

Research Article

Open Access, Volume 5

Aeroallergen sensitization in patients with allergic rhinitis unresponsive to medical therapiesSoroush Rasouli¹; Masoumeh Hemmatyar²; Sepideh Darougar^{2*}¹Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran.²Department of Pediatrics, Faculty of Medicine, Tehran Medical Sciences, Islamic Azad University, Tehran, Iran.***Corresponding Author: Sepideh Darougar**Tehran Medical Sciences, Islamic Azad University,
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Received: Jan 17, 2024

Accepted: Feb 01, 2024

Published: Feb 08, 2024

Archived: www.jcimcr.org

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DOI: www.doi.org/10.52768/2766-7820/2848

Abstract

Background: Allergic rhinitis is a chronic inflammatory disease, sometimes associated with asthma, that may significantly reduce the quality of life with detrimental effects on many aspects of it, including productivity, lifestyle, sleep pattern, social interaction, and work. The aim of this study was to detect the relevant aeroallergen sensitization in patients with allergic rhinitis unresponsive to medical therapies in order to control the refractory signs and symptoms more efficiently.

Methods: A total of 62 patients with refractory allergic rhinitis who visited the Allergy Clinics of Tehran Azad University from 2023 to 2024 were included in the study. Allergic rhinitis was defined according to ARIA guidelines and in the presence of sensitization to environmental allergens. After inclusion, the patients' socio-demographic data, concomitant allergic diseases, comorbidities, and clinical history of the rhinitis (date of onset/diagnosis, frequency and severity of symptoms) were collected.

Results: Females comprised 62.9% of the patients in this study. The mean age of all the patients was 33.9 with a standard deviation of 12.07 years (youngest: 14 years old, oldest: 65 years old; median: 34 years old). The most common aeroallergens in these patients were weeds (69.4%) and trees (64.5%). Outdoor allergens were more frequent than indoor allergens in patients with allergic rhinitis unresponsive to conventional medical therapies.

Conclusion: The results of this study show that outdoor allergens and specifically weeds are more common culprits than indoor allergens in patients with severe refractory allergic rhinitis. Therefore, individualizing medical treatments of refractory allergic rhinitis in accordance to their allergen sensitization results may significantly improve the timely treatment and positive outcomes in patients with asthma.

Keywords: Allergic Rhinitis; Sensitization; Aeroallergen; Asthma.

Citation: Rasouli S, Hemmatyar M, Darougar S. Aeroallergen sensitization in patients with allergic rhinitis unresponsive to medical therapies. *J Clin Images Med Case Rep.* 2024; 5(2): 2848.

Introduction

Allergies are chronic inflammatory disorders with their symptoms ranging from miserable to life-threatening reactions when the immune system is exposed to harmful allergens [1]. Collectively, 20% of the population worldwide have experienced one kind of atopic diseases in recent years [2]. The latest epidemiological studies have shown a significant increase in incidence and prevalence of allergic respiratory diseases in the last three decades [3]. Among the risk factors contributing to allergic respiratory disorders, including occupational agents, indoor pollutants, environmental exposure to air pollutants and bio-particulates, aeroallergens, as one type of bio-particulates, have been significantly dependent on climate change in recent decade. Allergic rhinitis is a chronic inflammatory disease, sometimes associated with other allergic disorders, including asthma, rhinosinusitis, and allergic conjunctivitis [4]. It has been estimated to affect up to 45% of the population [5]. Allergic rhinitis may significantly reduce the quality of life [4] and has detrimental effects on many aspects of it, including productivity, lifestyle, sleep pattern, social interaction, and work [6].

Subsequent to allergen inhalation, such as pollen, mold or animal dander, the interaction between these allergens and nasal mucosa results in recruitment of numerous inflammatory cells including mast cells, CD4-positive T cells, B cells, macrophages and eosinophils to the nasal lining [4,5,7]. Such infiltration of these cells may lead to a T helper 2 response and cytokine release or even overproduction (IL-4, IL-5 and IL-13), promoting IgE production and eosinophilia [4,5,7]. Symptom relief is the major treatment goal in management of allergic rhinitis, which is achieved by avoidance measures, nasal saline irrigations, oral antihistamines, intranasal corticosteroids and / or antihistamine sprays, leukotriene receptor antagonists and allergen immunotherapy. The aim of this study was to detect the relevant aeroallergen sensitization in patients with allergic rhinitis unresponsive to medical therapies in order to control the refractory signs and symptoms more efficiently.

Methods

A total of 62 patients with refractory allergic rhinitis who visited the Allergy Clinics of Tehran Azad University during the years 2023 and 2024 were included in the study. Allergic rhinitis was defined according to ARIA guidelines and in the presence of sensitization to environmental allergens. After inclusion, the patients' socio-demographic data, concomitant allergic diseases, comorbidities, and clinical history of the rhinitis (date of onset/diagnosis, frequency and severity of symptoms) were collected. This study was carried out in accordance with the ethical principles of the declaration of Helsinki, and approved by the Ethics Committee of Tehran Azad University of Medical Sciences. All the patients signed a formal written consent form before being included in the study.

Results

The Shapiro-Wilk test was used to check if the continuous variables followed a normal distribution. The data were reported as mean \pm SD. To show the quantitative difference between groups, T-test and Mann-Whitney were used for parametric and non-parametric tests, respectively, and Chi-square test was used for qualitative variables. In all tests, the levels of signifi-

cance and meaningfulness were considered 95% and less than 5%, respectively.

Females comprised 62.9% of the patients in this study. The mean age of all the patients was 33.9 with a standard deviation of 12.07 years (youngest: 14 years old, oldest: 65 years old; median: 34 years old). The results of the skin prick tests were evaluated according to age and sex and did not show any significant differences ($p>0.05$).

Table 1 summarizes the distribution of the prick test results on the patients with allergic rhinitis unresponsive to medical treatments.

Table 1: Distribution of the skin prick test results in patients with allergic rhinitis unresponsive to traditional medical treatment.

Aeroallergen		Number	Percent
Trees pollen	Positive	40	64.5
	Negative	22	35.5
Grass pollen	Positive	36	58.1
	Negative	26	41.9
Weeds Pollen	Positive	43	69.4
	Negative	19	30.6
Mites	Positive	23	37.1
	Negative	39	62.9
Fungi and molds	Positive	7	11.3
	Negative	55	88.7
Animal dander	Positive	10	16.1
	Negative	52	83.9

According to Table 1, the first and second most common aeroallergens in these patients were weeds (69.4%) and trees (64.5%), respectively. Table 2 compares the frequency of indoor and outdoor allergens in the patients with refractory allergic rhinitis.

Table 2: A comparison between the frequency of indoor and outdoor allergens in the patients with allergic rhinitis refractory to conventional medical therapies.

Aeroallergen		Number	Percent
Outdoor (trees, weeds, grass)	Positive	20	32.2
	Negative	42	67.8
Indoor (mites, Animal dander)	Positive	5	8.1
	Negative	57	91.9

Table 2 shows that outdoor allergens were more frequent than indoor allergens in patients with allergic rhinitis unresponsive to conventional medical therapies.

Discussion

Allergic rhinitis, as a prevalent allergy worldwide, is widely controlled by medications, yet the treatment response is heterogeneous in the patients. In this study, we tried to evaluate the frequency of various specific aeroallergen sensitizations in the patients who did not show an appropriate response to conventional treatments of allergic rhinitis and determine whether refractory outdoor allergen sensitizations were more common than indoor allergen sensitizations. Treatment efficacy was assessed based on the improvement of the symptoms and the pa-

tient's quality of life. The results showed that outdoor aeroallergens were more common than indoor ones. In addition, weeds and mites were the most common outdoor and indoor aeroallergens among the studied population, respectively.

The standard care for allergic rhinitis necessitates a treatment plan compatible with the severity of the disease and the patients' preferences [8]. Performing skin prick test and determination of its compatibility with the timing of signs and symptoms are important factors in assessment of these patients and their response to medications. Allergic shiners, mouth breathing, throat clearing, and transverse nasal crease are signs of allergic rhinitis not only supporting the diagnosis of the disease but also its severity [8].

Allergens are transferred through respiratory routes or food sources. The former allergens are either indoor or outdoor. Tree, grass and weed pollens as well as mold are outdoor allergens with the potential to trigger an allergy response in susceptible individuals. Among these, weed pollen allergy is a prevalent cause of pollinosis worldwide, which has increased in recent decades [9]. Weeds normally pollinate in late summer and fall. Surprisingly, some weeds may flower during summer, which may be mistakenly diagnosed as grass pollen allergy, due to their simultaneous pollination time [10].

In recent studies in Europe on the effects of climate change on allergic rhinitis, a large geographical dissemination with longer pollen seasons were noted, which may explain the reason for the increased frequency severity of this type of sensitization [11]. The change in climate has the potential to increase stressors, which may disrupt the normal structure of forests and ecosystem leading to alterations in the types of indigenous plants. It is reported that weeds are more adaptable to CO₂ concentrations and rising temperatures because of their diverse gene pools and physiological plasticity [12]. When native vegetation is stressed or destroyed due to detrimental effects of climate change and global warming, weeds seem to be more likely to gain new opportunities to tolerate warmer conditions, and therefore a huge colonization of weeds may result with the help of wind and flooding water [13,14]. In a recent Iranian review article, pollens were found to be the most common allergen sensitizations, with weeds on top of the list [14].

Indoor allergens include dust mites, cockroaches, pets and fungi inside buildings. Among these in the present study, the symptoms caused by mites were the most common to be unresponsive to conventional therapies. Dust mites normally colonize the indoor environment in dwellings in the temperate regions of the world, producing allergens that can induce immune reactions in sensitized people [15]. More than 95% of the allergens accumulated in mite cultures are associated with fecal particles, which become airborne upon disturbance [15,16]. Our finding concerning mites' commonality as the most important indoor allergen in the present study can be best explained by the larger reservoir of mite allergens with the potential for sensitizing the atopic individuals due to the concurrent presence of diverse groups of mites in the environment, which were already suggested in previous studies [3,15].

The patients' small sample size was one of the limitations of the current study. The fact that the patients were selected and enrolled on the basis of their own description of refractoriness, without any objective criteria to be measured in order to unify the study standards, can be another limitation of this study.

Conclusion

The results of this study show that outdoor allergens and specifically weeds are more common culprits than indoor allergens in patients with severe refractory allergic rhinitis. Therefore, individualizing medical treatments of refractory allergic rhinitis in accordance to their allergen sensitization results may significantly improve the timely treatment and positive outcomes in patients with asthma.

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