



Ann Med Res

Current issue list available at AnnMedRes

Annals of Medical Research

journal page: www.annalsmedres.org

Skin prick test results of allergic rhinitis and asthma patients in Kırıkkale: 5-year analysis

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ARTICLE INFO

Keywords:

Rhinitis
Allergic
Asthma
Allergens
Skin tests

Received: Aug 07, 2023

Accepted: Oct 18, 2023

Available Online: 25.10.2023

DOI:

[10.5455/annalsmedres.2023.08.179](https://doi.org/10.5455/annalsmedres.2023.08.179)

Abstract

Aim: It is aimed to contribute to preventive measures by determining the distribution of allergens in patients with allergic rhinitis and asthma in Kırıkkale and to contribute to the creation of the allergy map of our country.

Materials and Methods: The files of patients who underwent skin prick test at Kırıkkale Yüksek İhtisas Hospital between 2018 and 2022 were retrospectively analyzed.

Results: A total of 6,056 people, 4,464 (73.7%) women and 1,592 (26.3%) men, were applied skin prick test within 5 years. Of the test results, 3,454 (57%) were positive and 2,602 (43%) were negative. While 622 (10.3%) of 3,454 positive patients were sensitive to a single allergen, 2,832 (46.8%) were sensitive to multiple allergens. The most common positivity rate in the skin prick test is *Blattella germanica* (cockroach) (24.2%), *Dermatophagoides (D.) Farinae* (house dust mite) (21.9%), herb mixture (plant grass, wormwood, buckwheat, sticky grass) (weed pollen) (19%) and *D. Pteronyssinus* (house dust mite) (18.4%) was found. When the pollens were examined collectively rather than individually (test 5 willow pollen 10.7%, test 6 cereal pollen 17.8%, test 7 poplar pollen 14.0%), it was determined as 42.5%. House dust mites *D. Farinae* and *D. Pteronyssinus* together were determined to be 40.3% allergen positive.

Conclusion: It was determined that the most common allergens in Kırıkkale province were cockroaches, pollen and house dust mites.



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Introduction

An allergy is a hypersensitive reaction of the body's immune system to an unknown substance. The immune system's response to normally harmless substances in the environment is the production of Ig E by basophils and mast cells. Among the four hypersensitivity reactions, allergy is categorized as type I hypersensitivity [1,2].

Allergic rhinitis and asthma are diseases that show type 1 hypersensitivity reaction due to environmental factors in patients with a genetic history. Allergens such as house dust mites and pollen are involved in the pathophysiology of respiratory diseases such as allergic rhinitis and bronchial asthma [3].

In the diagnosis of allergic diseases, skin prick test for allergens and serum specific Ig E levels are as important as family history, anamnesis and physical examination [4]. The skin prick test is a method used more frequently in

clinical practice because it is both cheaper and easier to perform [5].

Knowing what the patient is sensitive to is important to avoid it and to reduce the allergic burden. While the vegetation changes from region to region due to geographical differences, this change may also affect the causes of sensitivity in allergic diseases. Therefore, identification of site-specific allergens is important. In our study, we aimed to contribute to the creation of the allergy map of our country by identifying the responsible allergens in allergic patients in Kırıkkale province.

Materials and Methods

The files of patients who underwent skin prick test at Kırıkkale Yüksek İhtisas Hospital between 2018 and 2022 were retrospectively scanned. Demographic characteristics (age, gender) and skin prick test results of the patients were recorded. Patients whose skin prick test results could not be reached were excluded from the study.

Skin prick test was applied to patients who did not use immunosuppressive drugs, did not have active infection and were not pregnant. In patients using antihistamine,

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antidepressant, montelukast and corticosteroid drugs that may affect the test result, an appropriate time was waited for the test after the drug was discontinued. Written informed consent was obtained from the patients before the procedure. A nurse trained in skin prick testing performed and evaluated the skin tests. The same nurse performed all the tests. Before applying the test, both forearm areas were wiped with alcohol without applying pressure. For the skin prick test, 13 standard allergen solutions from Lopharma brand, physiological saline as negative control and histamine solution as positive control were used. The test solutions were placed on the inner face skin of the forearm and the skin was scratched with different scalpels and the reaction was evaluated after 15-20 minutes. A skin induration of 3 mm or more compared to the negative control was considered positive. The allergen extracts used in the tests are given in Table 1.

The study protocol was approved by the Kırıkkale University Faculty of Medicine Ethics Committee, decision number: 2023.03.03, date: 19.04.2023. This study was performed as a retrospective file review, therefore, written informed consent was not obtained. The study was performed in accordance with the Declaration of Helsinki guidelines.

Statistical analysis

Data were entered into Microsoft Excel (Microsoft Corp., Redmond, WA, USA). Statistical analysis was performed using IBM SPSS Statistics for Windows v.25.0 (IBM Corp., Armonk, NY, USA). In the presentation of descriptive data, number, percentage (%), mean and standard deviation values were given. Wilcoxon test was used to compare dependent parametric variables that were not normally distributed. The Mann-Whitney U test was used to compare the nonparametric independent variables in the two groups. Statistical significance level was accepted as $p < 0.05$.

Results

Skin prick test was applied to 6056 people, 4464 (73.7%) women and 1592 (26.3%) men. The mean age of the pa-

Table 1. Allergens.

1	Histamine (positive control)
2	Physiological saline (negative control)
3	<i>Dermatophagoides farinae</i> (house dust mite)
4	<i>Dermatophagoides pteronyssinus</i> (house dust mite)
5	Tree pollen (Willow)
6	Cereal pollen (wheat, barley, oats, rye)
7	Tree pollen (Poplar)
8	Herb mix (Plant grass, wormwood, buckwheat, sticky grass) (weed pollen)
9	Latex
10	<i>Cladosporium</i> (Mold fungus)
11	<i>Aspergillus fumigatus</i> (Mold fungus)
12	<i>Alternaria alternata</i> (Mold fungus)
13	<i>Felis domesticus</i> (Cat epithelium)
14	<i>Canis domesticus</i> (Canine epithelium)
15	<i>Blattella germanica</i> (Cockroach)

Table 2. Allergy test results.

	Positive (n)	(%)
Test 3	1327	21.9
Test 4	1113	18.4
Test 5	649	10.7
Test 6	1076	17.8
Test 7	845	14.0
Test 8	1151	19.0
Test 9	374	6.2
Test 10	354	5.8
Test 11	514	8.5
Test 12	523	8.6
Test 13	795	13.1
Test 14	933	15.4
Test 15	1467	24.2

tients was 39.26 ± 14.9 (age range 14-94). There was a statistically significant difference according to the mean age of women and men ($p < 0.05$). The average age of women was older than men. Of the test results, 3454 (57%) were positive and 2602 (43%) were negative. Of the test-positive patients, 2544 were female and 910 were male. While 622 (10.3%) of 3454 positive patients were sensitive to a single allergen, 2832 (46.8%) were sensitive to multiple allergens. There was no statistically significant difference between male and female gender in terms of allergy test results and the number of sensitive allergens ($p > 0.005$). There was no statistically significant difference in terms of age and allergy test results ($p > 0.005$).

The highest positivity in the skin prick test was against *Blattella germanica* (cockroach) with 1467 (24.2%) patients. *D. Farinae* (21.9%), herb mixture (weed pollen) (19%) and *D. Pteronyssinus* (18.4%) followed, in order of frequency. The test was 5-6-7 pollen allergen. The total of these (test 5 willow pollen 10.7%, test 6 cereal pollen 17.8%, test 7 poplar pollen 14.0%), was determined to be 42.5%. While house dust mites *D. Farinae* and *D. Pteronyssinus* were determined to be 40.3% allergen positive together, mold fungi in the 10-11-12 test (test 10 *Cladosporium* 5.8%, test 11 *Aspergillus fumigatus* 8.5% and test 12 *Alternaria alternata* 8.6%) were determined to be 22.9% allergen positive in total. Allergy test results are given in Table 2.

Discussion

Regional differences in allergy frequency and distribution of allergens show the importance of environmental factors in the pathogenesis. Regional studies gain importance as the distribution of allergens varies according to the climate, altitude, vegetation and humidity of the regions. In this study, the results of the 5-year skin prick test in Kırıkkale province were analyzed retrospectively. Sensitivity to at least one allergen was detected in approximately 57% of patients presenting with allergic symptoms. Single allergen sensitivity was 10.3%, multiple allergen sensitivity was 46.8%. Different results have been reported in similar studies conducted in our country. Yegin et al. 36.3% in Istanbul, Bozkurt N. 59.2% in Denizli, Keleş et al. 43.7% in Elazığ, Çölgeçen et al. 64.7% in Yozgat, Kahraman et

al. 31.2% in Malatya, Nalbantoğlu et al. 39.7% in Tekirdağ, Torun et al. 53.6% in Bingöl, Bayram et al. 60% in Kayseri, skin prick test positivity has been reported [6-13]. When many studies conducted in Turkey are examined, it is reported that mite allergy is more common in regions with high humidity, and sensitivity to grass pollen is more common in regions with low humidity [7,14]. This indicates that allergen density affects sensitization. Kırıkkale province is a settlement with high altitude (712 m), high humidity (63%), less precipitation and continental climate characteristics (annual average temperature of 12.5°C). It is thought that these factors may contribute to the emergence of differences in allergen sensitivity compared to other regions.

In our study, the most common skin prick test result in patients presenting with allergic respiratory tract diseases in Kırıkkale province was *Blattella germanica* sensitivity (24.2%). *D. Farinae* was the second most common (21.9%), the third was herb mix (weed pollen) (19%) and *D. Pteronyssinus* was the fourth (18.4%). In fact, there were 5-6-7 pollen allergens in the test, and the sum of these was the most common allergens. Test 5 was willow pollen, test 6 was cereal pollen (wheat, barley, oats, rye) and test 7 was poplar pollen. The total of these (test 5% 10.7, test 6% 17.8, test 7% 14.0) was determined to be 42.5%.

Although cockroaches are a common aeroallergen, different degrees of sensitivity have been reported in different regions in studies conducted in our country. While the sensitivity to cockroaches was determined as 3.5% in Kilis, it was determined as 30.6% in Malatya [15,16]. In our study, it was found to be 24.2%. Cockroaches are often seen in low socioeconomic communities. Cockroaches produce potent allergens and their excrement raises IgE levels. Coexistence of house dust mite and cockroach is common. Similarly, it is associated with temperature, humidity, and socioeconomic status [17]. It was thought that the reason for the high rate of cockroach allergy in Kırıkkale was that they liked the humid environment.

In our country, Bayram et al. In the study they conducted in Gaziantep with 1627 patients (528 patients showing at least one allergen positivity), the most common was herb mixture (41.8%), the second was cockroach (32.9%), and the third was house dust mite (32.7%) reported allergy positivity [18]. Koc et al. In their study with 146 patients, they reported the most common positivity to cockroaches (56.8%), the second most common grain mix (53.3%) and the third most common herb mix (36.5%) [19]. In Şanlıurfa, sensitivity to mixed grasses (39.5%) and meadow grasses (36.8%) was found most frequently [20]. It has been shown to be sensitive to house dust mites (45.3%) and fungus mixture (36.2%), respectively, in the Osmaniye region [21]. Ceylan et al. In a study conducted in Şanlıurfa in patients with allergic rhinitis, the highest positivity in the skin prick test was found against grass pollen (66.7%) and grain pollen (31.1%) [22]. Edis et al. Allergy to house dust mites was found most frequently in Edirne with 39.8%, and tree pollen took the second place with 26% [23]. Talay et al. In their study in Bolu province, they reported positivity against mites (71%), fungi (42%) and grass pollen most frequently [24]. Bayram et al. In Kayseri province, pollen is the most common with a rate of

69.2%, Yalcin et al. House mites at a rate of 51.9% in Antalya, Kahraman et al. They found the highest sensitivity to grass at the rate of 19.4% in Malatya province [10,13,25]. Dikmen et al. In temperate and humid Kahramanmaraş, 41.3% were mostly positive for mites, followed by grass pollen (18.2%) [26]. Havlucu et al. They found 48.5% positivity against house dust mites in Hatay/Dörtyol [14]. In these studies, more susceptibility to mites was detected in humid and warm regions.

Fungus breed more in warm areas with high humidity. The positivity against the fungus mixture was 36.2% in Osmaniye and 37.6% in Hatay Dörtyol [14,21]. In this study, positivity was found against a total of 22.9% mold fungi, including *Cladosporium* 5.8%, *Aspergillus fumigatus* 8.5% and *Alternaria alternata* 8.6%.

In a study conducted in Yozgat province, cereal (wheat) pollen sensitivity was reported as 18.4% [9]. In a study conducted in Şanlıurfa, where agricultural areas are abundant, grain (wheat) pollen sensitivity was reported as 53.3% [19]. This situation can be explained by the fact that the people of the region are engaged in agriculture, agricultural lands and living areas are intertwined. In Kırıkkale province, 17.8% Cereal pollen (wheat, barley, oat, rye) allergen positivity was detected.

Finally, we acknowledge that the retrospective nature of the study may be an important shortcoming and that prospective studies are needed.

Conclusion

Since the most effective prevention and treatment method in allergic patients is to avoid allergens, it is very important to reveal the differences in regional allergen distribution. It is thought that our study will contribute to the diagnosis and treatment of allergic diseases in terms of showing the allergen sensitivities and characteristics specific to our region. Finally, the skin prick test is a successful method for detecting sensitivity to respiratory allergens and its use in clinical practice should be encouraged.

Ethical approval

The study protocol was approved by the Kırıkkale University Faculty of Medicine Ethics Committee, decision number: 2023.03.03, date: 19.04.2023. The study was performed in accordance with the Declaration of Helsinki guidelines.

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