

The Seasonal Variation in Allergic Rhinitis and Its Correlation with Outdoor Allergens in Kuwait

N. Behbehani^a N. Arifhodzic^d M. Al-Mousawi^d S. Marafie^c L. Ashkanani^c
M. Moussa^b A. Al-Duwaisan^d

Departments of ^aMedicine and ^bCommunity Medicine, Kuwait University, ^cAir Biology Laboratory,
^dAl-Rashed Allergy Center, Kuwait

Key Words

Allergic rhinitis · Pollen · *Chenopodium*

Abstract

Background: Allergic rhinitis (AR) is the most common allergic problem in Kuwait. Most of the patients who have either AR or asthma are referred to the Al-Rashed Allergy Center. **Objective:** To determine if there is a seasonal variation in AR in Kuwait and to correlate it with the daily pollen count. **Methods:** Information about the new patients referred to the center over a 5-year study period (1996–2000) was extracted from the center's records. The daily pollen count in Kuwait city was obtained from the Air Biology Laboratory. **Results:** There was a significant seasonal variation with a bimodal increase in the number of patients with AR referred to the center. The main peak in the number of patients occurred in September–October, and there was a smaller peak in April–May. The mean number $\pm$ SD of new patients per month over the 5-year period varied from 87 ± 32 for December to 367 ± 104 for September. Similarly, the average daily pollen count varied from 3.7 ± 1.0 pollens per mm^3 in January to 124 ± 92 in October. There was high correlation between the number of new AR patients and the average

total pollen count (Pearson correlation, $r = 0.77$, $p < 0.001$), as well as with Chenopodiaceae and Amaranthaceae (weed) pollens ($r = 0.75$, $p < 0.001$), while there was no correlation between the number of new patients and either tree or grass pollens. **Conclusion:** Seasonal AR occurs during two periods in Kuwait, i.e. September–October and April–May, with September–October being the main season. The rise in AR during late summer in Kuwait is mainly associated with the pollination of Chenopodiaceae species.

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Introduction

Allergic rhinitis (AR) and asthma are the most common allergic diseases in Kuwait and worldwide, but the prevalence of asthma and AR symptoms varies considerably across the world [1, 2]. The prevalence of allergic rhinoconjunctivitis (ARC) symptoms varies from 0.8 to 14.9% in 6- to 7-year-olds and from 1.4 to 39.7% in 13- to 14-year-olds [2]. An international study found that in Kuwait, the rates of ARC symptoms were 5.8% for 6- to 7-year-olds and 16.2% for 13- to 14-year-olds, while the prevalence of asthma symptoms among children aged 13–

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1018–2438/04/1332–0164\$21.00/0

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Correspondence to: Dr. Nasser Behbehani
Department of Medicine, Kuwait University
PO Box 24923, Safat 13110 (Kuwait)
Tel. +965 5319596, Fax +965 5338907
E-Mail nasser_beh@hsc.kuniv.edu.kw

14 years was 16.1% [3]. In this international study, the rank of Kuwait was 13th in terms of prevalence of symptoms of asthma and 31st in terms of prevalence of symptoms of ARC among the 56 countries in which the survey was performed. This clearly demonstrates that respiratory allergies are a common medical problem in Kuwait.

Despite the fact that Kuwait is a desert country, the development of allergic diseases in general and AR in particular has been recognized since the 1950s, with the first report by Dr. W.M. Wilkinson [4], who was a British physician practicing in Kuwait. Because of Dr. Wilkinson's observation and the increasing prevalence of AR and asthma, a central allergy unit was established in Al-Sabah hospital in 1964. In 1984, the Al-Rashed Allergy Center was established, and this center has been and still is the only specialized center in allergic diseases in Kuwait, where most of the patients with allergic problems are referred. The objectives of this study were to determine if there is a seasonal variation in the number of new AR patients referred to the Al-Rashed Center and to correlate the number of patients with the known levels of outdoor inhaled allergens in Kuwait.

Patients and Methods

The number of new patients with AR and asthma referred to the Al-Rashed Allergy Center during the 5 years from 1996 to 2000 was obtained from the center's records. The diagnosis of AR was based on suggestive symptoms of nasal allergy, namely sneezing, itchiness, runny nose and nasal blockage. The diagnosis of allergy was based on a positive skin prick test or measurement of specific serum IgE to common allergens [5]. The skin prick test was performed using standardized allergen extracts (Allergopharma, Germany). The size of wheal was measured and the reaction was considered positive if the wheal diameter was 3 mm or greater than the negative control. Specific serum IgE was determined by enzyme fluorescence assay (Pharmacia CAP system, Pharmacia Diagnostic, Uppsala, Sweden). Other causes of rhinitis were excluded by clinical and radiological assessment when indicated.

The daily pollen count from a single monitoring station in Kuwait city was obtained from the Air Biology Laboratory (Al-Rashed Allergy Center). The monitoring station is situated in the Al-Mansouriya area at a height of 12 m above sea level. A Burkard volumetric spore trap was used to collect the air sample. It has a suction pump, which sucks air at 10 liters/min to draw the air sample into the trap. The air sampling was done hourly and the recording tape was collected weekly. The total pollen and fungi counts as well as individual pollen and fungi counts were determined for every day of the year by manual counting.

Data were processed using SPSS, version 11. Periodic regression analysis [6] was used to determine if there was a seasonal variation in the number of new patients with AR referred to the center.

Pearson correlation was used to define the correlation between the daily total pollen count, individual pollens and fungi and the number of new patients with AR.

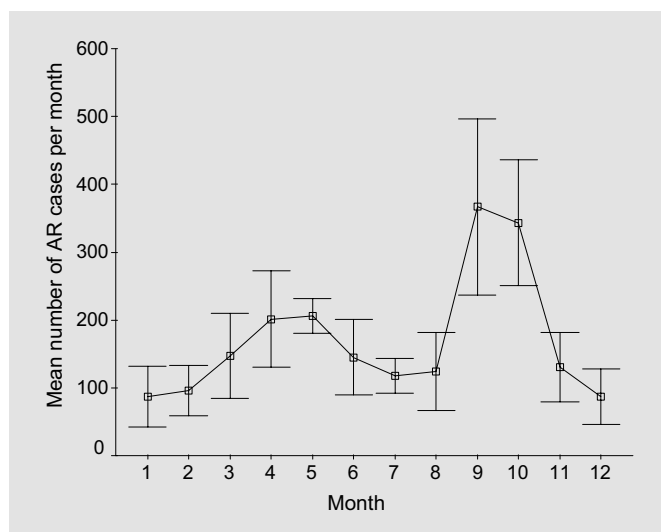


Fig. 1. Seasonal variation in the number of new AR cases referred to the allergy center over the 5-year period from 1996 to 2000. Error bars represent the 95% confidence interval around the mean.

Results

There was a statistically significant seasonal variation in the number of new AR patients referred to the Allergy Center ($p < 0.001$; fig. 1). The distribution of the number of patients with AR was bimodal, with the main peak occurring in September–October and a smaller peak in April–May. The mean numbers $\pm$ standard deviation of new patients per month over the 5-year period were 367 ± 104 , 343 ± 74 , 201 ± 57 and 206 ± 20 for the months of September, October, April and May, respectively. The mean number of new patients for the months of December and March was 87 ± 32 and 147 ± 50 , respectively. Similarly, the average daily pollen count peaked during the months of September and October, when it reached 104 ± 45 and 124 ± 92 pollens per mm^3 , respectively, while in January and April, the pollen count was 3.7 ± 1.0 and 41.8 ± 26.9 pollens per mm^3 , respectively. The most prevalent pollens found in Kuwait were weed pollens (Chenopodiaceae and Amaranthaceae group), which were the main pollens responsible for the peak in the pollen count in September–October (fig. 2). Grass pollens (Gramineae) contributed to the smaller peak in the pollen count, which occurred in April–May (fig. 2), while tree pollens were much less prevalent in Kuwait. There was a high correlation between the number of new AR patients and the average total pollen count ($r = 0.77$, $p < 0.001$;

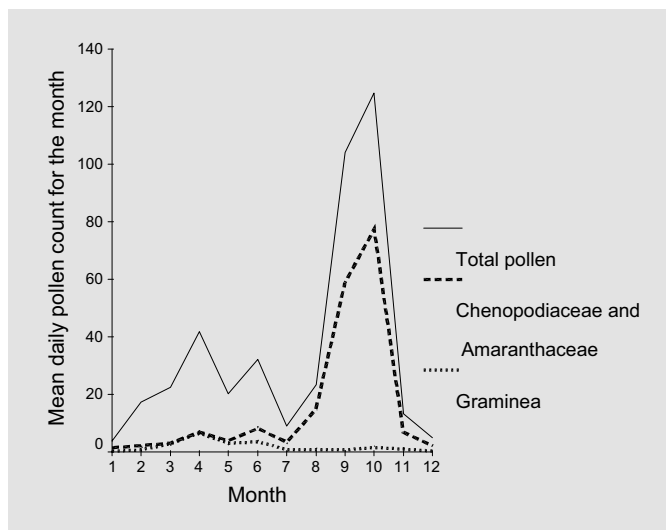


Fig. 2. Seasonal variation of the daily mean total pollen count and the two main pollens (chenopods and Gramineae). Chenopods contribute to the large peak observed in September–October. Gramineae have a small peak in April–May.

fig. 3). However, there was no correlation with the average total fungi spores ($r = -0.06$, $p = 0.2$). The only pollens that correlated with the number of new AR patients were Chenopodiaceae and Amaranthaceae (weed) pollens ($r_s = 0.75$, $p < 0.001$). There was no significant correlation between the number of AR patients and either grass or tree pollens.

Discussion

Our study showed that there is a significant seasonal variation in symptoms of AR in Kuwait, with a bimodal distribution. The main peak occurred during September–October, and a smaller peak occurred during April–May. This seasonal AR was mainly due to Chenopodiaceae (weed pollen) in the peak season.

AR is now divided into persistent and intermittent types [5]. Persistent (perennial) AR is usually due to exposure to indoor allergens like house dust mite or cat allergen, while intermittent (seasonal) AR is usually due to exposure to outdoor allergens. The season for AR and the main causative pollen vary in different regions of the world. AR due to ragweed is predominant in the eastern and Midwest regions of North America [7], while AR due to grass pollens and to a lesser extent tree pollens is common in Europe [8, 9]. Chenopods are widespread weeds

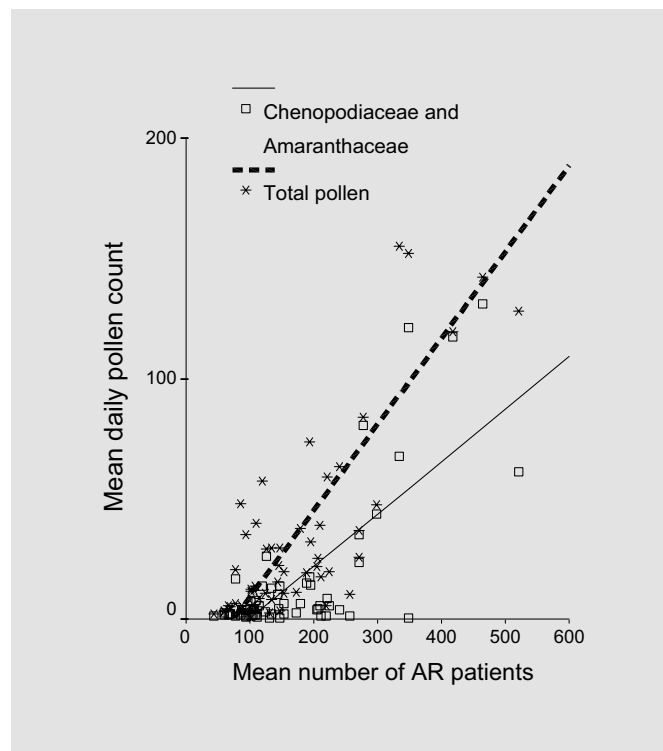


Fig. 3. Correlation between the average number of patients per month and the mean daily pollen count for that month for both total pollen ($r = 0.77$, $p < 0.001$) and the chenopod pollens ($r = 0.75$, $p < 0.001$).

and consist of two closely related families, the Chenopodiaceae and Amaranthaceae. Chenopods are predominantly spontaneous perennial plants growing on salt-enriched soils in areas of low population and hence have little allergenic effect [10]. However, chenopods are used as hedges or garden plants, and in some parts of the world like the south of Spain and Saudi Arabia, chenopods have emerged as an important cause of AR [11, 12]. In Kuwait, Chenopodiaceae species, especially *Chenopodium album* and *murale*, have been deliberately seeded in waste grounds since the early 1960s for the purpose of binding the sand [4], and they have been used over the last 20 years in an active greening program. The results of our studies show that chenopod pollens were the most prevalent airborne pollens in Kuwait. The peak pollination season for the chenopods coincides with the peak in AR symptoms, as evident from the distribution of the number of new AR patients who are referred to our allergy center. The fact that this center is the only referral center for most patients with AR and asthma allowed us to establish the seasonal pattern of AR in Kuwait. The date of assessment

at our center reflects the onset of symptoms, because patients who are referred to the center are usually seen the same day or within 1 week.

We did not report the pattern of sensitization among our patients in this study. However, there are several studies which describe the pattern of sensitization among patients with AR and asthma in Kuwait. In 1984, Ellul-Micallef and Al-Ali [13] found that the prevalence of atopy was 81% among 460 asthmatic patients seen at the allergy unit. In that study, the most common sensitizing agents were outdoor pollens like *Prosopis* (74%), *Chenopodium* (62%) and Bermuda grass (54%), while pet dander and house dust mite, which are indoor allergens, accounted for only 6 and 1.5%, respectively. In a recent case-control study, Ezeamuzie et al. [14] found sensitization to a specific allergen in 87.2% of asthma patients compared to 24.1% of nonasthmatic controls. Again, outdoor pollen sensitization was very high at 87.1%, and the three most common sensitizing pollens were *Chenopodium* (70.7%), Bermuda grass (62.9%) and *Prosopis* (62.7%). Similar results were obtained when a group of patients with AR only were studied [15]. The results of the above studies concur with our result that outdoor pollens, especially *Chenopodium*, are the most important sensitiz-

ing agents for respiratory allergies in Kuwait. The fact that we did not find a statistical correlation between the number of AR patients and other outdoor pollens like grass or tree pollens does not mean that these pollens are not allergenic. However, the contribution of these pollens to the total pollen count is small, but the grass pollens (Gramineae) in particular peak in April–May and are probably responsible in part for the smaller peak in the number of AR patients during this time.

In conclusion, our study shows that *Chenopodium* weed pollen is the most prevalent pollen in Kuwait, and its pollination season coincides with the onset of symptoms of seasonal AR. Since *Chenopodium* is a plant imported to Kuwait's desert environment, the results of our study should lead to a revision of the types of plant being seeded in Kuwait and some measures to control the spread of *Chenopodium* species in Kuwait.

Acknowledgements

We would like to thank Mrs. Suhaila Hussain and Mrs. Ahlam Bloushi from The Air Biology Laboratory for their dedicated work in the collection of the pollen data.

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