# Sensitization Pattern to common Inhalant allergens among patients with Allergic Rhinitis in Taiz, Yemen

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**الملخص:**

**المقدمة:** يؤثر التهاب الانف التحسسي على ملايين الأشخاص في السنة الواحدة وعدد كبير منهم يحتاج لرعاية صحية تحتاج المزيد من الانفاق الطبي على المجتمع. ومن اهم أسباب الحساسية هي المحسسات المستنشقة والتي يكون مصدرها حبوب اللقاح وعث الغبار المنزلي والفطريات تلك التي تنتج عن الحيوانات. ويختلف انتشار كل نوع من هذه المحسسات بحسب المنطقة الجغرافية. **الأهداف:** تم تصميم هذه الدراسة للتعرف على مدى الاستجابة للمحسسات المحمولة بالهواء في المرضى المصابين بالتهاب الانف التحسسي في مدينة تعز – اليمن. **المواد والطرق:** هذه الدراسة المستعرضة أجريت في مدينة تعز للفترة من مارس ٢٠١٤ وحتى أكتوبر ٢٠١٧. وتم تضمين المرضى الذين يعانون من اعراض التهاب الانف التحسسي وارتفاع نسبة الاجسام المضادة من النوع إي (IgE) واظهروا تحسسًا لواحد على الأقل من المحسسات المستنشقة اثناء اجراء اختبار الوخز على الجلد. وقد تم تقييم شدة الاعراض باستخدام نظام تقييم رتبي خاص. وتم اختبار الاستجابة للمحسسات المستنشقة لعدد ١٢ نوع شائع بواسطة اختبار الوخز في الجلد. **النتائج:** كانت نسبة المرضى الذكور للإناث هي ١:١,٦٦ ، وتوزعت أعمار المرضى بين ١١ سنة و٦٧ سنة. وكانت اعلى نسبة استجابة لاختبار الوخز هي للمحسس عث الغبار المنزلي بنسبة ٤٤,٧٦% يليه التحسس للصراصير بنسبة ١٦,٧٦% ثم غبار المنزل (١٤,٧٦%) والبعوض بنسبة ١٢,٣٨% بينما كانت اقل استجابة هي لشعر القطط بنسبة ١٠,٤٥%. **الخلاصة:** كشفت هذه الدراسة ان أكثر المحسسات أعطت استجابة لدى مرضى التهاب الانف التحسسي هو محسس عث الغبار المنزلي وهذه النتيجة متوافقة مع نتائج دراسات أخرى أجريت في مناطق ذات مناخ مشابه لمدينة تعز.

**ABSTRACT:**

**Introduction:** Allergic rhinitis (AR) affects millions of people annually and is associated with significant morbidity resulting in substantial health care costs to society. Inhalant allergens as one of the most common cause of allergic disease derived from pollens, dust mites, fungi, and animals. The prevalence of inhalant allergens is different in various areas. **Objectives:** This study was designed to identify the frequency of sensitization to aeroallergens in patients with AR in Taiz, Yemen. **Materials and Methods:** This cross-sectional study was conducted in Taiz, Yemen between March 2014 and October 2017. Patients with symptoms suggesting AR and have elevated total immunoglobulin-E (IgE) and sensitized to at least one inhalant allergen are included in this study. The severity of AR was assessed using special scoring system. Sensitization to inhalant allergens was assessed by skin prick test using a panel of common 12 inhalant allergens. **Results:** Sex ratio being 1.66:1, male: female. Age distribution ranged from 11 years to 67 years. House dust mite were the most common type of inhalant allergens (44.76%), followed by Cockroach (16.67%), house dust (14.76%), Mesquite (12.38%) and cat hair (10.45%). **Conclusion:** The results of the present study

revealed that HDMs play as a main sensitizing allergen in allergic rhinitis. This pattern was compatible with the results from studies carried in other areas with the same climate.

## INTRODUCTION

AR is a symptomatic disorder of the nose induced by an IgE-mediated inflammation of the nasal mucous membranes in response to allergen exposure [1]. As an inflammatory disease of nasal mucosa, rhinitis is often defined by its clinical manifestation, such as rhinorrhea, sneezing, nasal congestion and itching. Although sometimes considered as a trivial disease, because it is not associated with mortality, it can lead to a great financial burden and tremendously impair a patient's quality of life; negatively impacting many aspects of life such as sleeping, working performance, emotion, socializing, etc. [1,2].

AR affects millions of people annually and is associated with significant morbidity resulting in substantial health care costs to society. Most individuals think of "allergy" when they think of chronic upper respiratory symptoms because AR is the chronic rhinitis subtype that has been most extensively investigated [3].

The allergic reaction first requires sensitization to a specific allergen and occurs in genetically predisposed individuals. In case of allergen sensitization, the TH0 cells develop into TH2 cells. TH2 cells can then act on the B cell to promote class switching from immunoglobulin M production to antigen-specific IgE production. It is important to have information about the prevalence of allergens and sensitizations present in the region the patient lives for optimal clinical care in allergy. Skin-prick testing is the standard for diagnosing IgE-mediated allergies [3,4,5,6].

Allergic sensitization is attributed to the presence of allergen-specific Immunoglobulin E in the blood. The IgE sensitization is not always concordant with allergic symptoms [7]. Increase in the rate of inhalant allergens due to the aforementioned reasons and individuals' exposure, especially those who are atopic, may result in further allergic sensitizations [8]. Multiplex allergen-specific IgE panels evaluate allergen- specific IgE against several allergens at the same time. These multiplex panels are used for different age groups and regions providing invaluable findings to determine allergic sensitization patterns, the etiology, prevention and management of allergic diseases.7 A 25-50% prevalence of inhalant allergen sensitization has been reported in different countries, especially in developed countries. According to previous studies, the difference in IgE sensitization pattern has been reported among countries, cities and overall, different geographical locations [9,10,11,12].

We could not found any study conducted regarding IgE sensitization in allergic individuals of Taiz city; or in any region of Yemen. Several studies have been performed regarding common allergens in other regions of the world [13,14,15,16].

The performance of these studies in different locations and update these informations in

different durations could be helpful for physicians, patients and researchers.

With respect to different sensitization patterns in various geographical regions and their importance in AR and other allergic diseases, the objective of this study was the assessment of IgE sensitization paradigm to some of the common allergens in adults and children over the ten years using specific panel.

## MATERIALS AND METHODS

### Participants

This cross-sectional study was conducted between March 2014 and October 2017. Patients were selected from the attendants of our private clinic and the attendants of the medical laboratories of the Faculty of Medical and Health Science at Al-Saeed University – Taiz. The inclusion criteria were positive clinical history of AR manifestations, presence of one or more of symptoms suggesting AR on clinical examination, raised blood total IgE in of the patient on laboratory investigation and sensitization to at least one of 12 inhalant allergens on skin prick test (SPTs). A total of 210 individuals fulfilling the above mentioned criteria were enrolled in this study. A validated standard questionnaire was filled out for participants to assess their allergic symptoms. The questionnaire include demographic information, clinical symptoms of AR, (Nasal itching, Rhinorrhea, Sneezing, Nasal block, Ocular itching).

Informed consent was obtained from all subjects (or their parents).

### Skin prick test (SPT)

SPTs consisted of pricking the volar fore-arm skin with adequate lancets through individual drops of allergen extracts. All the participants attended the study without taking any antihistamines or topical/systemic steroids for at least 72 h prior to SPTs. Skin testing was done for the some of the most common allergens using (Omega, Montreal, Canada) battery ordered from Allergy unit at VACSERA, Giza, Egypt and consists of twelve inhalant allergens in addition to histamine as positive control and normal saline as a negative control. The 12 aeroallergens tested included house dust mites (HDM) (Dermatophagoides farina and Dermatophagoides pteronyssinus), house dust (HD), Cockroach, Cladosporium, Ragweed, Mesquite, Alternaria, Timothy, Birch, Sangeberch, Cat pelt and Perennial ray. The skin reaction towards each allergen was measured as the diameter of the wheal produced after 15 min. The result was based on skin index (SI = mean size of allergen weal/size of histamine wheal) [17]. In the study, SI ≥ 0.5 was confirmed to be a positive SPT result.

### Score for AR

Individuals were invited to complete the score for AR questionnaire investigating main symptoms of AR which are blocked nose, runny nose, sneezing, itchy nose and itchy eyes [18]. The severity for each symptom was ordered as

follow; zero (symptom is not present), one (symptom is mild), 2 (symptom is moderate) and 3 (symptom is severe). The cumulative score for the five symptoms were calculated and the severity of AR was then determined.

### Statistical analyses

Results were statistically analyzed with IBM SPSS version 19, (property of SPSS 2010, Inc., IBM Company) software. The comparisons between qualitative data were carried using Chi-square test. Friedman Repeated Measures Analysis of Variance on Ranks was used for difference testing between the ordered data of symptoms severity. A correlation analysis was carried out –after transformation– using Pearson correlation test. The p value of less than 0.05 was considered significant.

## RESULTS

There were 131 males and 79 females. Sex ratio being 1.66:1, male: female. Age distribution ranged from 11 years to 67 years. Age and sex description were summarized in table 1 and the difference between groups was statistically significant.

**Table 1. Demographic data of the studied population**

| Age** | | 10 to < 20 | 20 to < 30 | 30 to < 40 | 40 to 50 | Over 50 | Total |
|---|---|---|---|---|---|---|---|
| Patient No | | 22 | 62 | 55 | 46 | 25 | 210 |
| Gender* | Male | 12 | 41 | 36 | 29 | 13 | 131 |
| | Female | 10 | 21 | 19 | 17 | 12 | 79 |

*P= 0.008

**p=0.02

Regarding AR symptoms, 206 patients were presented with mild to severe watery nasal discharge, 208 with itching of the nose, 205 with sneezing, 207 with nasal blockage and 189 of patient were presented with ocular itching. Data summarizing the frequency and severity of AR manifestations are presented in table 2.

**Table 2. Frequency and severity of AR manifestations**

| Nasal itching* | | |
|---|---|---|
| **Grade** | **Patient No.** | **Percentage** |
| **No** | 2 | 0.95% |
| **Mild** | 52 | 24.76% |
| **Moderate** | 146 | 69.52% |

| | | |
|---|---|---|
| **Severe** | 10 | 4.76% |
| **Rhinorrhea*** | | |
| **Grade** | **Patient No.** | **Percentage** |
| **No** | 4 | 1.90% |
| **Mild** | 81 | 38.57% |
| **Moderate** | 122 | 58.1% |
| **Severe** | 3 | 1.43% |
| **Sneezing*** | | |
| **Grade** | **Patient No.** | **Percentage** |
| **No** | 5 | 2.38% |
| **Mild** | 52 | 24.76% |
| **Moderate** | 143 | 68.1% |
| **Severe** | 10 | 4.76% |
| **Nasal block*** | | |
| **Grade** | **Patient No.** | **Percentage** |
| **No** | 3 | 1.43% |
| **Mild** | 81 | 38.75% |
| **Moderate** | 115 | 54.76% |
| **Severe** | 11 | 5.24% |
| **Ocular itching*** | | |
| **Grade** | **Patient No.** | **Percentage** |
| **No** | 31 | 14.76% |
| **Mild** | 99 | 47.14% |
| **Moderate** | 61 | 29.05% |
| **Severe** | 19 | 9.05% |
| ***P = 0.674** | | |

The sensitization pattern to 12 inhalant allergens is as presented in the table 3. 115 (54.8%) of all investigated individuals had monosensitization, and 95 (45.2%) of all individuals had polysensitization; up to maximum 4 allergens. The most prevalent response to allergen in Taiz patients was the HDMs (94; 44.76%). The second most common was to the cockroach (35; 16.67%).

**Table 3. Sensitization rate to inhalant allergens in Taiz**

| Allergen | Patient's No. | Percentage | P |
|---|---|---|---|
| **HDMs** | 94 | 44.76% | <0.001 |
| **HD** | 31 | 14.76% | <0.001 |

| | | | |
|---|---|---|---|
| **Cockroach** | 35 | 16.67% | <0.001 |
| **Cladosporium** | 17 | 8.1% | <0.001 |
| **Ragweed** | 13 | 6.19% | <0.001 |
| **Mesquite** | 26 | 12,38% | <0.001 |
| **Alternaria** | 20 | 9.52% | <0.001 |
| **Timothy** | 20 | 9.52% | <0.001 |
| **Birch** | 12 | 5.71% | <0.001 |
| **Sangeberch** | 6 | 2.86% | <0.001 |
| **Cat pelt** | 22 | 10.48% | <0.001 |
| **Perennial rye** | 13 | 6.19% | <0.001 |
| **Negative control** | Zero | 0% | |
| **Histamine (Positive con.)** | 210 | 100% | |

The severity of the symptoms of AR – represented with score– correlates significantly (r=0.480, p< 0.001) with the numbers of allergens to which patients were sensitized. (Figure 1)

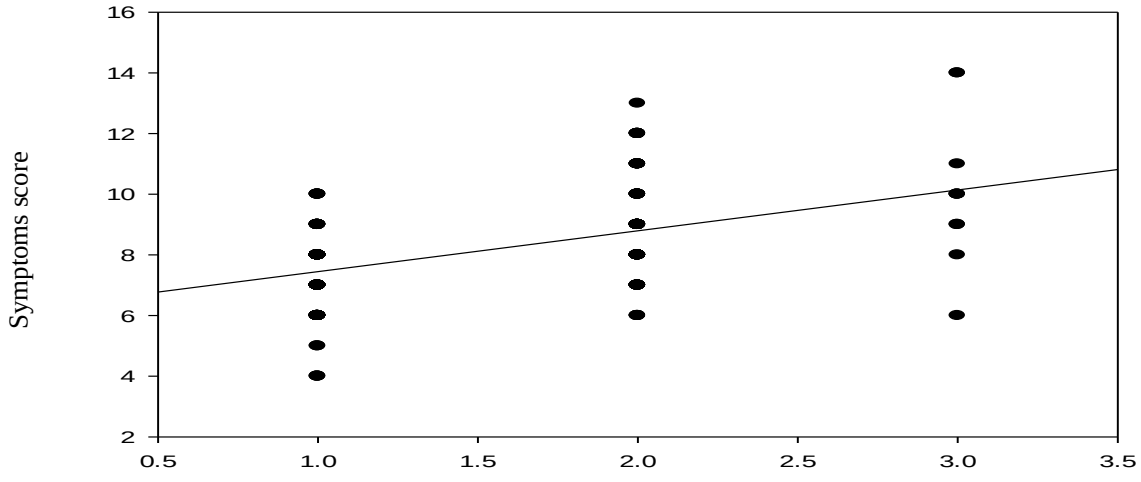


Figure 1. Positive correlation was seen between allergens' number and symptoms' severity score.

## Discussion

Rhinitis is a global health problem affecting up to 20% of the world population with an uprising incidence [19]. Around 1–15% of 6–7 year olds around the world have signs of AR. Around 2–40% of 13–14 year olds also have these signs. It is found in about 16% of adults. It can also occur at any age [15].

AR can be induced by different mechanisms, and it involves several etiological agents. Diagnosis is based on clinical manifestations and supported by detection of rising serum specific immunoglobulin E antibodies or by SPTs to aeroallergens [14].

AR and allergic asthma are characterized by a TH 2–dominated immune response associated with increased serum IgE levels in response to inhaled allergens. Because IgE is a key player in the induction and maintenance of allergic inflammation, it represents a prime target for therapeutic intervention [19].

Although, there are inadequate data on the epidemiology of allergic disorders in Yemen, but symptoms associated with AR are very common all over the country. The role of aeroallergens in allergic diseases is indisputable. To the best of our knowledge this is the first report in this context from Taiz, Yemen.

In the present study, it was found that there was a male preponderance, this can be attributed to the difficulty to get approval from females than in males to be a participant in the study due to community habits. The demographic data in this study was not representative for the prevalence of AR in Taiz; the reason being; only the cases with allergic symptoms and positive skin test those came to certain places and were agree to be a participant were included in the study.

In this study, we found the most common sensitization was to HDMs. The results of SPT were different from the positive and negative control with a high statistically significant ($p<0.001$). We think that more prevalent sensitization for HDMs among allergic rhinitis patient will be obtained if the study applied on the same patient in all regions in our country due to high allergenic potential of HDMs in comparison with other allergens. The same results were reported in allergic patients from other parts of the world in which weather is warm and humid [20,21]. On the contrary to our result, the sensitization was to pollens from weeds, grasses, and trees in several other parts of the world which may be attributed to the cold and dry weather of these areas [22].

Our data analysis led to two findings: (i) Polysensitization was less common for inhalant allergens, than monosensitization. (ii) The severity of symptoms showed a significant increase with the increase in the number of allergen sensitization.

Other studies in Taiz and in the republic of Yemen; using much more inhalant and food allergens should be conducted to ascertain the pattern of sensitivity in different allergic diseases not only AR. This well helps in introduction of effective management protocols that depends on immunohy posensitisation.

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