

Pet Allergy: How Important for Turkey Where There Is a Low Pet Ownership Rate

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ABSTRACT

Exposure and sensitization to allergens derived from cats/dogs have been shown to represent an important risk factor for allergic respiratory diseases. So far, there has not been any study exploring cat/dog sensitization and related factors in our geographic location. The aim of this study was to determine the sensitization to cats/dogs in a group of patients with rhinitis and/or asthma and to evaluate the relationship between current and childhood exposure and sensitivity to pets. Three hundred twelve consecutive subjects with asthma and/or rhinitis were included in the study and were asked to reply a questionnaire concerning past and current pet ownership and presence of pet-related respiratory symptoms. After performing skin-prick tests, subjects were allocated into three groups: group 1 (n = 103), subjects with nonatopic asthma; group 2 (n = 54), allergic rhinitis and/or asthma patients with pet allergy; group 3 (n = 155), allergic rhinitis and/or asthma patients without pet allergy. Pet hypersensitivity was detected in 54 of 209 atopic subjects (25.8%). There was no difference in the rates of past pet ownership among subjects with (29.6%) and without (23.8%) pet allergy. However, the ratio of current pet ownership was higher in atopic patients with pet allergy (16.6%) than in nonatopic subjects (2.9%; $p = 0.02$). The prevalence of sensitization to pets in current owners (42.8%) was higher than prevalence of sensitization in patients who never had a pet (22.6%; $p = 0.002$; odds ratio, 2.67) and who owned a pet at childhood

(28.2%; $p = 0.038$; odds ratio, 1.9). Thirteen subjects (13/54; 24%) described respiratory symptoms when exposed to cats and/or dogs. Rate of past pet ownership was similar in symptomatic and asymptomatic subjects with pet allergy (30.7% versus 29.2%; $p > 0.05$). Rate of current pet ownership was higher in symptomatic subjects than in asymptomatic subjects with pet sensitivity (38.4% versus 9.5%; $p < 0.0001$). Our data indicate that pet allergens have the potential to become an important source of indoor allergens in our population. Our findings also suggest that current pet ownership—but not childhood pet keeping—seems to be a risk for the development of sensitization to pets. (Allergy and Asthma Proc 24:137–142, 2003)

Clinical and population studies have shown that exposure and sensitization to allergens derived from furred pets represent an important risk factor for allergic respiratory diseases.^{1–3} In countries such as Sweden with high pet-owning habits like, pets were found to be the most important indoor allergen source that induces allergic respiratory diseases.³ Cats and dogs are estimated to be found in >50% of homes in western countries and up to 1/3 of these sensitized individuals live in a home with a pet.⁴ Previous studies reported that pet allergy was related to exposure to pets during an early childhood period.^{3,5} However, contradictory data appeared from several recent population studies in which it is hypothesized that childhood exposure to pets might modulate immunologic mechanisms and reduce sensitization to cats in adulthood.^{1,6–8}

As far as we know pet ownership is not so common in the inner cities of our country. A limited number of studies reported that 5–14% of patients with asthma had pets in their homes.⁹ So far, there has not been any study exploring cat/dog sensitization and related factors in our geographic location. The aim of this study was to investigate pet ownership habits and sensitization to cats/dogs in a group of

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patients with rhinitis and/or asthma in Ankara, Turkey. Second, we aimed to determine the relationship between current and childhood exposure to cat/dog sensitization and the development of respiratory symptoms to pets.

MATERIALS AND METHODS

Subjects

Three hundred and twelve patients (female patients/male patients [F/M], 197/115; mean age, 31.02 ± 9.38 years) who attended our outpatient clinic located in Ankara, Turkey, between September 1999 and June 2000 and were diagnosed with asthma and/or rhinitis were included in the study. The diagnosis of asthma was made according to International Asthma Guidelines by clinical history and laboratory documentation of reversible airway obstruction.¹⁰ The diagnosis of rhinitis was based on symptoms of recurrent episodes of sneezing, nasal itching, secretion, and/or obstruction, regardless of common cold.¹¹ The study population comprised patients from both Ankara and various other regions of Turkey who were referred to our allergy department. Participants included were residents of the inner cities.

Study Protocol

In the evaluation of past and current pet ownership and presence of pet-related respiratory symptoms, a face-to-face interview was conducted by a physician. Past pet ownership consisted of the presence of a pet at home in the first 5 years of life. All subjects underwent skin-prick test (SPT) analysis for determination of atopic status.

Allergy Skin Testing

SPTs were performed with a standardized panel including *Dermatophagoides pteronyssinus*, *Dermatophagoides farinae*, grass, tree, weed pollens, cat, dog, cockroach, *Alternaria*, and *Cladosporium* antigens (Stallergenes, Paris, France). The puncture method was used in SPTs and a mean wheal diameter of ≥ 3 mm of control solution was considered positive. Histamine dihydrochloride (10 mg/mL) and glycerol diluent were used as positive and negative controls, respectively.

Measurement of Specific Immunoglobulin E

Specific immunoglobulin E (sIgE) was measured by the Pharmacia CAP system according to the manufacturer's instructions (Pharmacia, Uppsala, Sweden). Results equal to or greater than class II (IgE level ≥ 0.7 kU/L) were considered positive.

Determination of sensitivity to cats/dogs was made with the evaluation of both SPTs and sIgE results. Subjects with a positive SPT to cats and/or dogs or with a presence of sIgE levels equal or greater than class II to cats and/or dogs were considered "pet sensitive."

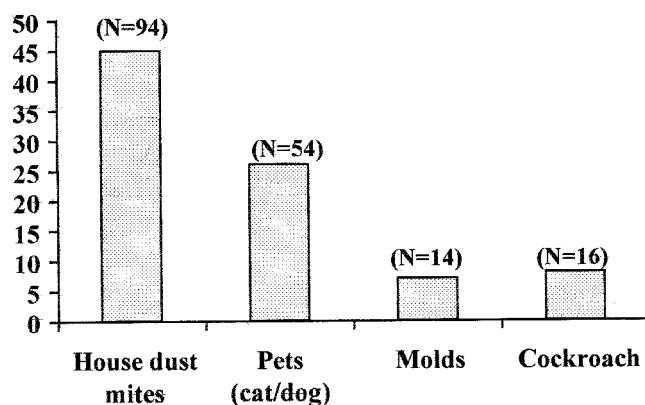


Figure 1. Distribution of other indoor aeroallergen sensitivity in subjects with allergies (% of the subjects).

After performing SPTs, subjects were classified into three groups: Group 1. Patients with nonatopic asthma ($n = 103$; F/M, 60/43; mean age, 31.22 ± 9.4 years) Group 2. Patients with allergic rhinitis and/or asthma with pet allergy ($n = 54$; F/M, 32/22; mean age, 29.22 ± 9.4 years) Group 3. Patients with allergic rhinitis and/or asthma without pet allergy ($n = 155$; F/M, 105/50; mean age, 33.68 ± 9.9 years)

Statistical Methods

Numeric values were expressed as mean $\pm$ SD and intergroup calculations were performed by Student's *t*-test for two groups and one-way analysis of variance (ANOVA) for comparison of more than two groups. Nominal values were expressed as n (%) with univariate intergroup comparisons performed by chi-square test. All directional *p* values were two-tailed and significance was assigned to values lower than 0.05. SPSS v6.0 for Windows (SPSS, Chicago, IL) was used to analyze the data.

RESULTS

Pet Hypersensitivity

Pet hypersensitivity was detected in 54 of 209 atopic subjects (25.8%) in the second order with respect to sensitization to indoor allergens. Among atopic subjects, the distribution of the sensitivity to indoor aeroallergens is shown in Fig. 1. There was no difference in age and sex distribution among groups with and without pet sensitivity ($p > 0.05$).

Thirty-eight subjects were sensitive to cats (38/209; 18.8%) and 31 subjects (31/209; 14.87%) were sensitive to dogs regardless of underlying asthma or rhinitis. Regarding the underlying disorders, the distribution of cat and dog sensitivity in subjects with asthma and rhinitis are shown in Table I. Despite the finding of no statistical significance, subjects with isolated allergic rhinitis had slightly higher sensitivity rates to pets ($p > 0.05$).

Table I

Sensitization Rates to Cats and Dogs in the Atopic Group and in Isolated Asthma and Isolated Rhinitis

Variable	Cat Positive (n)	Dog Positive (n)	p
Atopic group (n = 209)	38 (18.8%)	29 (13.87%)	NS
Patients with isolated allergic asthma (n = 55)	7 (12.7%)	7 (12.7%)	NS
Patients with isolated allergic rhinitis (n = 96)	19 (19.7%)	15 (15.6%)	NS

NS = not significant.

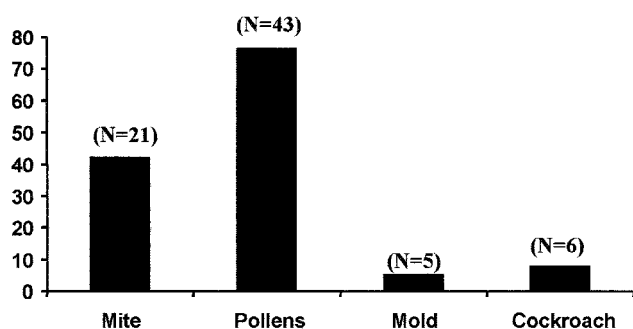


Figure 2. Distribution of other aeroallergen sensitivity in subjects who are allergic to pets (% of the subjects).

Most pet-sensitive patients (47/54, 87%) had other aeroallergen sensitivities (Fig. 2). Fourteen subjects (14/54, 25.9%) were sensitized to both cats and dogs. Among pet-sensitive patients, isolated cat and dog sensitization rates were 9.25% (5/54) and 3.7% (2/54), respectively.

Determination of Pet Exposure and Ownership

Distribution of past and current pet ownership in study groups are presented in Table II. In all groups (including nonatopic group 1) current pet ownership rates were lower than past ownership ratios (group 1, $p < 0.0001$; group 2, $p = 0.04$; group 3, $p = 0.0006$). There was no difference in the rates of past pet ownership among the three groups ($p > 0.05$). However, the ratio of current pet ownership was higher in atopic patients with pet allergy than in nonatopic subjects ($p = 0.02$). The prevalence of sensitization to pets in current owners (42.8%) was higher than those who never had a pet (22.6%; $p = 0.002$; odds ratio [OR], 2.67) and who owned a pet in childhood (28.2%; $p = 0.038$; OR, 1.9; Fig. 3). Twenty-five percent of patients with dog sensitivity and 36.8% of patients with sensitivity to cats had never lived around a pet.

Relationship of Symptoms with Pet Exposure

A total of 13 subjects (13/54; 24%) described respiratory symptoms when exposed to cats and/or dogs. Among cat-sensitive patients, 28.9% (11/38) were aware of symp-

toms when exposed to cats (Fig. 4). The rate of patients with positive symptoms on exposure to dogs was 25.85% (8/31) among dog-sensitive subjects. Six subjects (6/54; 11.1%) were symptomatic to both cats and dogs. The relationship of symptoms with past and current pet ownership is presented in Table III. Among past pet owners there was no difference in the rates of symptomatic and asymptomatic subjects (30.7% versus 29.2%; $p > 0.05$); however, the rate of current pet ownership was higher in symptomatic subjects than in asymptomatic subjects with pet sensitivity (38.4% versus 9.5%; $p < 0.0001$; OR, 6.1 [2.79–13.72]).

DISCUSSION

Exposure and sensitization to pet allergens have been shown to be an important risk factor for the development of respiratory allergic diseases.^{1–3} Pet sensitivity has been suggested to be influenced by pet ownership habits of populations and has been reported to be high in countries with high rates of pets in homes.³ It was our belief that pet ownership rates were not as high as those reported from western populations in our region. As expected, regardless of their atopic status, we found that 11.2% of patients with asthma and/or rhinitis were currently keeping pets in their homes in accordance with previous data from our country.⁹ It should be noted that the study group consisted of subjects with asthma and rhinitis who possibly had been advised by their physicians not to keep pets at home, but this is still a lower rate when compared with other western populations. However, it was striking in this study that almost one-quarter of atopic subjects were sensitized to cats/dogs. These results suggest that although our patients with asthma and/or rhinitis were less likely to keep pets in their homes, a significant group was sensitized to cats/dogs.

It has been suggested that exposure to pet antigens during early life may increase the risk for the development of subsequent sensitization in adulthood.^{3,5} However, in our study, childhood exposure to pets was similar in all groups with and without pet sensitivity and was not related to sensitization to pets in adulthood. There are conflicting data on early exposure to pets and further development of sensitization. Despite documentation of an increase in pet sensitization in the presence of early exposure to pets during early childhood, recently high dose exposure to cat allergens during infancy has been shown to have a protective effect on later allergy development.^{6,7} In their recent study Platts-Mills and colleagues showed that exposure to high amounts of cat allergen was associated with decreased sensitization but a higher prevalence of IgG antibody to Fel d 1. The authors concluded that exposure to high amounts of cat allergen could produce a modified Th2 response, which can be regarded as a form of tolerance.¹² Although a protective effect was not shown in the current study, our findings might support that childhood exposure comprised no risk for subsequent development of pet sensitivity.

On the other hand, current owners were the ones who had the highest rate of sensitization to cats and dogs in this

Table II

Demographic Characteristics and Childhood and Current Pet Ownership of the Study Groups

	Nonatopic Patients with Asthma (<i>n</i> = 103)	Atopic Patients with Pet Allergy (<i>n</i> = 54)	Atopic Patients without Pet Allergy (<i>n</i> = 155)
Past pet ownership	25 (24.2%)	16 (29.6%)	37 (23.8%)
Current pet ownership	13 (2.9%)	9 (16.6%)*	13 (8.3%)

**p* = 0.02, significantly higher than nonatopic patients with asthma (OR, 6.67 [1.87–23.39]).

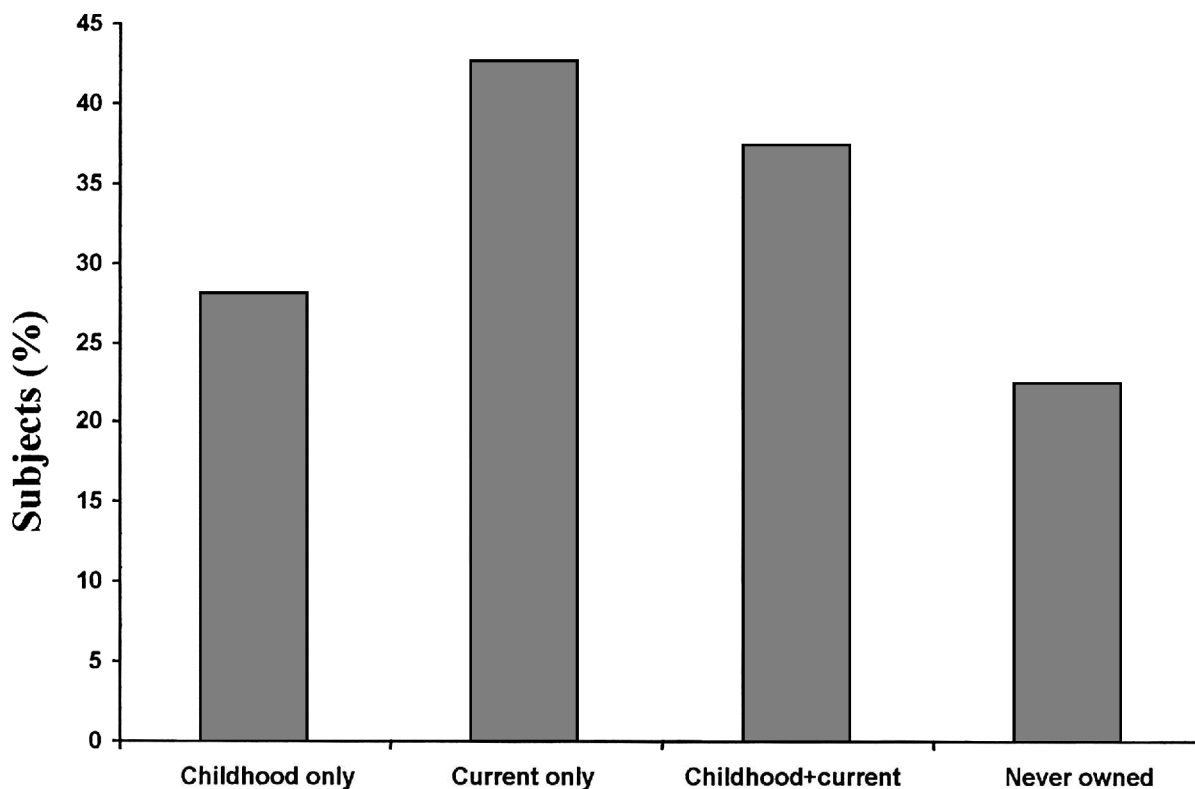


Figure 3. Relation between pet ownership status and rate of sensitization to pets (% of the subjects).

study. The association of childhood and current exposure to cats and sensitization was analyzed in the framework of the European Community Respiratory Health Survey.¹ According to this trial, childhood exposure to pets was associated with lower sensitization in adulthood and current cat ownership was a significant risk for the development of sensitivity to cats. In accordance with the European Community Respiratory Health Survey report, the prevalence of sensitization to pets in those who owned a pet at present was higher than those who never had a pet and who owned a pet in childhood in our study. According to our findings, current pet ownership—but not childhood pet ownership—seems to be a risk for sensitization to pets.

Even though current pet ownership seems to be related to sensitization to cats/dogs, a significant percentage of patients with pet sensitization had a history of never living with a pet around in accordance with previous studies.^{13–15}

Cat allergen is made up of very small particles that may be airborne for long periods and could be carried on the clothing of cat owners to public places.^{16–20} That is why pet allergen exposure is not limited to pet owners and significant levels of cat antigens can be detected in public places and in homes where cats have never been. Thus, it is not unusual to find subjects sensitive to pets who have never lived with a pet.^{13–15} In our study, this finding explains the high prevalence of subjects sensitized to pets who never owned a cat or a dog. High amounts of exposure in public places are expected in communities where many families have pets. The interesting point in our study is that although pet ownership is not very common in our population, there are many pet-sensitive subjects who possibly are exposed to the allergen in public places. Such exposure may be found in other people's houses that have pets as well as in classrooms and workplaces. So far, the pet allergen concentra-

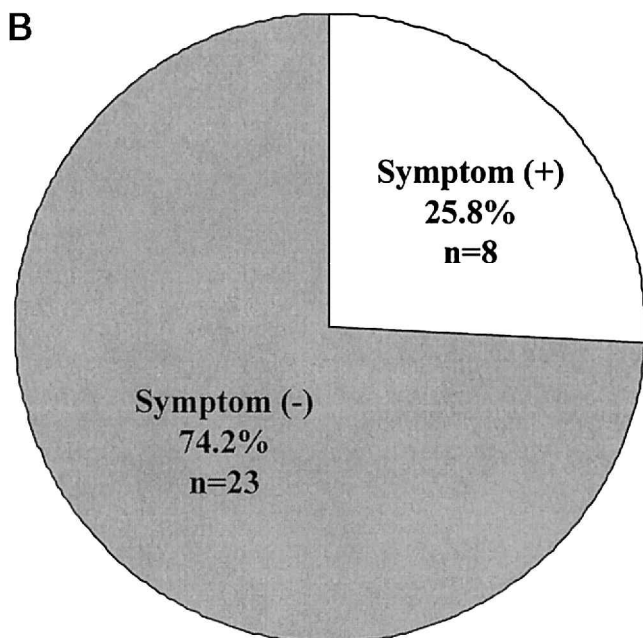
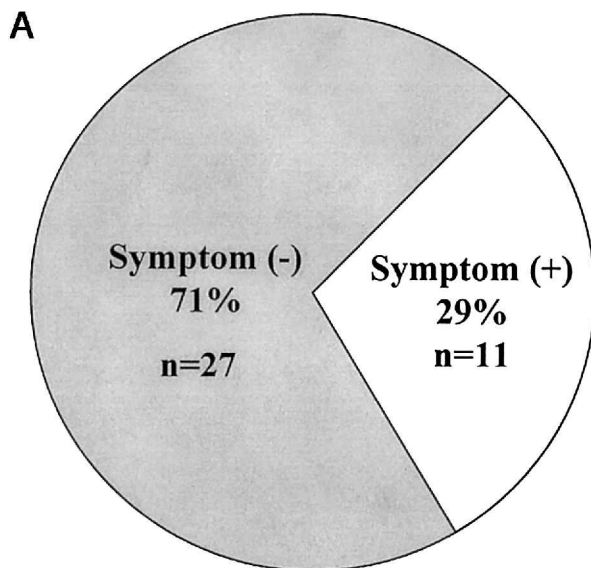


Figure 4. Relation of symptoms and exposure to pets in subjects who are allergic to pets. (A) Subjects who are allergic to cats; (B) Subjects who are allergic to dogs.

tions have not been explored in our city. According to the results of this study, we may conclude that despite the lower frequency of pet owning, pet allergen also is a community allergen for our society.

It is a well-known feature for pet-sensitive subjects to be symptomatic in the presence of a pet.²¹ However, in this

Table III

Relationship of Symptoms and Past and Current Pet Ownerships in Subjects with Cat and Dog Allergy

Pet-Sensitive Subjects	Past Ownership	Current Ownership
Symptomatic (<i>n</i> = 13)	4 (30.7%)	5 (38.4%)*
Asymptomatic (<i>n</i> = 41)	12 (29.2%)	4 (9.5%)

**p* < 0.0001, significantly higher than asymptomatic pet-sensitive subjects (OR, 6.19 [2.79–13.72]).

study, a low percentage of subjects who were allergic to pets were aware of the symptoms on exposure to pets. Among 54 subjects with cat sensitivity, only 13 (5 subjects currently owned a pet) subjects described symptoms when exposed to pets. The remaining 41 subjects, the majority of whom currently owned a pet, did not describe any symptoms when exposed to a pet. However, it is uncertain whether or not these subjects are asymptomatic because a majority of them did not currently own pets. A recent study showed that repeated exposure to low doses of pet allergen may increase bronchial hyperresponsiveness (a significant decrease in provocative dose₂₀ methacholine from 263 to 126 µg) even in the absence of asthmatic symptoms.²² In accordance with this finding, we may hypothesize that exposure of those subjects with no pet at home to repeated low doses of allergen in public places may not provoke symptoms but may be enough to induce inflammation.

Evaluating the symptoms based on past/current ownership of pets, we observed that past ownership habits were similar in pet-sensitive subjects with and without symptoms when exposed to pets. On the other hand, current pet ownership seemed to influence development of symptoms in subjects who were allergic to pets. However, despite having a pet at home, four subjects with pet allergy did not describe exposure-related symptoms. There is little information about the clinical relevance of allergen levels. Some authors suggest that repeated low-dose allergen exposure may increase bronchial hyperreactivity without inducing symptoms,²² and others report that symptoms may occur even in patients exposed to low cat allergen levels in homes without cats.²³ Therefore, we propose that measurement of local allergen levels could provide a better understanding for symptom-exposure relationships for our subjects with pet sensitivity.

In conclusion, our data indicate that despite the low rate of pet ownership in the region, pet allergens acting as a “community” allergen have the potential to become an important source of indoor allergens in our population. Our findings also suggest that current pet ownership seems to be a risk for sensitization to pets. Although a protective effect was not shown in this study, childhood exposure created no risk for subsequent development of pet sensitivity. Further trials assessing pet allergen levels in different public places

are required for our region to understand the relationship of sensitization and symptom development with exposure and to take preventive measures in this particular group of subjects.

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