Skin prick test results of child patients diagnosed as bronchial asthma

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ABSTRACT

*Background:*The pathogenesis of asthma is associated with both genetic and environmental factors. Allergen sensitization is an important risk factor in asthma development.

Aim: To evaluate sensitivity to allergens by using the skin prick test in patients with a diagnosis of bronchial asthma.

Method: Patients with a diagnosis of bronchial asthma followed-up at the Ministry of Health, Diskapi Children's Diseases Training and Research Hospital in Ankara (Turkey) between January 1995 and March 2000 were included. Sensitivity to allergens, as determined by the skin prick test, was evaluated retrospectively.

Results: The files of a total of 3025 children (63.3 % boys) with bronchial asthma, aged 3 months to 16 years were evaluated. Of the total, 1667 patients with a diagnosis of bronchial asthma and 1358 with bronchial asthma plus allergic rhinitis were under follow-up. Of the 3025 asthmatic patients, 1902 had undergone the skin prick test and 60.3 % of these patients were atopic. The most common allergens were house dust mite [726 patients (63.3 %)], followed by pollens [565 patients (49.3 %)]. The most common allergen within this group was grass pollens [348 patients (30.3 %)].

Conclusions: Atopy was an important risk factor in our patients and the most common allergens were aeroallegens. The development of sensitization could be delayed by early precautions.

Key words: Atopy. Skin prick test. Bronchial asthma. Childhood sensitization is an important risk factor in asthma development.

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INTRODUCTION

Bronchial asthma is characterized by respiratory airway obstruction developing as an exaggerated response to various stimuli and appearing as recurring crises that resolve simultaneously or with treatment. Although the cause of childhood asthma has not be enpinpointed, research implicates an relation between genetic and environmental factors[1].

Atopy is defined as a hereditary predisposition to developing immunoglobulin E antibodies in response to exposure to allergens and is an important risk factor for allergic disease development in a susceptible individual. Allergy or atopy can be detected in clinical studies by measuring serum total or specific IgE level, or by measuring cutaneous immediate hypersensivity to common environmental allergens[2]. Aeroallergens are the most important group of allergens causing asthma and allergic rhinitis in particular. Food allergens and occupational allergens can also lead to the clinical symptoms of asthma[3].

We aimed to evaluate the prevelance of sensitization to common allergens of patients diagnosed with bronchial asthma using the skin prick test.

MATERIAL AND METHODS

The total IgE and specific mix IgE and/or skin prick test results of patients were evaluated retrospectively. The patients had be en followed-up with a diagnosis ofbronchial asthma at the Allergy Clinic of the Ministry of Health, Ankara Diskapi Children's Diseases Training and Research Hospital between January 1995 and March 2000. The hospital is the We used the ELISA (Enzyme linked immunoassay) method to determine total IgE levels and the immunoassay method for specific mixed IgE (mites, pollens, milk, eggs). The total IgE value had be en determined in all patients. Mixed IgE had be en preferred in patients where a skin prick test could not be undertaken due to small age, refusal of the family and skin findings such as egzema or dermographism.

Skin prick test: The skin tests were performed by the same nurse in a standardized manner. The patient's antihistaminic medication, if any, was stopped at least three days before the test. A drop of the allergen solution at standard activity and concentration was placed on the skin and let to seep into the epidermis with the help of a lancet. The lancet used for pricking the skin was a metallic lancet with a 1 mm tipo A prick made with a clean lancet was used as the negative control. The skin reaction was graded 20 minutes later. The skin edema and erythema that developed were graded between zero to four degrees by comparing the size with negative (antigen diluting solution) and positive (histamine hydrochloride 10 mg/ml) controls as follows:

Area of edema and erythema twice as large as the positive reference	+ + + +
Area of edema and erythma the same size as the positive reference	+ + +
Area of edema and erythma half the size of the positive reference	+ +
Area of edema and erythma smaller than the positive reference, but larger than the negative reference	+
Area of edema and erythma the same size as the negative reference	–

+ + + + and + + + + skin tests were accepted as positive.

A total of 38 allergen solutions, inc1uding the negative and positive control, were employed. The allergens used inc1uded pollens (tree, grass, weed pollens), fungal spores, mites *(D. farinae, D. pteronyssinus)*, animal fur (cat, dog, bird, sheep), cockroaches (german), latex and various food substances (seven cereal grains, banana, peach, strawberry, olive, orange, hazelnut, walnut, Pistachio nut, bean, spinach, tomato, cow meat, egg white, yolk, cows milk, cacao, coffee) (Stallergens S.A-France).

Statistical analysis: The SPSS 9.0 software package was used. The detinitions were provided as number and percentage for discrete variables and mean and standard deviation for continuous variables.

RESULTS

The files of a total of 3025 children with bronchial asthma were evaluated retrospectively. Of the total, 1667 patients were being followed up with a diagnosis ofbronchial asthma and 1358 (44.9 %) with bronchial asthma + allergic rhinitis. The ages were 3 months to 16 years and the mean was 5.5 ± 3.3 years. 1915 (63.3 %) ofthe patient were male.

Atopy-related tests revealed a high total IgE median level at 524.3 IU/ml. The specific IgE (AlaTOP and food panel) level was determined in 625 patients of which 325 (48 %) were positive. 1902 of the 3025 patients had received a skin prick test with 1146 (60.3 %) found to be atopic and 756 (39.7 %) nonatopic. 149 (13 %) of the atopic patients had monoallergen sensitivity.

726 (63.3 %) patients had allergy to house dust mites, 565 (49.3 %) to pollens, 402 (35 %) to food, 309 (26.9 %) to animal fur and dander, 187 (16.3 %) to cockroaches, 333 (29 %) to molds and 42 (3.6 %) to latex (table I).

DISCUSSION

Bronchial asthma is the most common chronic disease of childhood. The prevalence and severity of asthma have been increasing in recent years. The relationship between genetic and environmental factors is now thought to playa very important role in asthma pathogenesis[4]. Atopy (allergen sensitization) is an important risk factor in asthma development and 80 % of asthmatic children have been found to be atopic[2]. 60.3 % of our patients were atopic on the skin prick test.

Exposure to allergens at an early stage of life probably facilitates later specific disease development due to the immunologic sensitivity in the first year of life[5]. Exposure to allergens is a risk factor for the development of allergic diseases in sensitive individu-

als. Many external factors such as genetic factors, air pollution, cigarette smoke and viral infections can also contribute to the recognition ofthese allergens by the immune system[3]. Allergens can enter the body by inhalation and by the oral or parenteral routes[6].

Allergens that are inhaled can be from the internal environment or external environment. House dust mites, animal allergens, cockroach allergens and fungi are internal environment allergens while pollens, some fungi and animal allergens are external environment allergens[7]. The frequency and severity of asthma increased with exposure to internal environment allergens. Chronic exposure to allergens leads to development of allergic diseases, especially in genetically predisposed individuals. Bedroom allergens, of which mites are the most important, playa leading role in the development of asthma[8-10]. Although there are many mites among house dust, the most allergenic species are *Dermatofagoides pteronissinus* and *farinae*. The main antigenic product ofmites is their feces[7,11]. Many studies have reported house dust mites as the most important aeroallergens. Skin prick test results are positive for house dust mites at arate of30.9 % to 79.5 % in various studies around the world[12-16]. The most common1y encountered household allergen in Turkey is house dust mite[3,16]. Emin et al[17] reported a house dust allergy rate of 73.3 % in infantile asthma patients younger than 3 years. House dust was the most common allergen in our study with arate of 63.3 %.

Allergies of animal origin be come important where pets are found frequently as this increases exposure to animal allergens and, in consequence, lead to sensitization. Sensitivity to cats and/or dogs has been found to be more common in children with pets. However, it is emphasized that sensitization is not solely associated with having a cat as a pet as 23.8 % of those with pet sensitivity have never kept a cat in the house[3]. We found an allergy to animal fur at arate of 26.9 %. The most common among these was allergy to cat fur.

Pollens are distinct among external environment aeroallergens. The main allergens are grass, tree and weed pollens[7,11,18]. The pollen is a part of the male reproduction organ of the seeded plant. The pollen count in the atmosphere changes according to the weather and the time of the day. The pollen count increases in dry and sunny weather and also between the hours of 10 and 16[8,11]. Grass pollens are the most important pollen allergen group in many European countries and in our country[3,19]. Cross-reactions are observed between many grass pollen types[8,20]. Tree pollens show regional variation but pollenization is generally between the months of February and April. Tree pollens are thought not to be as allergenic as grass pollens[3]. Weed pollen sensitivity is encountered most frequently in the USA. It stays longer in the atmosphere than other pollens and is thought to be a perennial pollen[8,9,19]. Emin et al[17] have reported a pollen allergy rate of 52.1 % in pa-

Table I

Allergen sensitivity of the patients determined with the skin prick test

Allergens	n	%
Animal fur and danders	309	26.9
Dog	113	
Cat	164	
Bird	69	
Sheep	101	
Cockroaches	187	16.3
Food	98	11.3
Seven cereal grains	5	
Banana	2	
Peach	2	
Strawberry	3	
Olive	1	
Orange	1	
Hazelnut	22	
Walnut	17	
Pistachio nut	10	
Bean	5	
Spinach	1	
Tomato	1	
Cow meat	4	
Egg white	29	
Yolk	15	
Cows milk	6	
Cacao	30	
Coffee	11	
House Dust Mites	726	63.3
D. farinae	697	
D. pteronyssinus	703	
Pollens	565	49.3
Grass pollens	348	30.3
Twelve grass pollens	348	
Tree pollens	142	16.5
Betulacae	17	
Moist zone frees	42	
Park tree pollens	92	
Fagaceae	20	
Eastern trees	17	
Mediterranean trees	10	
Weed pollens	274	23.9
Four cereal grains pollens	217	
Weed mix III	135	
Latex	42	3.6
Mold mix	333	29

tients younger than 3 years old with infantile asthma. Pollen allergy ranked second in our study with 49.3 % and grass pollen allergy was the most frequent allergy within this group.

Fungi do not have chlorophyll but distribute many allergenic spores to the atmosphere. They can be found everywhere and at every temperature[8,9]. We detected a mold allergy rate of 29 %.

Cockroach allergy is encountered frequently in hot and humid areas and tropical regions. It is especially important as an allergen for low-income families[8]. Data on cockroach allergy in Turkey is not extensive. Mungan et al[21] have reported a rate of 41 % with the skin prick test in adult atopic patients. An allergy prevalence of 58 % has been reported from the USA. This rate is lower in European countries at 6.3-15 %[22]. We found arate of 16.3 % in our patients being followed-up with a diagnosis of asthma.

The most common allergenic foods in children are milk, eggs, peanuts, wheat and soya. The major food allergens are glycoproteins. Cross-reactions between inhalant allergens and food allergens are encountered frequently due to similar protein structures[23]. 11.3 % of patients had sensitivity to food allergens. However we did not carry out food elimination by making a definite decision on the basis of the skin prick test. We used food elimination for those patients with clinical signs who had positive results following a challenge test.

High IgE levels are uncommon without signs of an allergic disease in childhood. IgE levels are high in 75-83 % of children with allergic asthma. However, a normal or low value does not eliminate the diagnosis of asthma[1]. The median total IgE level of our patients was high. Specific IgE determination in the serum is les s sensitive, more expensive and more time consuming than the skin prick test but less traumatic for the patient. The skin reactivity to histamine and allergens is low in infants and young children and this is therefore a preferred method in young children, those with extensive eczema or dermographism and children who carry a risk of anaphylaxis due to hypersensitivity[1]. The test was positive in 325 (48 %) of the 625 patients that we tested with specific mix IgE.

In conclusion atopy was important risk factors in our patients and the most commonly encountered allergens were aeroallergens.

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