitivity of house dust mite 1 was 67.9%, mite 2 was 67.2%, *Alternaria alternata* was 19.4%, and grass pollen was 17.7%. Diagnosis distributions of patients were; 38.9% allergic rhinitis, 32.9% asthma, 15.9% urticaria and 5.9% atopic dermatitis (12). Although mite sensitivity is similar in the neighboring province of our center in

the Mediterranean region, molds sensitivity was found to be higher in our study.

In a study conducted in Sakarya province in the Western Black Sea Region, a positive reaction was observed in 46% skin prick test of 623 patients (1-12 yearsold) with allergic rhinitis. In this study, 87% to pollens (weed: 66% and trees: 21%); 51% to mites; 8% to molds; 6% to animals and 6% sensitivity to nutrients were detected (13). In a study of 2-17 year-old children in the Central Black Sea Region, the most positive response was against house dust mites (97%), and second frequency against diverse plant pollen (grass and trees) (30.6%). Other sensitivities were molds (12%) and cockroach (12.3%) (14). In a study in the Eastern Black Sea Region, 421 patients aged between 3-17 years with at least one aeroallergen sensitivity were evaluated. In the evaluation of these 421 patients, it was found 71% grass pollen sensitivity, 61% house dust mites sensitivity, 12.8% molds sensitivity (*Alternaria* and *Cladosporium*) (15). The most common allergens in the test results of 583 patients between the ages of 3-70 years (mean 30.6 ± 17.5) who had been diagnosed with allergic asthma, atopic dermatitis, chronic urticaria, allergic rhinitis, conjunctivitis, sinusitis, pharyngitis in Çanakkale province were house dust mites (50.5%), grasses (28.8%), cereal pollen (29%), cat hair (14.7%), dog hair (16.3%), pollens (9.5%), molds (9.1%) and olive tree (8.8%) (16). In Istanbul, Küçükosmanoğlu et al (17) applied skin tests to 532 atopic children; positivity was found in 92 patients (17.2%), the most common sensitivity was found to the house dust mites (96.7%). Secondly, the sensitivity of grass pollen (18.5%) was determined.

In a study conducted in Ankara, at least one aeroallergen sensitivity was detected in 862 (35.1%) of 2547 children (2-18 years) who underwent skin prick test with respiratory problems. In that study, the most common allergen was grass pollen (70.3%), the second common allergen was house dust mites (29%). The other sensitivities were found to weed pollens (23.1%), cat epitel (13.3%), molds (*Alternaria* 7.2%, *Cladosporium* 2.2%), olive tree pollens (3.1%), cockroach (4.6%) (18). Atopy is seen to be more common in male sex (19). In our study, 57.3% of the patients with skin prick test positivity were male and 42.7% were female according to the literature. Eosinophils affect the pathogenesis and pathophysiology of asthma. Many studies have reported that high blood eosinophils are associated with bronchial hyperreactivity, respiratory inflammation

in children with recurrent wheezing, uncontrolled asthma, increase in future asthma attacks and use of excessive short acting β_2 -agonist (20-23). High blood eosinophil levels are risk factors for both asthma exacerbation and asthma development. In a longitudinal study from 2007 to 2015 including patients older than 20 years who did not initially have asthma (n=57975); high blood eosinophils at baseline was significantly associated with increase in the asthma incidence (24). In our study, there was no noticeable difference in eosinophil and total IgE levels between the patients with allergic rhinitis, atopic dermatitis and chronic urticaria ($p > 0.05$). The mean eosinophils of patients with asthma were higher than those without asthma ($p < 0.05$).

In our region, the winter is warm and humid the summer is very hot and dry. Mediterranean climate is seen and our region is in the humid category according to Erinç precipitation efficiency index (25). The highest rates of mite fauna study in seven regions of Turkey were found in the Mediterranean (48.4%) and Black Sea (46%) regions. The presence of mites was related to an increase both in mean temperature (> 15 degrees C) and in humidity ($> \text{or} = 40\%$) as well as low altitude (< 300 m). This study suggests that the mite population of humid coastal regions of Turkey is prevalent (26). House dust mite sensitization is a significant risk factor for asthma and rhinitis, particularly in the Tropics where they grow all year (27). Our region has tropical climate characteristics due to rainy winters and very hot summers. In our study, high house dust mite sensitivity is associated with warm and humid climate of our region and low altitude. A previous study from Adana, which is a city with hot and humid climate in the southern region of Turkey, found that the most common respiratory allergens were house dust mites (73.8% and 71.6%) and molds (23.4%) (28). In another study from Mersin, which is also nearby Mediterranean Sea and has hot and humid climate, the most common aeroallergens were house dust mites and *Alternaria alternata* (12).

In our study, we detected common inhaler allergen sensitivities for the first time in our region. Prevention from allergens is important to control the disease in atopic diseases. We believe that our study will contribute to disease control by taking protective measures against allergens responsible for atopy.

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