Adult Allergic Rhinitis in Aseer, Southwestern Region of Saudi Arabia: Prevalence and its Concomitant Aspects

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Abstract

Objective: To study the prevalence and factors associated with allergic rhinitis (AR) in Aseer region of southwestern Saudi Arabia.

Methods: A cross-sectional study was conducted on a representative sample of adults. We used an authenticated Arabic form of the International Study of Asthma and Allergies in Childhood questionnaire that was appropriately modified to fit the present adult survey.

Results: The present study included 960 adults. The prevalence of AR in the previous 12 months was 30.2% (95% confidence interval [CI]: 27.3–33.2). In the multivariate analysis, female sex (adjusted odds ratio [aOR]=1.49, 95% CI: 1.05–2.12), use of wood for heating (aOR=3.62, 95% CI: 1.14–6.03), exposure to trucks passing outside the dwelling (aOR=1.69, 95% CI: 1.22–2.36), and having cats in the household (aOR=2.24, 95% CI: 1.16–4.34) were factors significantly associated with AR.

Conclusion: AR is a community health problem in Aseer, southwestern Saudi Arabia. The magnitude of AR and its associated factors should be taken into consideration by the health policy decision makers, clinicians, and medical practitioners during the management of this condition.

Key words: Allergic rhinitis; associated factors; Saudi Arabia

Introduction

Allergic rhinitis (AR) is a common inflammatory condition of the nasal mucosa. It is characterized by paroxysms of nasal itching, sneezing, runny nose, and nasal obstructive symptoms. In most of the cases, it is associated with itching of palate, throat, ears, and eyes. These symptoms vary in severity among different individuals, but they can be incapacitating. In adults, they often lead to much sufferingand distress. Moreover, these symptoms have a destructive effect on the execution of daily actions, quality of sleep, work, and school performance as well as on psychosocial well-being of the affected individuals [1,2]. The subsequent societal expense is also considerable due to negative consequences on educational achievements and loss of efficiency at work [3].

AR is an IgE-mediated inflammatory response due to exposure to ubiquitous indoor and/or outdoor environmental triggers. Its symptoms are related to diffuse inflammation affecting the nasal mucosa and its adjacent paranasal sinuses. These symptoms may explain the new term allergic rhinosinusitis [2].

The etiology of AR is not easily explained by the presence of any one genetic or environmental factor. It is possible that multiple genes in combination with one another and specific environmental triggers are responsible for the clinical manifestations of AR. Family history represents a main risk factor for the occurrence of AR. The risk of developing atopic disease in the absence of parental family history was reported to be 13%. This risk increased to 29% if one parent or sibling was atopic, to 47% if both parents were atopic, and to 72% if both parents had similar atopic appearance [4]. Such genetic linkage analysis has been employed to collectively identify a multitude of genetic loci associated with a higher incidence of AR [5]. Environmental pollution and strong climate changes have also been linked to the development of AR in adults [6], while other factors such as good breast feeding and sufficient exposure to certain allergens (e.g., dogs) have been described to be protective against the development of AR in early life [7,8].

The prevalence of AR varies significantly among different countries, as demonstrated by a landmark study that reviewed self-reported symptoms of allergic rhinoconjunctivitis, asthma, and atopic dermatitis among 463,801 children aged 13 to 14 years from 56 nations [9]. Interestingly, there has been an overall increase in the prevalence of AR across most of the countries, particularly among young children when the International Study of Asthma and Allergies in Childhood (ISAAC) was repeated between 2002 and 2003 [10]. Data regarding AR in the Aseer region of southwestern Saudi Arabia are limited and even missing. The present study explored the prevalence and the issues associated with AR in the Aseer region of southwestern Saudi Arabia.

Methods

1. Design

The present cross-sectional survey included a representative sample of adults in Aseer region of Southwestern Saudi Arabia.

2 Portrayal of the study region

Aseer region stretches from the high chain of mountains called *Sarawat* to the eastern coast of the Red Sea. The climate in this area varies depending on the altitude and the proximity to the sea. This chain of mountains includes Saudi Arabia's highest mountain *Al-Sooda*, which is approximately 3,200 meters above sea level . Cool temperatures characterize these mountainous areas and frost and snow occur occasionally during winter. A very narrow Red Sea coastal plain called *Tehama* is present to the west of these mountains. It is a hot and humid area for most of the year. A number of inhabited cities, towns, and villages are scattered in most of these areas [11]. Health care facilities in the study area include 23 hospitals and 247 primary health care centers (PHCCs).

3 Target Population

Adult males and females who attended any of the selected PHCCs for any reason were the target group for the study. Adults were defined as individuals aged 20 years or older. Using the World Health Organization (WHO) manual for sample size determination in health studies [12] with a conservative anticipated proportion of 28.8% [13] from the Riyadh study and an absolute precision of 3% at 95% confidence interval (CI), the minimum sample size required for the study was calculated to be 876 adults.

4 Sampling Technique

Five PHCCs were randomly selected. Selection of these PHCCs took into account their urban, rural, low-altitude, and high-altitude locations. The selected centers were *Al Manhal* (urban, at an altitude of 2,300 meters above sea level); *Al Mowazafin* (urban, at an altitude of 2300 meters above sea level); *Muhayel* (urban, at an altitude of 400 meters above the level); *Tharaban* (rural, at an altitude of 200 meters above sea level); and *Al-Sooda* (urban, at an altitude of 3200 meters above sea level).

5 Data Collection

The present study used a validated Arabic version of the ISAAC questionnaire that was suitably modified to fit the present adult survey and AR. This questionnaire was used for adults of all ages, as our study aimed to analyze AR in all adults in the study areas. The questionnaire has previously been compared to the European Community Respiratory Health Survey [14,15] and has been found to be adequately valid. As stated in the ISAAC questionnaire, *sneezing, runny nose, or blocked nose while not having a cold or the flu in the past 12 months* was used as proxy for AR prevalence.

The data collection form also included demographic data, environmental exposures according to the type of housing, fuel used for cooking and heating, and animals inside the house.

6 Field Visits
Scheduled visits to the selected centers were arranged by the study field teams. During such visits, men and women attending the selected PHCCs for any reason were invited to participate in the study. A signed informed consent was obtained from each subject before inclusion in the study.

7 Data Analysis
The compiled data were validated and analyzed using IBM SPSS Statistics version 22.0 (IBM Corp., Armonk, NY, USA). Frequency and 95% CIs were used to present the AR prevalence. Univariate and binary logistic multivariate regression were used to identify potential factors associated with AR. Crude odds ratio, adjusted odds ratio (aOR), and their concomitant 95% CIs were used to present the results. Variables included in the univariate and in the multivariate analysis were gender, age, altitude, residence, smoking, body mass index (BMI), exposure to trucks passing outside the house, usage of wood for heating, usage of wood for cooking, and presence of sheep, camels, cats, and dogs inside the house. Hosmer–Lemshow test was used to test the fitting of the model.

Results

1 Description of the study sample
The present study included 960 adults. The sample included 705 men (73.4%) and 255 women (26.6%). The ages ranged from 20 years to 95 years with a mean of 39.43 ± 14.63 years and a median of 36 years. The study sample included 446 individuals from high-altitude areas (47.5%) and 514 from low-altitude areas (53.5%). The study included 492 individuals from urban areas (51.3%) and 468 from rural areas (48.7%). The majority of the sample were living in concrete houses (734, 76.5%), had electricity (949, 98.9%), and had no animals in their households (618, 64.4%).

2 Prevalence of Adult AR
The study reported a prevalence of 30.2% (95% CI: 27.3–33.2) with 290 adults having AR in the past 12 months. The prevalence of AR in the past 12 months was 27.4 % (n=193) among men and 38.8% (n=97) among women. The difference was statistically significant (P=0.001).

3 Seasons related to adult AR in the past 12 months
Among the adults reporting AR in the past 12 months, 39.3% reported having AR in winter (December–February), 23.1% reported having AR in spring (March–May), and 21.4% reported having AR in autumn (September–November). Only 16.2% adults reported having AR in summer (June–August).

4 Factors associated with AR in the past 12 months
Table 1 shows the univariate and the multivariate analyses of personal and environmental outdoor and indoor factors associated with AR. In the multivariate analysis, gender was a significant associated factor. Females were significantly more likely to have AR (aOR=1.49, 95% CI: 1.05–2.12) compared to males. Similarly, individuals who were using wood for heating had significantly more chances of having AR (aOR=3.62, 95% CI: 1.14–6.03) compared to those who did not use wood. Exposure to trucks passing outside the dwellings (aOR=1.69, 95% CI: 1.22–2.36) and presence of cats in the house were also the factors significantly associated with AR (aOR=2.24, 95% CI: 1.16–4.34). Having wheezes in the past 12 months was significantly associated with AR in the multivariate analysis (aOR=3.54, 95% CI: 2.49–5.03). Age, altitude, rural or urban residence, history of smoking, BMI, use of wood for cooking, and presence of sheep, camels, and dogs were not significantly associated with AR in the past 12 months.

Diiscussion

Worldwide, the incidence of AR is mounting. A WHO report has pointed out that about 40% of the overall population may have allergic diseases including AR [16]. The present study in Aseer region revealed an AR prevalence rate of 36.1% (95% CI: 33.1–39.3) among adults.

A study from Denmark has reported a rising trend in the prevalence of allergic respiratory diseases over the preceding decades [17]. This increasing trend may be attributed to environmental factors such as increasing levels of air pollution, climatic changes, and heat trapping [18]. The prevalence of AR among adults in Europe and the USA ranges from 10% to more than 30% [19,20]. In Asia, AR affects a large sector of the population, varying from 27% in South Korea [21] to 53% in Malaysia [22].

In Saudi Arabia, studies have shown that the prevalence of AR varied according to geographical location. It was 24.7% in the western region [23] and 51% in Hail [24]. Another study showed that the prevalence of AR was 34% across 14 PHCCs in Saudi Arabia [24]. These differences may be attributed to variations in the study population characteristics, study tools, and the extent of environmental exposure [21]. Saudi Arabia is affected by frequent sandstorms in all seasons. Sandstorms may carry numerous types of allergens and dirt particles that can initiate or exacerbate allergic respiratory diseases including AR [25]. Other contributing factors for the relatively high prevalence of AR in Saudi Arabia may include rapidly changing lifestyle and environmental aspects such as urban living, smoking, and air pollution [26].

The present study reported that women were significantly more likely to have AR (aOR=1.49, 95% CI: 1.05–2.12) than men. A study in Mexico that used tools similar to the present study reported findings consistent with our findings [27]. A nationwide study in Saudi Arabia also reported a female predilection of AR [28]. Experimental studies have shown that female patients with AR demonstrated higher levels of sensitivity to irritants and airway hyperresponsiveness than male patients. Studies have demonstrated that sex hormones, primarily estrogens, affect mast cell activation. Mast cell proteases can amplify neurogenic inflammatory responses including the release of neurokinin substance B. This difference may explain the female predilection of AR [29].

Table 1: Univariate and Multivariable analysis of personal and environmental outdoor and indoor factors associated with adult Allergic Rhinitis (AR) in the past 12 months in Aseer region, southwestern Saudi Arabia

Personal and environmental Factors	No-AR group n (%)	AR group n (%)	cOR (95% CI)	aOR (95% CI)
Sex				
Males	512 (72.6)	193 (27.4)	Ref.	Ref.
Females	158 (52.8)	97 (38.0)	**1.63 (1.21–2.21)**	**1.49 (1.05–2.12)**
Age (years)				
18-29	476 (70.4%)	200 (29.6%)	Ref.	Ref.
30+	194 (68.3%)	90 (31.7%)	1.11 (0.88 – 1.49)	1.24 (0.89 –1.75)
Altitude				
High	314 (70.4)	132 (29.6)	Ref	Ref
Low	356 (69.3)	158 (30.7)	1.05 (0.81 – 1.39)	1.14 (0.81 – 1.59)
Residence				
Urban	346 (70.3)	146 (29.7)	Ref	Ref
Rural	324 (69.2)	144 (30.8)	1.06 (0.80 -1.38)	0.93 (0.69 -1.26)
Ever smoking				
No	459 (68.8)	208 (31.2)	Ref	Ref
Yes	211 (72.0)	82 (28.0)	0.86 (0.63 – 1.16)	0.99 (0.71 – 1.39)
BMI				
Normal	223 (72.9)	83 (27.1)	Ref	Ref
Overweight and Obesity	447 (68.3)	207 (31.7)	1.24 (0.92 – 1.68)	1.39 (0.99 – 1.94)
Trucks outside				
No	522 (72.7)	196 (27.3)	Ref	Ref
Yes	148 (61.2)	94 (38.8)	**1.69 (1.25 – 2.29)**	**1.69 (1.22 – 2.36)**
Wood for Heating				
No	658 (70.8)	272 (29.2)	Ref	Ref
Yes	12 (40.0)	18 (60.0)	**3.62 (1.72 -7.36)**	**2.62 (1.14 – 6.03)**
Wood for cooking				
No	658 (70.1)	281 (29.9)	Ref	Ref
Yes	12 (57.1)	9 (42.9)	1.759 (0.73 – 4.22)	1.01 (0.36 – 2.81)
Sheep and goats				
No	489 (71.4)	196 (28.6)	Ref	Ref
Yes	181 (65.8)	94 (34.2)	1.29 (0.96 – 1.74)	1.18 (0.82 – 1.71)
Camels				
No	645 (70.1)	275 (29.9)	Ref	Ref
Yes	25 (62.5)	15 (37.5)	1.41 (0.73 – 2.71)	1.35 (0.63 – 2.91)
Cats				
No	642 (71.3)	259 (28.7)	Ref	Ref
Yes	28 (47.5)	31 (52.5)	**2.74 (1.61 – 4.67)**	**2.24 (1.16 – 4.34)**
Dogs				
No	658 (69.8)	285 (30.2)	Ref	Ref
Yes	12 (70.6)	5 (29.4)	0.96 (0.33 – 2.76)	0.42 (0.11 – 1.47)
Wheezes in the past 12 months				
No	588 (75.8)	188 (24.2)	Ref	Ref
Yes	82 (44.6)	102 (55.4)	**3.89 (2.78 – 5.43)**	**3.54 (2.49 – 5.03)**

cOR = Crude Odds Ratio, aOR = Adjusted Odds Ratio for other studied personal and environmental factors, 95% CI = 95%Confidence Interval. Bold 95% CIs are statistically significant. Hosmer-Lemshow Chi-square= 10.18, P=0.253 (Indicating a goof fit of model)

The present study showed that having cats in the household was a factor significantly associated with AR (aOR=2.24, 95% CI: 1.16–4.34). A study among University students in Japan revealed that having a pet at home was significantly associated with AR and the effects of pets on AR varied according to the timing of animal exposure or the age at which the subjects were evaluated [30].

The present study reported other environmental exposures as significant determinants of AR in the studied region. Individuals who were using wood for heating were significantly more likely to have AR (aOR=3.62, 95% CI: 1.14–6.03) than those who did not use wood. Exposure to trucks passing outside the individual's place of residence (aOR=1.69, 95% CI: 1.22–2.36) was also found to be a factor significantly associated with AR. A nationwide cross-sectional study in Saudi Arabia reported environmental triggering factors such as dust, pollens, and fur as factors significantly associated with AR [26]. In China, a study found significant association of AR with living near a main road or a highway [31].

The present study showed that having wheezes in the past 12 months was a factor significantly associated with adult AR (aOR=3.54, 95% CI: 2.49–5.03). Similar findings were reported in Ukraine [32] and in Oman [33]. The relationship between AR and asthma has been reported repeatedly in scientific publications, which confirmed the affinity of the anatomy of the mucous membranes of the upper and the lower respiratory tracts and the course of pathophysiological processes in these tracts. Inflammation in AR and asthma occurs with the involvement of identical triggers, immunocompetent cells, and inflammatory mediators [34]. Due to the cross-sectional design of the present study, the temporality of this association could not be assessed.

Conclusion

The present study revealed increased prevalence rates of AR in Aseer region. The study showed that certain environmental exposures including use of wood for heating, trucks passing outside the dwellings, and presence of cats in the household were significantly associated with AR. Magnitude of AR should be taken into consideration by the health policy decision makers, clinicians, and medical practitioners while diagnosing and treating related conditions.

Conflicts of Interests:
There are no conflicts of interest.

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