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Original Article

Prevalence of Aeroallergens and Food Allergens in Allergic Patients in Tehran, Iran

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Background and Aims: Identification of different allergens is a major challenge in allergic diseases. Avoiding these allergens is known as one of the best types of treatment. The aim of this study is to determine the prevalence of aeroallergens and food allergens in patients with allergy by Skin Prick Test.

Materials and Methods: A cross-sectional study was conducted on 255 patients with allergic diseases who had referred to the Khorshid Allergy and Immunology Clinic. Skin Prick Test was performed using 82 allergen extracts to determine the patients' sensitivity to food and aeroallergens.

Results: One hundred percent of the patients were sensitive to at least one allergen. Allergy to food allergens and aeroallergens was 49% and 51 %, respectively. Most sensitivity to food allergens included hazelnut (26.27%), bananas (21.96%), egg yolk (21.56%) and wheat (20.39%). Among the aeroallergens, grass with a frequency of 87% and fungi with a frequency of 34% had the highest and lowest frequencies.

Conclusions: Depending on the nutrition, cultural habits, environmental conditions, and life style, prevalence of the allergens in each area may be different. Therefore, early identification and avoidance from these allergens can be suggested.

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Introduction

During the past two decades, allergic diseases such as atopic dermatitis, allergic rhinitis and asthma have been the most common non-communicable disease worldwide [1, 2]. Different substances with different sources (namely, aeroallergens, food allergens, contact allergens and pharmaceutical allergens) can cause clinical manifestations of allergy (type 1 hypersensitivity disease) such as skin reactions and other allergic symptoms [3]. Although the prevalence of allergic diseases has been assumed to be generally, but not always, lower in the developing countries, recent reports have demonstrated a swift rising trend, mainly due to air pollution and industrial emissions in these countries including Iran [4]. Accordingly, there are quite different but totally increasing reports on the prevalence of allergic diseases in Iran (ranging from 1% to 40%, according to different cities and areas) [1, 5, 6]. Tehran, the capital, is known to be the most air-polluted and over-crowded city in the country. Despite the high prevalence of allergy throughout the country including Tehran, there are few reports indicating the frequency and also the pattern of different causative allergens. Therefore, identification and characterization of aero- and food allergens is critical for appropriate preventive measures. Due to non-invasiveness, quick response, and providing definite confirmation, Skin Prick Test is used for determination of allergens in different allergic diseases via the specific IgE antibodies [7, 8]. The aim of this study is to determine the prevalence of aeroallergens and food allergens in patients with allergy by Skin Prick Test in Tehran, Iran.

Materials and Methods

In a cross-sectional study, conducted from April 2017 to April 2018, all allergic patients who had referred to the Khorshid Allergy and Immunology Clinic in Tehran were included in the study. The study was approved by the Ethics Committee of Baqiyatallah University of Medical Sciences, Tehran, Iran. Diagnosis of the allergy was performed according to the clinical symptoms by an allergy and immunology specialist.

People, who took antihistamine and Cortico-steroids, or any interfering symptoms, were excluded. The patients referred to the clinic were from different areas of Tehran, the capital, with various socio-economic conditions. Then, the patients underwent Skin Prick Test for determination their pattern of common allergens by means of the Skin Prick Test kit containing 47 most common food allergens as well as 35 most common aeroallergens (Greener kit, USA). The allergens included in the kit are listed in Tables 1 and 2. Histamine hydrochloride and physiological saline were used as the positive and negative controls, respectively. To run the test, we put the extract of allergens in the front of the forearm and at the distance of 2 cm from each other. Then with lance scratching (without bleeding) was made at the allergen site. After 20 minutes, the result of the test was

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determined and compared with the control. If there was redness and bulge with a size greater than 3 millimeter in terms of negative control, positive skin test was taken.

Statistical Analysis

The statistical analysis were performed using SPSS (version 20) as well as descriptive statistics and the chi-squared test. A $p<0.05$ was considered statistically significant.

Results

In this study, of all the people who had referred to the clinic during one year, 255 patients with allergy type one were identified. Totally, 134 women (52.5%) and 121 men (47.5%) were studied. They were 1 years to 61 years old (mean±SD: 22.47±16.36 years). In order to closely check the prevalence of food allergens and aeroallergens and also determine the possible association between the pattern of allergens and age, people were divided in three age groups: 1-6 years (pre-school), 7-18 years (school age) and older than 18 years old. The age distribution of patients suffering from allergies type 1 is displayed in Table 3. Generally, among food allergens, fruits with 25 percent and vegetables and greens with 4 percent had respectively the highest and lowest frequencies in the allergic patients. Most sensitivity to food allergens included hazelnut (26.2%), bananas (21.9%), egg yolk (21.5%), and wheat (20.3%). Also, sensitivity to apricot and beans was observed among none of the patients and the skin prick test was negative for these two allergens. Among aeroallergens, grass with a frequency of 31% and fungi with a frequency of 12% induced in the highest and the lowest prevalence (Fig. 1). In addition, among these allergens, the most sensitive one was attributed to dermatophagoides farina mite with 25.88 percent, Timothy grass with 17.64 percent and sycamore with 17.64 percent. All the patients were sensitive to at least to one of the aeroallergens. Negative test was not observed in none of patents. In separate age groups, the prevalence of aeroallergens and food allergens were investigated (Tables 4 and 5). On this basis, in those of 1 to 6 years old, frequency of grasses and mites were reported equal (21.21%) but fungi (16.66%) were as. On the other hand, in two other age groups, the prevalence of grasses and trees were more than other aeroallergens (Table 4). On the prevalence of food allergens among different age groups, the results of this study showed that in children age groups (1-6 years) egg with 36.36 % had the most frequency and vegetables and greens with 7.57 % had the least frequency. In this age group, nuts and fruit with 25.75 percentages were in the second place, after eggs. In other age groups, nuts were observed as the most abundant. Also similar to children (1-6 years), vegetables and greens had the lowest share in allergenicity (Table 5). As can be seen in figure 2, in the children group (1-6 years) the prevalence of food allergens were more than aeroallergens. In the age group 7 to 18 years, with a little difference of about 5 percent, both food allergens and aeroallergens had the same proportions in causing allergy among patients. Aeroallergens had a greater role in sensitivity in 18 years old adults and older patients.

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Table 1. Prevalence (%) of food allergens in all 255 allergic patients*

Fruits	Grain/ cereal	Vegetables/ greens	Meets	Spices	Nuts	Egg
Banana (21.96)	Wheat (flour) (20.39)	Tomato (5.88)	Fish Tuna (15.68)	Cacao (8.62)	Hazelnut (26.27)	Egg (yolk) (21.56)
Kiwi (16.07)	Soya (18.43)	Garlic (1.56)	Beef (15.29)	Pepper (7.05)	Peanut (25.09)	Egg (white) (16.47)
Watermelon (15.68)	Rye (Flour) (3.13)	Potato (1.56)	Fish mix (14.50)	Chocolate (3.13)	Walnut (19.21)	Egg whole (9.01)
Cantaloupe (14.09)	Barly (2.74)	Spinach (1.56)	Shrimp (12.15)	Cinnamon (1.56)	Almond (15.68)	
Orange (13.72)	Rice (1.56)	Pepper green (1.17)	Hen meat (9.41)	Curry (0.78)		
Grape (7.84)	Green pea (0.39)	Onion (1.17)	Lamb (3.92)	Ginger (0.78)		
Strawberry (3.92)	Beans (0)	Celery (0.78)		Coffee (0.39)		
Mango (1.96)						
Apple (1.17)						
Peach (0.39)						
Pineapple (0.39)						
Apricot (0)						

*A person may be sensitive to more than one food allergen simultaneously, so the percentage of each allergen is independently calculated from 255.

Table 2. Prevalence (%) of aeroallergens in patient with allergy (255 patient)*

Trees	Grasses	Animal Dander	Fungi/ Molds	Mites
Sycamore (17.64)	Timothy (24.70)	Cat fur (hair) (10.98)	Alternalria Alternate (14.11)	Mite D.F (25.88)
Elm (12.54)	Bermuda (21.56)	Cockroach Mix (10.58)	Aspergillums Mix (10.19)	Mite D.P (21.56)
Beech (12.54)	Rough pigweed (16.07)	Dog hair (10.19)	Cladosporium (5.49)	
Cypress (10.19)	Chenopodiaceae (14.9)	Mouse epithelial (5.09)	Yeast mix (2.74)	
Pine (7.54)	Dandelion (2.74)	Feather mixture (1.96)	Penicillium mix (1.56)	
Alder (7.54)	Oat (1.96)	Horse (0.78)		
Birch (2.74)	Plantain (1.96)	Mosquito (0.39)		
Acacia (2.74)	Composites (1.96)	Cattle epithelial (0.39)		
Willow (1.17)	Sun flower (1.17)			
Poplar pulpier (1.17)				

*A person may be sensitive to more than one aeroallergen simultaneously, so the percentage of each allergen is independently calculated from 255.

Table 3. Age distribution of patient

Age groups (Years)	N (%)
1-6	66 (25.88)
7-18	51 (20.00)
>18	138 (54.12)
Total	255 (100)

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Table 4. Prevalence of aeroallergens according to the age groups

Age (Yrs)	Mites	Fungi/ Molds	Animal Dander	Grasses	Trees
1-6	14 (21.21)*	11 (16.66)	7 (10.60)	14 (21.21)	10 (15.15)
7-18	12 (23.52)	12 (23.52)	11 (21.56)	21 (41.17)	26 (50.98)
>18	53 (38.40)	39 (28.26)	46 (33.33)	82 (59.42)	72 (52.17)

*N (%)

Table 5. Prevalence of food allergens in patient with allergy in different groups

Age (Yrs)	Egg	Meets	Grain/ cereal	Nuts	Fruits	Vegetables/ greens	Spices
1-6	24 (36.36)*	15 (22.72)	12 (18.18)	17 (25.75)	17 (25.75)	5 (7.57)	13 (19.69)
7-18	21 (41.17)	16 (31.37)	19 (37.25)	24 (47.05)	20 (39.21)	4 (7.84)	4 (7.84)
>18	34 (24.63)	57 (41.30)	49 (35.50)	58 (42.02)	59 (42.75)	17 (12.31)	19 (13.76)

*N (%)

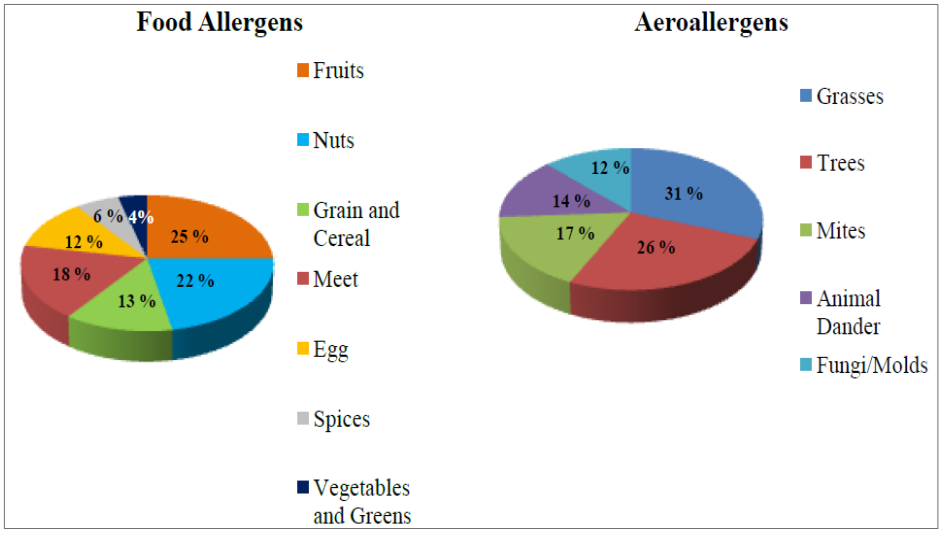

Fig. 1. Frequency of aeroallergens and food allergens among allergic patients (N= 255)

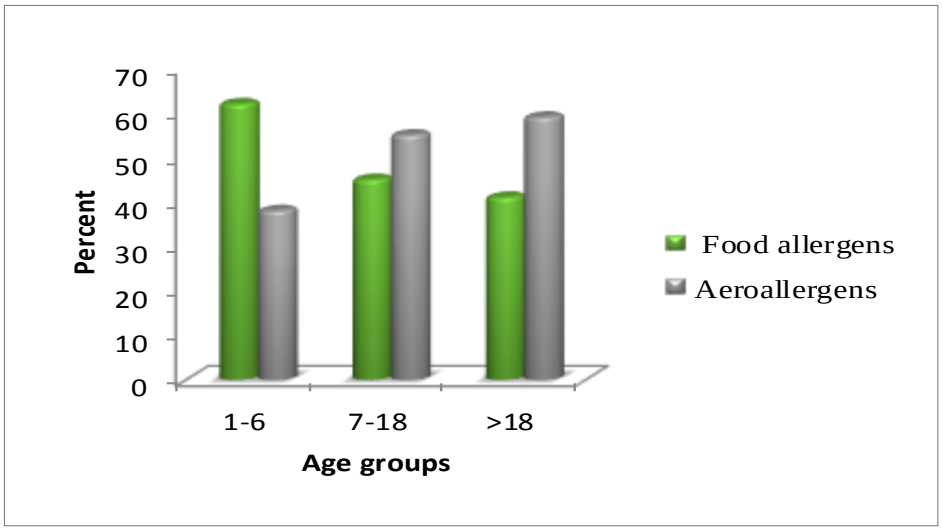

Fig. 2. The prevalence of both food allergens and aeroallergens in per age groups

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Discussion

Recent studies show that allergic diseases are highly increasing in the Middle East region including Iran [9, 10]. In the present study, to determine the prevalence of food and aeroallergens in Tehran, 82 Skin Prick Test were examined on 255 allergic patients, all known to have at least one allergic disease (data not shown). The results revealed that 100% of the patients had at least one positive Skin Prick Test result. Many studies have been conducted worldwide showing a high prevalence of positive skin prick tests to common aeroallergens in the general population. In Europe, the Global Allergy and Asthma European Network survey indicated the prevalence variation from 31.4 to 52.9 % [10] while in the United States, a similar trend was observed in 2 national surveys, with almost half of the population aged 6 years and over having at least one positive skin prick test to common allergens [7, 11-13]. Another study in Vietnam found that one-third of the population was sensitized to common allergens. In Cameroon, a recent study identified that 32 % of a population of individuals with no allergic symptoms had one or more positive skin prick test to common aeroallergens [14]. Comparing to our study, the results of the previous studies demonstrated a range of sensitivity from 50 to 80 percent to at least one allergen [1, 15-17]. Varying prevalence in different studies may result from differences in the number and availability of studied allergens or differences in the type and severity of underlying diseases in the allergic patients. Many studies have reported that food allergies are very common in children, and up to 30 to 40 percent of children with moderate to severe atopic dermatitis are suffering from food allergies [18, 19]. This highlights the importance of identifying common food allergens in children. Here, the highest sensitivity to food allergens was found to include nuts, hazelnut (26.27 %), bananas (21.96 %), eggs (21.56 %), wheat (20.39 %), and milk (17.64 %), respectively. But, none of the patients were sensitive to apricot and beans which resulted in negative Skin Prick Test. Several studies on the frequency of food allergens in different areas have shown that cow's milk, tomato, egg, and nuts are the most frequent food allergens [20-22]. Differences in dietary habits, age and race of the patients can produce different prevalence of food allergens in various studies. In all age groups, the lowest prevalence was related to vegetables and greens. For better understanding, the subjects were divided into three age groups. The results showed that the most prevalent allergy was seen for the egg in the children group (under 6 years old), and the nuts and fruits took the second place. For the age group older than 6 years, nuts including hazelnuts, peanuts, walnuts, and almonds were the most frequent. Chen and his colleagues conducted a study on 1687 children less than two years old and reported that sensitivity to egg, milk, shrimp, and fish were the most

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prevalent [23]. Nabavi et al. showed that the prevalence of peanuts, spices, soy, and walnuts are very high in allergic patients. Similar to the present study, they reported that sensitivity to eggs was more frequent in the children less than 5 years compared with the children older than 5 years [24]. In the current study, 47 common food allergens were classified in eight food groups including fruit, vegetables and greens, nuts, egg, spices, grain and cereal. On this basis, the fruits group had the highest percentage (98%) and the vegetables and greens group leveled the lowest percentage (13.61%) among the patients. Classification of food groups can help physicians to identify the allergenic food. In addition, prescribing a diet following an incorrect diagnosis can cause nutritional problems and may result in negative effects on a patient's mental health. For this reason, removal of a foodstuff should be accomplished after a careful evaluation of it [18]. In addition to food allergens, aeroallergens are the other important factors in the development and exacerbation of respiratory allergic diseases. In this study, 35 common aeroallergens in 5 groups were studied and the results of which indicated that pollen such as grass and trees (57%) and mites (17%) but the highest prevalence and animal dander and fungi were at the lowest. In many studies from different regions, the most common aeroallergens have reported to be the pollens [25]. The difference in the frequency of reported allergens may result from different seasons of the studies and also the vegetation of their regions. The results of this study showed that in the pre-school age group, the frequency of mites and fungi were higher but with increasing age, the frequency of grasses and tree became more prevalent. Because childeren under 6 years are not often working, it is expected that indoor allergens including fungi and mites account for the larger portion of allergy in this age group. A study in Turkey on 161 children with allergies showed that sensitivity to mites and fungi were most prevalent. It follows that avoiding this category of the aeroallergens may result in a significant impact on the development of asthma in adulthood [26]. Here we found that with increasing age from childhood to middle age, although statistically not significant, the food and aeroallergens will gradually play a more important role in the allergic patients.

Conclusion

According to high prevalence of allergy in Iran and especially in industrialized cities such as Tehran, identifying the distribution and abundance of allergens in other regions could be so helpful in controlling allergic diseases. Early identification of common aeroallergens and food allergens as well as shunning them especially in childhood may lead to decrease of the frequency of allergic diseases, appropriate control and prevention of the exacerbation of allergic diseases, and as a result, reduction of the cost of health care system.

Conflict of Interest

The authors have no financial conflict of interest.

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