



Aeroallergen Sensitization by Skin Prick Testing in Children from Erzurum, Eastern Türkiye

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Abstract

Objective: This study aimed to evaluate the frequency and distribution of aeroallergen sensitization in children who presented with allergic complaints to the Pediatric Allergy and Immunology Clinic in Erzurum and surrounding provinces and underwent skin prick testing.

Methods: A retrospective analysis was conducted on 1,251 patients aged 2–18 years who underwent skin prick testing (SPT) at the Pediatric Allergy and Immunology Clinic between February 1, 2022, and November 1, 2024. Demographic data, SPT results, serum total IgE, and eosinophil counts of patients with at least one aeroallergen sensitization were analyzed.

Results: Sensitization to at least one aeroallergen was detected in 55.4% (n=693) of the patients, with 75.3% being polysensitized. The most common allergen group was pollens (79.2%), with grass pollen mix (55.1%) being the leading sensitizer. Pollens were followed by house dust mites (35.9%), cat epithelium (24.6%), dog epithelium (19.1%), and *Alternaria alternata* (16.5%). The most frequent diagnoses in sensitized patients were allergic rhinitis (43.7%) and asthma (26.3%). Significant differences in IgE and eosinophil levels were found between atopic dermatitis and respiratory allergic disease groups (p<0.05).

Conclusion: In children living in Erzurum and surrounding provinces, the most common sensitizations are to pollens and house dust mites. House dust mite sensitization remains a significant concern even in low-humidity regions due to indoor environmental factors. Determining the regional allergen profile can guide both diagnostic evaluation and the development of effective environmental control measures and immunotherapy strategies.

Keywords: Atopy, Aeroallergen, Skin prick test, House dust mites

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Erzurum ve Türkiye'nin Doğusundaki Çocuklarda Aeroalerjen Duyarlılığının Deri Prick Testi ile Değerlendirilmesi

Öz

Amaç: Bu çalışma, Erzurum ve çevre illerinde bulunan Çocuk Alerji ve İmmünoloji Polikliniğine alerjik şikayetlerle başvuran ve deri prick testi yapılan çocuklarda aeroalerjen duyarlılığının sıklığını ve dağılımını değerlendirmeyi amaçlamıştır.

Yöntemler: 1 Şubat 2022 – 1 Kasım 2024 tarihleri arasında Çocuk Alerji ve İmmünoloji Polikliniğine başvuran, 2–18 yaş arası ve deri prick testi (DPT) yapılan 1251 hasta retrospektif olarak incelendi. En az bir aeroalerjene duyarlılığı olan olguların demografik verileri, DPT sonuçları, serum total IgE ve eozinofil düzeyleri değerlendirildi.

Bulgular: Hastaların %55,4'ünde (n=693) en az bir aeroalerjene karşı duyarlılık saptandı. Duyarlılığı olan olguların %75,3'ü polisensitizeydi. En sık saptanan alerjen grubu polenlerdi (%79,2); bunlar arasında çimen polen karışımı (%55,1) ilk sırada yer aldı. Polenleri ev tozu akarları (%35,9), kedi epiteli (%24,6), köpek epiteli (%19,1) ve *Alternaria alternata* (%16,5) izledi. Aeroalerjen duyarlılığı olan olgularda en yaygın tanılar alerjik rinit (%43,7) ve astım (%26,3) idi. IgE ve eozinofil düzeyleri, atopik dermatit ile solunum yolu alerjik hastalıkları arasında istatistiksel olarak anlamlı fark gösterdi (p<0,05).

Sonuç: Erzurum ve çevre illerindeki çocuklarda en sık polenler ve ev tozu akarlarına karşı aeroalerjen duyarlılığı gelişmektedir. Ev tozu akarlarının, nem oranı düşük bölgelerde dahi iç ortam koşullarına bağlı olarak önemli bir duyarlılık nedeni olduğu görülmektedir. Bu nedenle bölgesel alerjen profilinin belirlenmesi, hem tanılarda süreçte hem de çevresel kontrol önlemleri ve immünoterapi planlamasında yol gösterici olabilir.

Anahtar kelimeler: Atopi, Aeroalerjen, Deri prick testi, Ev tozu akarları.

INTRODUCTION

Allergic diseases are a global health problem affecting individuals of all ages¹. In childhood, allergic diseases can manifest as atopic dermatitis, food allergy, allergic rhinitis/conjunctivitis, and allergic asthma². The prevalence of allergic diseases has increased in recent years, leading to a rising demand for diagnostic allergy testing³⁻⁵.

Atopy is an important risk factor for the development of allergic diseases. It is characterized by type I hypersensitivity, in which genetically predisposed individuals produce immunoglobulin (Ig) E antibodies against specific antigens under the influence of genetic and environmental factors. Consequently, allergic asthma, allergic rhinoconjunctivitis, and atopic dermatitis may develop in atopic individuals^{6,7}. Sensitization generally precedes the clinical onset of IgE-mediated allergic diseases. Sensitization to inhaled allergens (house dust mites, pets,

pollens, and molds) typically develops during the early years of life^{8,9}. Accurate identification and avoidance of causative allergens constitute the first step in the management of allergic diseases. The most commonly used methods to detect IgE-mediated allergy and determine allergen sensitization are the skin prick test (SPT) and/or measurement of serum-specific IgE levels¹⁰.

In addition to genetic predisposition, environmental factors play a crucial role in the development of allergies. Climatic and geographic differences, such as vegetation, humidity, altitude, and seasonal variations, influence allergen distribution across regions. These variations are particularly relevant for guiding specific treatment approaches such as allergen immunotherapy in allergic rhinitis and asthma¹¹. Therefore, determining the allergens responsible for sensitization in different geographic regions is of great importance^{12,13}.

This study aimed to evaluate the prevalence and distribution of aeroallergen sensitization among children with atopy, diagnosed by SPT, living in Erzurum and the surrounding provinces.

METHODS

This retrospective study included 1,251 patients (aged 2–18 years) who presented with allergic complaints and underwent skin prick testing for inhalant allergens at the Pediatric Allergy and Immunology Outpatient Clinic between February 1, 2022, and November 1, 2024. Demographic data, SPT results, and laboratory findings (serum total IgE levels and eosinophil counts) of patients with at least one positive aeroallergen sensitization were obtained from medical records. The study was approved by the Local Ethics Committee of (Date: July 9, 2025; Decision No: 2025/197).

Medications that could interfere with test results (e.g., antihistamines, antidepressants, decongestants) were discontinued 3–10 days before testing, in accordance with EAACI/WAO guidelines recommending discontinuation for at least 72 hours before skin testing¹⁴.

Tested inhalant allergens included house dust mites (*Dermatophagoides farinae*, *Dermatophagoides pteronyssinus*), pollen allergens (birch, grass mix, meadow grass, ryegrass), tree pollens (birch, oak, plane tree), weed mix (goosefoot), cat epithelium, dog epithelium, and molds (*Alternaria alternata*, *Aspergillus fumigatus*).

Exclusion Criteria: Patients were excluded if they had: (i) any acute infection or chronic systemic disease that could interfere with immune response (e.g., primary immunodeficiency, autoimmune diseases, uncontrolled chronic illnesses), (ii) ongoing

systemic corticosteroid or immunosuppressive treatment, (iii) dermatological conditions precluding skin testing (e.g., extensive eczema, dermatographism), or (iv) missing or incomplete SPT results, serum total IgE or eosinophil data.

Statistical Analysis

Statistical analyses were performed using the SPSS software package (version 24.0; SPSS Inc., Chicago, IL, USA). The normality of variable distributions was assessed both visually (histograms and probability plots) and analytically using the Kolmogorov–Smirnov and Shapiro–Wilk tests. Descriptive statistics were presented as means for normally distributed (parametric) continuous variables and as medians for non-normally distributed (non-parametric) continuous variables. Categorical variables were expressed as percentages.

Categorical data were analyzed using Fisher's exact chi-square test or Pearson's chi-square test, as appropriate. Differences between group means were assessed using one-way analysis of variance (ANOVA). When a statistically significant difference was detected by ANOVA, post hoc pairwise comparisons were performed using the Tukey's Honestly Significant Difference (HSD) test to determine the source of the difference. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 693 children (55.4%) demonstrated sensitization to at least one aeroallergen. The majority of sensitized patients (75.3%) were polysensitized (sensitized to more than one aeroallergen). A positive family history of atopy was present in 11.1% of cases. The mean age of patients with inhalant allergen sensitization was 7.94 ± 3.92 years, and more than half (58.7%) were male (Table 1).

Table I: Demographic characteristics of patients with aeroallergen sensitization

Characteristics	Values
Patients with aeroallergen sensitization	693 (55.4%)
Monosensitized	171 (24.7%)
Polysensitized	522 (75.3%)
Mean age (years)	7.94 ± 3.92
Gender (Female / Male)	286 (41.3%) / 407 (58.7%)
Family history of atopy	11.1%

Based on skin prick test results, pollens were the most common allergen group (79.2%). The most frequent pollen sensitizations were to grass pollen mix (55.1%), tree pollens (21.9%), and weed pollens (2.1%). Pollens were followed by house dust mites (35.9%), cat epithelium (24.6%), dog epithelium (19.1%), and *Alternaria alternata* (16.5%). The distribution of aeroallergen sensitizations is presented in Figure 1.

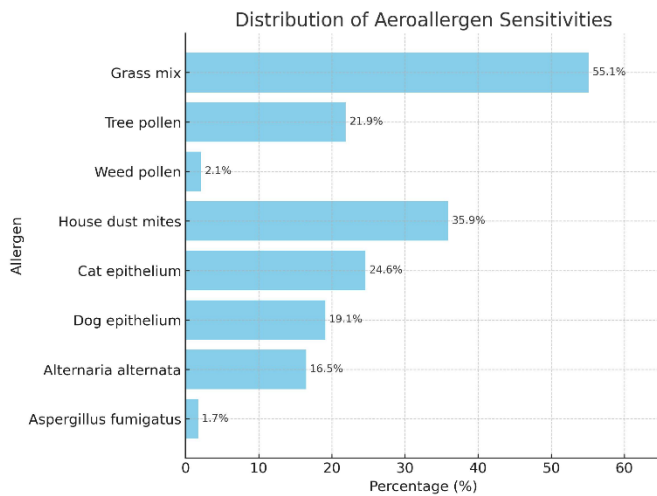


Figure 1. Distribution of allergen sensitizations identified by skin prick test

The diagnostic distribution among the 693 sensitized patients was as follows (Figure 2): allergic rhinitis (43.7%), asthma (26.3%), asthma + allergic rhinitis (17.8%), atopic dermatitis (9.8%), and allergic conjunctivitis + allergic rhinitis (2.3%).

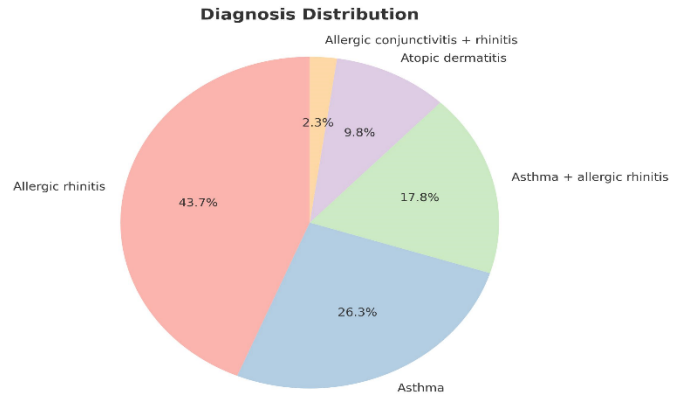


Figure 2. Diagnostic distribution of patients with aeroallergen sensitization

Among the 619 patients in whom total serum IgE levels were measured, the mean value was 288.40 ± 457.60 IU/ml. In the 676 patients whose eosinophil counts were available, the mean value was 310.44 ± 272.36 /mm³. A statistically significant difference in IgE levels was found between the asthma + allergic rhinitis group and the atopic dermatitis group ($p = 0.003$). Regarding eosinophil counts, significant differences were observed between the allergic rhinitis and atopic dermatitis groups ($p < 0.001$), asthma and atopic dermatitis groups ($p < 0.001$), and asthma + allergic rhinitis and atopic dermatitis groups ($p = 0.002$).

The seasonal distribution of skin prick test results was as follows (Figure 3): Monosensitized patients: Spring 39.2%, Summer 28.7%, Autumn 18.7%, Winter 13.5%. Polysensitized patients: Summer 35.8%, Autumn 33.1%, Spring 18.8%, Winter 12.3%

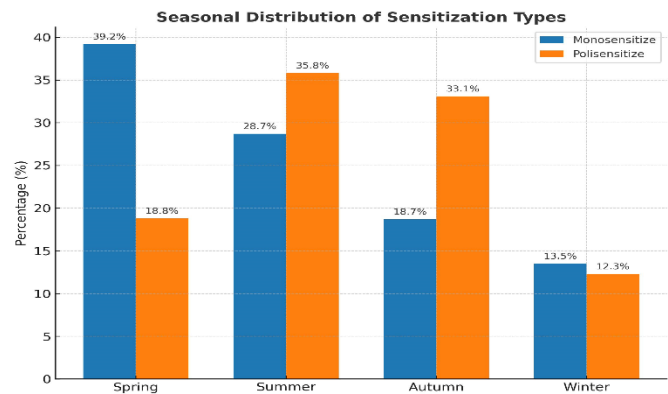


Figure 3. Seasonal distribution of aeroallergen sensitizations

DISCUSSION

In this study, aeroallergen sensitization was evaluated in children aged 2–18 years living in Erzurum and surrounding provinces, and the sensitization profile was determined. The finding that 55.4% of the 1,251 patients examined were sensitized to at least one aeroallergen highlights the high prevalence of atopic diseases in childhood. Similar studies have reported sensitization rates ranging between 30% and 70% among children both in Turkey and worldwide^{4,15}.

The fact that 75.3% of sensitized cases were polysensitized suggests that, in addition to genetic predisposition, the immune system of allergic individuals is likely to develop sensitivity to multiple environmental allergens. Polysensitization has been associated with more severe clinical manifestations, increased symptom burden, and a more complex therapeutic response. The observation that 58.7% of skin prick test–positive patients were male is consistent with literature indicating a higher prevalence of atopy among boys^{16,17}.

In this study, pollens were the most common allergen group (79.2%), particularly grass (55.1%) and tree pollens (21.9%). Similar results have been reported in other regional studies conducted in Turkey^{18–20}. In continental climate regions such as Erzurum, the high prevalence of pollen sensitization may be related to increased pollen exposure during the summer months. Furthermore, the high altitude may influence vegetation diversity and pollen types²¹. The second most common sensitization was to house dust mites (35.9%). This finding suggests that even in low-humidity regions, indoor environmental conditions (e.g., carpet use, insufficient ventilation, heating systems) may support mite survival²². Higher sensitization rates to mites (40–75%) have been reported in studies conducted in the Mediterranean and Marmara regions²³.

Sensitization to cat (24.6%) and dog epithelia (19.1%) supports the notion that pet exposure is an important risk factor in atopic children. Animal epithelial particles are known to remain suspended in the air for long periods and can be easily inhaled²⁴. Sensitization to mold allergens such as *Alternaria alternata* (16.5%) highlights the need to consider mold exposure, especially in children living in damp and poorly ventilated environments. *Alternaria* has been implicated in asthma development and in exacerbating disease severity in several studies²⁵.

When clinical diagnoses were analyzed, allergic rhinitis (43.7%) and asthma (26.3%) were the most common conditions among patients with aeroallergen sensitization. These findings indicate a strong relationship between aeroallergen sensitization and allergic respiratory diseases. Notably, significant sensitization rates were also observed in skin diseases such as atopic dermatitis (9.8%).

In this study, the mean total serum IgE level was 288 IU/ml, and the mean eosinophil count was 310 /mm³. Significant differences in IgE and eosinophil levels were observed between the atopic dermatitis and respiratory disease groups. Elevated total IgE levels and increased eosinophil counts support the role of these parameters as biological markers of allergic inflammation²⁶.

Seasonal distribution analysis revealed that monosensitized patients most frequently presented in spring, while polysensitized patients predominantly presented in summer and autumn. These findings align with the seasonal variability of aeroallergens and suggest that symptoms are more pronounced during periods of increased exposure to outdoor allergens such as pollens²⁷.

This study has several limitations. First, its retrospective, single-center design may limit generalizability. Second, some patient data were missing, which could have influenced

clinical associations. Third, seasonal and environmental confounders were not fully controlled, which may have affected sensitization rates. Despite these limitations, the study provides novel regional data from Eastern Türkiye, an underrepresented area in aeroallergen research.

In conclusion, our study demonstrates that the most common aeroallergen sensitizations among children in Erzurum and surrounding provinces are to pollens and house dust mites. Knowledge of regional allergen profiles enables a more targeted approach in both diagnosis and environmental control recommendations. These data are valuable for the development of locally tailored guidelines for the management of atopic diseases.

Ethical approval: The study was approved by the Local Ethics Committee of (Date: July 9, 2025; Decision No: 2025/197).

Conflict of Interest: The authors declared no conflicts of interest.

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