

Original article

Characteristics of sensitization to cockroaches in patients with respiratory allergy in Izmir, Turkey

Les caractéristiques des sensibilisations aux blattes chez les patients présentant une allergie respiratoire à Izmir, Turquie

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Received 5 February 2004; accepted 30 September 2004

Abstract

Cockroach (CR) infestation is an important cause of sensitization in allergic individuals. We investigated the prevalence and the characteristics of sensitivity to CRs in patients with respiratory allergy in Izmir. Three hundred and fifty-four patients with allergic rhinitis and/or asthma responded to a questionnaire and were prick tested with CR extract as well as with extracts of other household allergens. One hundred and twenty-eight of these patients (36.2%) were sensitized to CRs; sensitivity was 1.4 times more frequent among men compared to women. The prevalence of asthma was 39.1% in the group of individuals sensitized to CRs and 28.8% in the non-sensitized group (95% confidence intervals (CI) 1.005–2.508; $P = 0.047$). Moderate, persistent asthma was reported more often in patients sensitized compared to patients not sensitized to CRs (30% versus 18%). In patients with allergic rhinitis, the mean time before they became asthmatic was less in the group sensitized compared to those not sensitized to CRs (2.8 ± 3.4 versus 4.5 ± 5.2 years, $P = 0.045$). More than half the patients sensitized to CRs were also sensitized to cats (68.9%), to dog dander (62.1%) and to *Dermatophagoides pteronyssinus* (59.8%). We conclude that allergy to CRs is present in a large number of atopic individuals in Izmir. The existence of allergy to CRs seems to shorten the delay in the onset of asthma in patients with allergic rhinitis.

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Résumé

L'infestation par les blattes est une cause importante de sensibilisation chez les individus allergiques. Les auteurs ont étudié la prévalence et les caractéristiques des sensibilisations aux blattes chez les patients présentant une allergie respiratoire à Izmir, Turquie.

Méthodes. – Trois cent cinquante-quatre patients présentant une affection allergique (rhinite et/ou asthme) ont répondu à un questionnaire et ont été testés par prick-test avec l'allergène de blatte et les allergènes domestiques usuels.

Résultats. – Cent vingt-huit patients (36,2 %) présentent une sensibilisation aux blattes. Cette sensibilisation est 1,4 fois plus importante chez les hommes que chez les femmes. La fréquence de l'asthme est de 39,1 % dans le groupe des individus sensibilisés aux blattes et de 28,8 % dans le groupe non sensibilisé ($p = 0,047$) (IC à 95 % : 1,005–2,508). Un asthme persistant modéré est observé plus fréquemment chez les patients sensibilisés aux blattes et asthmatiques que chez les patients non sensibilisés aux blattes (30 versus 18 %). Chez les patients atteints de rhinite allergique, la durée moyenne d'apparition de l'asthme est plus courte dans le groupe des patients sensibilisés aux blattes que dans le groupe non sensibilisé ($2,8 \pm 3,4$ ans versus $4,5 \pm 5,2$ ans $p = 0,045$). Plus de la moitié des patients présentant une sensibilisation aux blattes sont aussi sensibilisés au chat (68,9 %), aux phanères de chien (62,1 %) et à *Dermatophagoides pteronyssinus* (59,8 %).

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Conclusions. – L'allergie aux blattes affecte un grand nombre d'individus atopiques à Izmir. Dans cette étude, l'existence d'une sensibilisation aux blattes semble raccourcir le délai d'évolution vers l'asthme chez les patients atteints de rhinite.

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Keywords: Cockroach; Allergy; Asthma; Allergic rhinitis

Mots clés : Blatte ; Allergie ; Asthme ; Rhinite allergique

1. Introduction

Cockroach (CR) infestation has been identified as an important cause of allergic sensitization in allergic subjects [1]. In certain hot and humid regions of the United States or tropical areas, allergies to CRs are as frequent as, or even more frequent than allergies to *Ambrosia* pollen or to house dust mites (53–69%) [2–4]. CRs are also prevalent in many European countries, but the prevalence of CR sensitization seems to be lower (6.1–24.3%) [5–10]. CRs are particularly important in low-income housing where they cause severe asthma [1].

However, there is little information on the possible role of CR in allergic disease in Turkey. In central Anatolia, where the climate is cold and humidity is low, the prevalence of CR sensitivity among asthmatic patients ranges from 4.7% to 41% [11,12].

Since there is a limited data on the prevalence of CR sensitivity in adults with respiratory allergy from Izmir, the third populated city in Turkey situated next to Aegean Sea, where reigns a temperate climate, we initiated our study to investigate the prevalence of CR sensitivity in the population that we serve and to gain a better understanding of the characteristics of sensitization to CR in patients with respiratory allergy.

2. Methods and materials

2.1. Patients and study design

Our allergy clinic (Ege University Allergy Clinic) is the only public allergy clinic serving mainly middle class adult population in Izmir. The study group was constituted from 389 adult patients with respiratory allergy, who were consecutively referred to our outpatient clinic between June 2000 and June 2001. Of these patients, 370 (95%) answered the questionnaire and 354 (91%) accepted skin prick tests (SPT). After informed consent was obtained, 354 patients with confirmed diagnosis of allergic rhinitis or allergic asthma have been included in the study. The patients' ages ranged between 16 and 59 years (mean age 34.2 years). In addition to demographic data, subjects were evaluated by a standard questionnaire addressing personal and familial history of atopic disease, exposure to pets, and presence of CR at home. Asthmatic patients were also asked whether rhinitis preceded their asthma, and if so, by how many years. Asthma

severity was evaluated according to Highlights of the Expert Panel report 2 [13].

All patients underwent SPT to German CR (*Blattella germanica*, Stallergenes, Antony Cedex, France), the most common CR in Turkey [12], as well as to other indoor allergens such as house dust mite, dog dander, cat, and *Aspergillus*.

2.2. Subject selection

Subjects were included in the study if they demonstrated the following: male or non-pregnant female greater than 16 years of age, history of allergic rhinitis and/or allergic asthma for at least 12 months duration, symptomatology that was related to aeroallergen exposure, patients living in Izmir for at least the past 2 years, the ability of the subject to withhold all antihistaminic medications for at least 5 days, and physical examination consistent with allergic rhinitis and/or asthma. They were excluded if they had received antihistamines or were receiving beta-blockers, tricyclic antidepressants or chronic high dosage systemic corticosteroids.

2.3. Skin testing

SPT was performed by two nurses according to European guidelines [14], with commercially available CR allergen (*B. germanica*) and other indoor allergens, such as *Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*, dog dander, cat and *Aspergillus* (Stallergenes®, Antony Cedex, France). Histamine phosphate (10 mg/ml) and glycerinated saline were the positive and the negative controls, respectively. The mean wheal size (longest plus shortest diameter divided by two) was recorded after 15 min. The SPT was regarded as positive with a wheal size of minimum 3 mm larger than the negative control.

2.4. Analysis of data

All statistical analysis were performed using SPSS for windows 9.05 (SPSS Inc.). Data were presented as mean and standard deviation (S.D.). The relation between rhinitis and/or asthma, sensitivity to other allergens and CR sensitivity was examined using Pearson's χ^2 -test and odds ratios (OR) with 95% confidence intervals (CI) were also presented. Unpaired Student's *t*-test was used to compare mean time between rhinitis and the occurrence of asthma in CR-

sensitive and non-sensitive patients. Multivariate analysis was performed to assess the independent role of CR sensitization on the estimated time between rhinitis and asthma. P -value < 0.05 was considered significant.

3. Results

The mean age ($\pm$ S.D.) of the study group was 34.2 (10.4). Seventy per cent were females. Two hundred and thirty-nine patients (67.5%) had allergic rhinitis and the remainder 115 patients had allergic asthma. All asthmatic patients had also allergic rhinitis. Patient demographics and clinical characteristics are presented in Table 1.

One hundred and twenty-eight (36.2% of all) patients were sensitized to CR assessed by SPT. CR sensitivity was more prevalent in males than females (46.2% versus 31.9%, $P = 0.011$, OR: 1.451; 95% CI: 1.103–1.909). There was no difference in mean age between patients with and without CR sensitivity. Only one patient had isolated CR sensitivity (0.28%), whereas for all other people, the CR sensitivity was combined with at least one of the other aeroallergens according to the SPTs. Sensitization to other indoor allergens was most frequently found among CR-sensitized subjects. More than half of the CR-sensitized patients sensitized also to cat (68.8%), dog dander (61.4%), and *D pteronyssinus* (59.4%), respectively (Table 2).

Forty-six per cent of CR-sensitive patients reported that they saw CRs at least one time in their homes. On the other hand 44% of patients, who never reported CR infestation,

were nevertheless sensitive to CR ($P = 0.83$). CR infestation rate for CR non-sensitized patients was 24.2%.

Asthma prevalence was 39.1% ($n = 50$) in CR-sensitive and 28.8% ($n = 65$) in CR non-sensitive patients ($P = 0.047$, OR: 1.588; 95% CI: 1.005–2.508). Mild intermittent, mild persistent and moderate persistent asthmatics constituted 40%, 30% and 30% of the CR-sensitive patients, and 44.6%, 36.9% and 18.5% of the CR non-sensitive patients, respectively ($P = 0.278$). The mean duration in years between allergic rhinitis and the onset of asthma was shorter in CR-sensitive group (2.8 ± 3.4 years) than CR non-sensitive group (4.5 ± 5.2 years) ($P = 0.045$) (Fig. 1). However, the independent role of CR sensitization on this duration could not be confirmed by multivariate analysis. Estimated time between rhinitis and the onset of asthma as regards CR sensitization was given in Fig. 2.

4. Discussion

In our cohort, 36% of the patients with both allergic rhinitis and asthma were sensitized to CR. The prevalence of CR sensitivity in asthmatic patients reached to 43%. This rate is lower than the prevalence of the urban atopic population in the USA (50%) and the children and young adults with rhinitis and/or asthma in Brazil (79%) [2,3,15]; but it is 1.5–6 times higher than the prevalence reported from Europe [5–10]. In central Anatolia, where the climate is relatively cold and dry than our region, the prevalence of CR sensitivity among asthmatic patients ranges from 4.7% in Eskisehir to

Table 1
Patient characteristics

	CR positive ($n = 128$)		CR negative ($n = 226$)		Total ($n = 354$)
Males	49 (38.3%)		57 (25.2%)		106 (29.9%)
Females	79 (61.7%)		169 (74.8%)		248 (70.1%)
Age (years)	33.7 ± 10.6		34.5 ± 10.2		34.2 ± 10.4
Allergic rhinitis	78 (60.9%)		161 (71.2%)		239 (67.5%)
Asthma	50 (39.1%)		65 (28.8%)		115 (32.5%)
Mild intermittent	20 (40%)		29 (44.6%)		49 (42.6%)
Mild persistent	15 (30%)		24 (36.9%)		39 (33.9%)
Moderate persistent	15 (30%)		12 (18.5%)		27 (23.5%)
Severe persistent	0 (0%)		0 (0%)		0 (0%)

Data are presented as mean $\pm$ S.D.

Table 2
Number of subjects (percentage of group) with positive SPT to indoor allergens in 354 patients

Allergens	CR positive ($n = 128$)		CR negative ($n = 226$)		P -value ^a	OR; 95% CI
	n	%	n	%		
Mites ^b	79	61.7	91	40.3	<0.0001	2.392; 1.533–3.731
<i>D. farinae</i>	62	48.4	70	31	0.001	2.094; 1.339–3.273
<i>D. pteronyssi-</i>	76	59.4	83	36.7	<0.0001	2.518; 1.614–3.927
<i>nus</i>						
Dog dander	78	61.4	34	15	<0.0001	8.989; 5.395–14.978
Cat	88	68.8	69	30.5	<0.0001	5.006; 3.132–8.000
<i>Aspergillus</i>	40	31.3	51	22.6	0.078	1.560; 0.959–2.538

SPT positivity: wheal size of minimum 3 mm larger than negative control.

^a Pearson's χ^2 .

^b Mites: sensitivity to *D. farinae* and/or *D. pteronyssinus*.

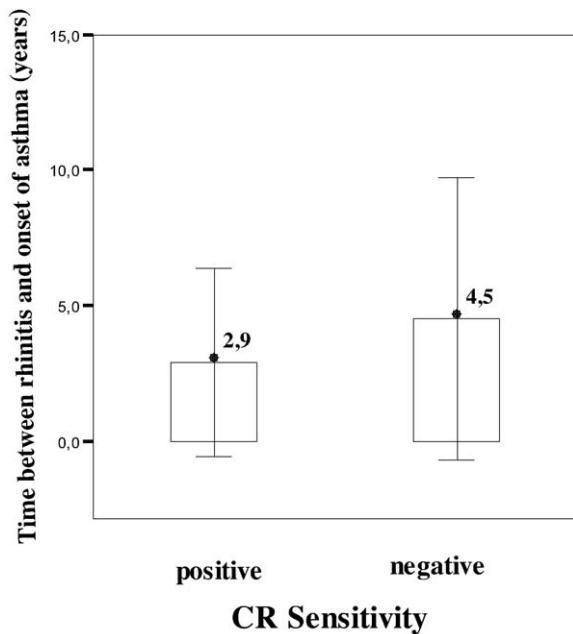
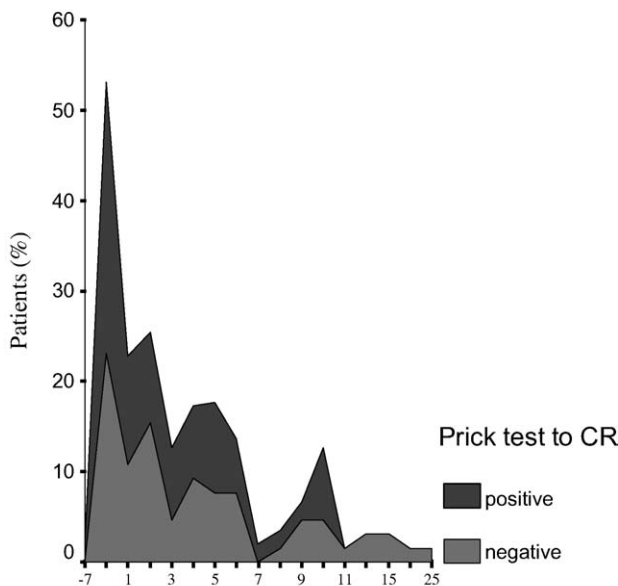


Fig. 1. The time between rhinitis and the onset of asthma in the patients who were sensitive or not to CR. In the graphic, bars show mean values and error bars show S.D. The mean time between rhinitis and the onset of asthma in CR-sensitive patients was 2.8 ± 3.4 years. This time was longer in patients who were not sensitized to CR (4.5 ± 5.2 years). If asthma would occur in an allergic individual, the presence of CR sensitivity might shorten significantly this time ($P = 0.045$).



Estimated time between rhinitis and onset of asthma (years)

Fig. 2. Area of percentage showing estimated time between rhinitis and the onset of asthma. The onset of rhinitis and asthma was synchronous in 30% of CR-sensitive patients. This rate was 23% in the CR non-sensitive group. Only one patient had asthma first, 7 years before the onset of rhinitis. This patient was CR-sensitive. For all the other patients the onset of rhinitis preceded asthma. In the first year of allergic rhinitis, asthmatic symptoms were present in 44% of CR-sensitive patients and 34% of CR non-sensitive patients.

41% in Ankara [11,12]. In these studies, the study populations were consisted from outpatient asthmatic patients referred to university clinics, and the allergen used in SPT was *B. germanica*. The prevalence reported from Ankara, may not however, reflect the true status of central Anatolia, as the study population comprised patients from both Ankara and various other regions of Turkey. The need of higher temperatures and humidity for optimal population growth [16] may at least partly explain why CR sensitization is more common in our region than central Anatolia.

Unlike the previous reports, in our study group, CR sensitivity was more prevalent in males than in females. The reason for this remained unclear.

At present, it is not clear when sensitization to CR allergen occurs and where the main exposure takes place [16]. CRs tend to cluster in hiding places and forage after dark. Therefore, CR infestation may not be apparent to the patient and patients are usually not aware of being allergic to CRs. With respect to our study, nearly half of the patients were sensitive to CR though they had never seen CR in their homes. Another explanation for high rate of sensitization of our patients despite the absence of apparent CR infestation could be previous exposure in another home or from current exposure at public places.

There is a causal relationship between CR allergy and asthma. It has been shown that CR sensitization was more common in the asthmatics presented to an emergency room than the non-asthmatics [17]. Steroid dependency is usually higher in CR-sensitive asthmatics than those of general asthmatics and these patients have longer duration of asthma [18]. In our cohort, CR-sensitive patients were more likely to have asthma compared to CR non-sensitive patients (39% versus 28%, $P < 0.05$). It is also worth to mention that although the majority of our CR-sensitive asthmatics had mild intermittent asthma (40%), moderate persistent asthma was more frequent among CR-sensitive asthmatics than CR non-sensitive patients (30% versus 18%, respectively). More excitingly, our CR-sensitized patients developed asthma earlier in life than patients not-sensitized to CR. Moreover, the mean duration between allergic rhinitis and the onset of asthma was significantly shorter in CR-sensitive group than in CR non-sensitive group. But we could not confirm the independent role of CR sensitization on the estimated time between allergic rhinitis and the onset of asthma, as the dummy variables in forward selection did not fit the model in multivariate analysis.

We also showed that sensitivity to CR allergens was more frequently associated with other indoor allergen sensitivities, especially dog, cat dander and mite sensitivity. High rates of additional mite allergy (62%) could partly be explained by the cross-reactivity between these two allergenic sources [16]. However, at present there is no evidence of cross-reactivity with CR and animal allergens. Another explanation for this co-existence might be that our patients were simultaneously exposed and became sensitized to these allergens. This co-sensitization with other indoor allergens might also

contribute to the early development of asthma and a more severe course of the disease.

In conclusion, CR allergy affects an important proportion of atopic adults in Izmir, Turkey. If asthma would occur in an allergic individual, the presence of CR sensitivity seems to shorten this time.

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