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Prick Test Results and Total IgE Levels of Asthma Patients in A University Hospital

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Abstract

Respiratory allergies are currently on the rise and affect all age groups. Aeroallergens play a major role in the pathogenesis of respiratory allergic diseases, especially in asthma and allergic rhinitis. Skin prick tests and specific blood tests can be used to safely ascertain allergen-specific IgE. When correctly implemented, aeroallergens such as house mites, pollens, and pet allergens can be determined. Skin tests are widely used to assess sensitivity to allergens due to their relatively easy application and safety.

The present study aims to delineate a regional allergen profile and compare this profile with that of other regions of the country. Furthermore, a comparison of total IgE elevation and prick test positivity was made to assess the sensitivity and specificity of total IgE levels.

One hundred and sixty seven patients over 18 years of age that applied to either in- or out-patient clinics, that had a diagnosis of asthma according to the criteria of GINA (the Global Initiative for Asthma) and had been attack-free for at least one month were included. Forty one patients were male and 124 were female.

The prick test was positive in 18.7%. Pollens (41.9%), mite (22.5%) and cochroach were the most frequently detected allergens. Those that had serum IgE levels higher than the serum reference value had significantly higher rate of prick test positivity (p=0.029).

The present study demonstrates inter-regional variability of allergen profiles and the direct correlation between total IgE elevation and prick test positivity. In cases where prick tests are not available, allergen sensitivity can be determined by total IgE levels.

Key Words: Total IgE, Prick Test, Allergy

Introduction

Respiratory allergies are a group of diseases that can be seen in all age groups and whose incidence is still on the rise (1). Aeroallergens play a major role especially in asthma and allergic rhinitis (1). Defining an allergy rests on the history of complaints after allergen exposure. The presence of allergen-specific IgE can be safely detected by specific blood tests or skin prick tests (2). Skin prick tests are carried out by introduction of small allergen extracts into the skin. When carried out correctly, aeroallergens from house dust mites, pollens and indoor pets can be determined (2). Allergy skin tests are widely used because they are reliable and easy to perform (3).

In this study, we aimed to determine the regional allergen profile and compare that to those of other parts of the country. Furthermore, we aimed to assess total IgE levels for sensitivity and specificity by comparing it to prick test results.

Material and Methods

One hundred and sixty-seven patients that had applied to the outpatient clinic were included. Approval of the institutional review board was obtained. All patients received the skin prick test panel that contained 14 allergen extracts, including positive and negative controls. Skin tests were applied on the volar side of the fore arm using a needle that does not disrupt the skin or subcutaneous tissues, allows sufficient test solutions to reach the skin and is specifically produced for easy and safe administration of prick tests.

Droplets of allergen extracts were applied on the forearm with 2 cm intervals and needles pricked the skin perpendicularly. The test was read 20 minutes later. The widest diameter of the edematous area, along with the diameter that is perpendicular to the widest diameter, were obtained. These two values were added and the sum was divided by 2. If the negative control

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Table 1. Patients Demograhic Characteristics

	n(%)
Age (mean±SD)	39.30±14.23
Sex	
Male	41(24.84%)
Female	124(75.16%)
Skin Test Allergens	31
Pollen	13(41.9%)
Mite	7(22.5%)
Cochroach	4/12.9%)
Cat and Dog Hair	3(9.6%)
Mold	3(9.6%)
Penicillium	1(3.5%)

yielded no reaction and the tested allergen yielded an average diameter of 3 mm or more, the test was considered positive. The positive control was histamine (histamine hydrochloride, 10 mg/ml). The allergens tested are as follows:

D. Pteronyssinus house dust mite

D. Farinae house dust mite

Aspergillus mix

Cat hair

Dog hair

Hair mixture

Grass mix (5): Perennial rye grass/Lolium perenne, cock's foot grass/Dactylis glomerata, smooth meadow grass/Poa pratensis, timothy grass/Phleum pratense, Sweet vernal/Anthoxanthum odorantum)

Grass mix (12): Grass mix (5), oat, common wild oat/Avena fatua, meadow fescue/Festuca pratensis, Agrostis Vulgaris, Holcus Lanatus, Dactylon, Bromus)

Tree pollen

Legume pollen

Latex

Cockroach

Penicillium

Patients that had used topical/systemic medication which would interfere with the test, such as antihistaminics, corticosteroids, mast cell stabilizers, immunosuppressors, tricyclic antidepressants, were not included. Those patients were tested after 15 days of drug discontinuance. For total IgE measurement, 5 cc of venous blood in a standard biochemistry tube was used. Samples were run in an Immulite 2000 immunoassay machine by a technician. Values at or above 85 IU/ml were noted as positive. For patients aged 12 and over, the reference range is 0-84 IU/ ml.

The reasons for limiting the study are only in asthma patients. Because allergic rhinitis and eczema diseases such as allergic diseases. In addition, adult patients do not include children.

Continuous variables were described via means and standard deviations (SD). Kolmogorov-Smirnov test was used to determine whether variables assumed a normal distribution. Categorical variables were cross-tabulated and analyzed using the chi-square test with Yates correction. Hypotheses were double-sided and p values where $p < 0.05$ were considered statistically significant. Statistical analyses were carried out using SPSS software, 15.0 for Windows (SPSS Inc., Chicago, IL, USA).

Results

The present study included 165 patients over 18 years of age that applied to either in- or out-patient clinics of university hospitals between June 2013 – September 2013, that had a diagnosis of asthma according to GINA criteria (the Global Initiative for Asthma) and had been attack-free for at least one month. Forty one patients were Male and 124 were female. (Table 1) The skin prick test was positive in 18.7% of patients. Pollens (41.9%), mite (22.5%) and cochroach were the most frequently detected allergens. Those that had

Table 2. Prick Test and Total IgE Relationship

	Total IgE >87	Total IgE < 87	p
Skin Prick Test Positive	21	10	0.029
Skin Prick Test Negative	61	73	

P<0.05 were considered statistically significant

serum IgE levels higher than the serum reference value had significantly higher rate of prick test positivity (p=0.029). (Table 2)

Discussion

The allergens that cause sensitization in asthma are air-borne. House dust mites, cockroaches, fungi and pet dander are among the most frequent indoor allergens. Pollens cause sensitization frequently in the outdoor setting (4). The fact that the presence of pollens have seasonal variation cause seasonal symptoms in patients sensitized to them. The presence and intensity of allergens vary according to geographical properties, climate and flora, creating regional diversity. The fact that pollen sensitivity in asthma patients varies between 0.7% and 80% is an expected finding regarding cross-country and even interregional variability among flora and climate (4). Pollens were reported to be the second most frequent allergens after house dust mites by Davutoğlu et al for Diyarbakır, Bostancı et al and Yılmaz et al for Ankara (5-7). In the multicentered study that included 5 different regions of Turkey, Kalyoncu et al reported pollens as the second most frequent (26.4%) allergens that asthma patients in Samsun were sensitized to, after house dust mites. The same study showed similar house mite dust-pollen sensitivity in Ankara, Adana and İzmir, while in Elâzığ, pollen was the third most frequent sensitivity factor after house dust mite and cockroach (8). The most frequent sensitizer was pollen (41.9%) in our study, which is in concordance with the studies described above.

Various studies conducted in several regions of Turkey demonstrate that house dust mites are found in 18-98% of houses. Temperatures higher than 15˚C, altitudes lower than 300 meters were reported to affect the presence of mites (10). İzmir and Bursa demonstrate a mite prevalence of 74.5% and 34.4%, respectively (11, 12). In a study by Kalpaklıoğlu et al that spanned 7 regions and 45 different cities of Turkey, houses of atopic patients that were located in coastal regions such as the Black Sea and the Mediterranean harbored higher rates of mite presence (46%), while no mite was detected in dust samples from Southeastern Anatolia. Wang et al, in their study on 111 asthmatic adolescents in China, detected atopy in 71.2% and house dust mite sensitivity was frequent (13). Twenty-four percent of Swedish asthma patients had mite sensitivity on an allergy skin test (14). Özçeker et al was found the most commonly detected allergen as house dust mites (15) Our study displays a rate of 22.5% of house dust mite sensitivity, the second most common sensitivity after pollens.

The rate of mold sensitivity via the allergy skin test was found to be 10-15% among asthmatic patients. The most frequent molds were Aspergillus, Alternaria, Penicillium and Cladosporium (16). Akçakaya et al showed that asthmatic patients in İstanbul demonstrated Candida albicans and Aspergillus fumigatus sensitivity rate of 6%, while in Diyarbakır, Davutoğlu et al reported a mold sensitivity rate of 25%. In Edirne, Yazıcıoğlu et al noted a sensitivity rate of 25% for mold spores (5, 17, 18). The 420 patients studied by Ceylan in 2004 in Harran University displayed no mold sensitivity, yet in 2006, a similar study conducted in the same institution on 420 patients showed a sensitivity rate of 5% for molds (19). In Elazığ, Kalyoncu et al noted that 3.9% of asthmatic men and 2% of asthmatic women displayed Cladosporium sensitivity (20). Our study demonstrates a sensitivity rate of 9.6% for molds (Aspergillus mix, Cladosporium, Penicillium).

Despite its insufficiency to prove the presence of atopy by itself, it is known that total IgE levels are higher in patients that have otherwise proven allergen sensitivity (21). Though, in a subset of atopic patients, total serum IgE levels were not significantly different from non-atopic patients (22). It was concluded that total IgE levels could be high in non-atopic people as well. Davutoğlu et al reported that total IgE levels of allergen-sensitive bronchial asthma patients were higher than those without allergen sensitivity; Kuyucu et al noted that among healthy school children, those with allergen sensitivity had higher total IgE levels than those with no allergen sensitivity (5, 23). In Van, Sakin showed high total IgE levels in 77.78% and 43,9% of atopic and non-atopic patients, respectively (24). In their study, Özceker et al. showed that those with a total level of> 100 IU / ml had a more allergic structure (15). In Konya, Yüksekkaya et al noted higher total IgE levels in 48% overall; those with atopy had high total IgE level rate of 52.8% (25). In

our study, high total IgE levels and atopy showed a statistically significant association (p=0.029).

Skin prick tests are frequently used in general practice as a sign of atopy. A prick test can demonstrate the allergens the individual is sensitive to; it therefore aids medical therapy by avoidance of the allergen. In our region, pollens and house dust mites stand out with their high rates of prick test positivity.

Our study demonstrates variable allergen profiles in different regions. Furthermore, high levels of total IgE are significantly associated with prick test positivity and in cases where prick tests are not available, allergen sensitivity can be determined by total IgE levels.

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