

Short communication

Characteristic features of cockroach hypersensitivity in Turkish asthmatic patients

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Exposure to cockroach has been reported to cause asthma in many parts of the world. Although house-dust-mite is known to be the most important indoor allergen in Turkey, there are few data on the prevalence of allergy to cockroaches. Therefore, we evaluated the prevalence of cockroach sensitivity in asthmatic Turkish patients to see whether it is also an important source of asthma in addition to house-dust mites. A total of 206 patients demonstrating the characteristic features of asthma were included in the study. Sixty-three percent of the patients were considered atopic, and 37% were found to be nonatopic by skin prick tests. Mite allergens were the most common cause of indoor allergy (50%), while cockroach sensitivity was detected in 25.7% of all the asthmatics. Among all cockroach-sensitive patients, 70% were also positive for mites. A female predominance was observed in cockroach-sensitive patients, as 44% of atopic women and 34% of atopic men had positive skin tests with cockroach allergen. The average duration of asthma was 7.1 ± 5.6 years in cockroach-sensitive asthmatics, and there was no difference between groups in average duration of asthma ($P > 0.05$). Mild, moderate, and severe asthmatics constituted 73.6%, 20.7%, and 5.7% of the cockroach-sensitive patients, respectively. These data indicate that cockroach is also an important source of domestic infestation in Turkey. Thus, it seems reasonable to suggest the need for cockroach allergen in the routine battery of inhalant skin tests in this geographic location. However, possible cross-reactivity with mites has to be taken into consideration during the clinical evaluation of subjects with cockroach sensitivity, especially in our patient population with such high rates of house-dust-mite allergy.

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Cockroach has been identified as an important source of indoor allergens in homes throughout the world. The most commonly encountered species are *Blattella germanica*, *Periplaneta americana*, and *Blattella orientalis* (1, 2). To our knowledge, the most common cockroach in Turkey is *B. germanica*. Exposure to cockroach has been reported to cause asthma in many parts of the world. A number of studies have demonstrated that up to 58% of atopic asthmatic patients in the USA were sensitized to cockroach allergens, particularly patients living in

the larger urban areas. However, in Europe, this prevalence seems to be lower (3, 4). Although house-dust-mite sensitization is known to be the most important indoor allergen in Turkey (5), there are few data on the prevalence of allergy to cockroaches (6). Therefore, we planned to evaluate the prevalence of cockroach sensitivity in Turkish asthmatic patients to see whether it is also an important source of asthma in addition to house-dust mites. We also aimed to determine some characteristics of asthmatic patients with cockroach sensitivity.

Material and methods

Patient selection

Subjects with recurrent symptoms of wheezing, shortness of breath, and cough were included in the study. Diagnosis of asthma was made by clinical history and laboratory documentation of reversible airway obstruction (7). On entry, their asthma had been in a stable period for at least 2 weeks.

The study population comprised patients from both Ankara and various other regions of Turkey who were referred to our allergy department. In selecting the subjects for study, social class or socioeconomic status were not distinguished. Participants included residents of both the inner city and small towns.

After giving informed consent, the subjects were asked to complete a questionnaire including age, sex, atopic background, duration of asthma, and seasonality of symptoms. During the baseline period, the severity of their asthma was evaluated by a physician by history, physical examination, and spirometric data.

Allergy skin testing

Skin prick tests (SPT) were performed with a standardized panel including *Dermatophagoides pteronyssinus* (*Der p*) and *D. farinae* (*Der f*) and grass, tree, weed-pollen, cat, dog, *Alternaria*, and *Cladosporium* antigens (Stallergènes, France). Commercially available cockroach antigen (*B. germanica*) was also obtained from Stallergènes. The puncture method was used in SPT, and a mean wheal diameter of 3 mm or greater than control solution was considered positive. Histamine dihydrochloride (10 mg/ml) and glycerol diluent were used as positive and negative controls, respectively. To prevent interobserver variability, the same doctor, who had special training in allergy, performed all SPTs.

Measurement of specific IgE

Specific IgE was measured by the Pharmacia CAP System, according to the manufacturer's instructions. Specific IgE to *B. germanica* (i6) was analyzed in 91 subjects, 12 of whom were non-atopic controls, the rest comprising three groups of patients who demonstrated positive response to cockroach, mite, or cockroach plus mite allergens in SPT. Among these patients' sera, 62 were also tested for specific IgE to *Der p* (d1) and *Der f* (d2). Results equal to or greater than class II (IgE level ≥ 0.7 kU/l) were considered positive.

Statistical analysis

Results were expressed as mean $\pm$ standard deviation (SD). SPT results were expressed as percentage of the patients, and differences in percentages between groups (patients with cockroach hypersensitivity, atopic asthmatics other than those with cockroach hypersensitivity, and nonatopics) were determined by Student's *t*-test. A *P* value less than 0.05 was considered significant. The statistical Package for Social Sciences (SPSS) for Windows, Version 6.0, was used to analyze the data.

Results

A total of 206 patients demonstrating the characteristic features of asthma were included in the study. There were 87 male and 119 female patients with a mean age of 32.3 ± 9.3 years (Table 1). A total of 130 patients (63%) were considered atopic, and 76 (37%) nonatopic according to SPT.

Cockroach hypersensitivity was detected in 53 (25.7%) patients. Mite allergens were the most common cause of indoor allergy, affecting 50% of the all-asthma group in whom pollens affected 31% as an outdoor allergen. The distribution of the other aeroallergens is shown in Fig. 1. Only five patients demonstrated isolated cockroach positivity, whereas most of the cockroach hypersensitivity was combined with at least one of the other aeroallergens according to the SPTs. Among all cockroach-sensitive patients ($n=53$), 37 (70%) were also positive for mites, whereas only 14 and five shared reaction to molds and cat/dog dander, respectively. The aeroallergens detected with cockroach positivity are shown in Fig. 2.

There was no difference in mean age between atopic asthmatics with and without cockroach hypersensitivity. A female predominance was observed in cockroach-hypersensitive patients. Of atopic women, 44% showed cockroach positivity, and this figure was 34% for atopic men. The average duration of asthma was 7.1 ± 5.6 years in cockroach-hypersensitive asthmatics, 7.5 ± 5.7 in atopic patients without cockroach sensitivity, and 5.1 ± 4.2 in nonatopic asthmatics. There was no difference between groups according to average duration of asthma ($P > 0.05$). Mild, moderate, and severe asthmatics constituted 73.6%, 20.7%, and 5.7% of the cockroach-sensitive patients, respectively (Table 1).

When cockroach-specific IgE results were evaluated according to SPT positivities with mite and cockroach allergens, 17 patients in the group positive for cockroach and negative for mites ($n=22$) had negative CAP results for cockroach-specific IgE. However, in the other group positive for both

Table 1. Demographic features of general group and asthmatics with cockroach hypersensitivity

Demographic features	Asthmatics with cockroach hypersensitivity	Atopic asthmatics other than with cockroach hypersensitivity	Nonatopic asthmatics	P
Male/female	17/36	32/45	34/42	>0.05
Age (years)*	33.1±8.5	34.21±8.8	31.9±8.9	>0.05
Asthma duration (years)*	7.1±5.6	7.5±5.7	5.1±4.2	>0.05
Asthma severity(%)				
Mild	73.6%	59.8%	46.1%	<0.05
Moderate	20.7%	25.9%	30.2%	>0.05
Severe	5.7%	11.3%	23.7%	<0.05

*Mean ± SD values.

mites and cockroach in SPTs (n=30), only eight patients had a negative and 22 subjects had a positive cockroach-specific IgE test.

Discussion

In this study, we demonstrated a high prevalence of SPT reactivity to cockroach among atopic patients with asthma (41%). However, the prevalence of cockroach sensitivity in this study seemed to be lower than that reported in the atopic population of some US cities (53–69%) (8), but higher than that reported in other European countries (6.3–15%) (4).

The German cockroach has been regarded as the most widespread of all cockroaches with a high immunologic potential (1). As *B. germanica* is known to be the most common cockroach in Turkey, we used this type in SPT. On the other hand, many cockroach species have been found to share common allergens (9, 10), suggesting that we could obtain similar sensitivity rates if other cockroach extracts were included in the test panel.

Interestingly, most of the patients with cockroach sensitivity also had other inhalant allergies, and only five subjects showed isolated cockroach allergy by SPT. Of all cockroach-allergic patients,

70% were also positive for mites. High rates of additional mite allergy in patients with cockroach hypersensitivity suggest that there may be cross-reactivity between these two allergenic sources. Several studies have reported an association between hypersensitivity to cockroach and house-dust mites in SPT and cross-reactivity between these allergens (11–13). It is hard to confirm the presence of cross-reactivity between these two allergens with our data, as further assays were not performed. However, when CAP and SPT results were evaluated, we observed that the group positive for both cockroach and mites in SPT had the highest positivity rates for cockroach-specific IgE. It is doubtful to what degree these findings are attributable to the presence of cross-reactivity between these two allergens, but it may be hypothesized that an antigenic similarity between cockroach and mite allergens causes higher false positivity rates in cockroach-specific IgE tests in subjects sensitive to both allergens.

Cockroach sensitivity has been reported to affect young males and adult females more frequently; however, the reason for this observation is not clear (14, 15). In our study, the average age of cockroach-sensitive asthmatics did not differ from that of general asthmatics. In accordance with the previous reports, cockroach hypersensitivity was more pre-

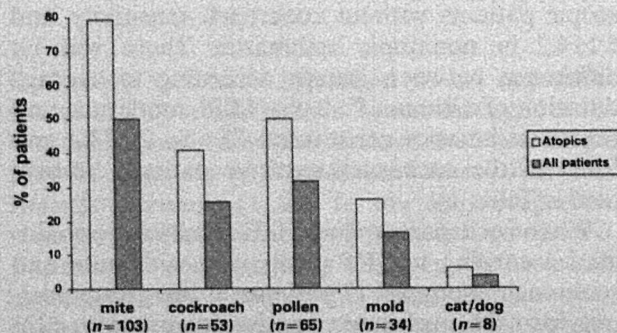


Fig. 1. Distribution of sensitivity to aeroallergens in atopics and in all patients.

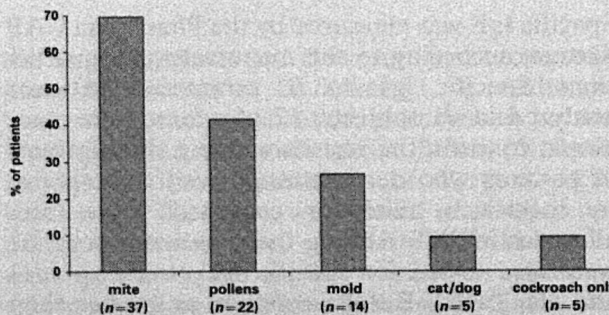


Fig. 2. Sensitivity to other aeroallergens in cockroach-sensitive patients.

valent among female than male subjects. The variations in age and sex distributions in different study groups could be due to the duration of exposure to the allergens according to subjects' lifestyles in the different populations.

It has been reported that patients with cockroach-sensitive asthma had more chronic and perennial symptoms and seemed to have more severe disease than other asthmatics. Such severity and chronicity of cockroach asthma have been explained by both the prolonged exposure time and the heavy content of indoor allergens, especially for patients spending long periods indoors (8, 14, 15). However, our investigation demonstrated no difference in disease chronicity between cockroach-sensitive asthmatics and others. It was also interesting to note that the great majority of cockroach asthmatics had mild asthma in this study. It is difficult to explain the high rate of mild asthmatics in the cockroach-sensitive group, but this rate could be influenced by several factors. As quantities of cockroach allergens were not analyzed, we have no information on the extent of exposure to cockroach allergens. On the other hand, it is well known that the rate of cockroach sensitization is quite high among subjects with low socioeconomic status (2). Although individual measures of socioeconomic status such as educational background, employment, medical insurance, and housing status, were not investigated in this study, most of the patients were employed and had social security coverage. In addition, the lifestyle of the study group might influence the amount of domestic allergen, as it was observed that cleaning measures were strictly performed in many patients' homes. Taken together, these factors might have contributed to disease severity in our study subjects.

In conclusion, we found a high rate of cockroach sensitization in Turkish asthmatic patients. These data indicate that cockroach is also an important source of domestic infestation in addition to house-dust mites in Turkey. Thus, it seems reasonable to suggest the need to include cockroach allergen in the routine battery of inhalant skin tests in this geographic location. We suggest that further investigation to assess disease severity, along with the level of allergens and duration of exposure, would

be helpful in determining the characteristics of the cockroach-sensitive asthmatic population in Turkey.

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