

# Prevalence of Rhinitis Symptoms Among 16 to 18 Years Old Adolescents in Saudi Arabia

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## ABSTRACT

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**Objective.** The present study was designed to estimate the prevalence of rhinitis symptoms among secondary school students in Saudi Arabia

**Methods.** A cross-sectional study was conducted among children from secondary schools in the city of Riyadh. The study utilised the International Study of Asthma and Allergies in Children (ISAAC) questionnaire.

**Results.** Among the 3073 students (1504 boys and 1569 girls), the prevalence of life-time rhinitis, rhinitis in the past 12 months, and hay fever were 43.8%, 38.6% and 21.3%, respectively. There was a significant difference between boys and girls in the prevalence of life-time rhinitis (41% *versus* 46.5%,  $p=0.02$ ) and the prevalence of rhinitis in the past 12 months (35.1% *versus* 41.9%,  $p=0.001$ ). There was no significant difference between boys and girls in the prevalence of hay fever (22.5% *versus* 20.2%,  $p=0.144$ ). The prevalence of asthma symptoms among students with life-time rhinitis and hay fever were 35.4% and 39.9%, respectively. Asthma symptoms were strongly linked with life-time rhinitis (Odds Ratio [OR]=2.5,  $p<0.001$ ) and hay fever (OR=2.4,  $p$  value $<0.001$ ).

**Conclusions.** The prevalence of rhinitis symptoms is high among 16 to 18 years old adolescents in Saudi Arabia, and symptoms are more common in girls compared to boys. Rhinitis symptoms are also associated with a high frequency of asthma symptoms. [Indian J Chest Dis Allied Sci 2013;55:11-14]

**Key words:** Rhinitis, Prevalence, ISAAC, Saudi Arabia.

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## INTRODUCTION

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The prevalence of allergic rhinitis and other allergic diseases has increased globally in the last three decades, and the geographical prevalence rates vary from 10% to 45%.<sup>1-4</sup> In addition to genetic factors, lifestyle factors influence the prevalence of allergic rhinitis and other allergic diseases. These include changing life styles, increasing vehicular pollution, increasing ownership of indoor plants and pets, choice of bedding and carpets, and an increasing use of air conditioning.<sup>1-4</sup> In addition, the increase in the prevalence of allergic rhinitis and other allergic diseases may also be attributed to changes in the perception of symptoms among patients and increased awareness and diagnosis of allergic diseases among healthcare professionals.

There have been a limited number of epidemiological studies in population older than 16 years old from Saudi Arabia and the Eastern Mediterranean region. However, among children below the age of 15 years, Al Frayh and

Colleagues<sup>5</sup> reported an increasing prevalence of rhinitis from 20% in 1986 to 25% in 1995. Another study<sup>6</sup> that used the International Study of Asthma and Allergies in Childhood (ISAAC) phase 1 questionnaire to evaluate rhinitis symptoms indicated a 26.5% prevalence among 6 to 15 years old children in Saudi Arabia. More recently, a study that also used the ISAAC questionnaire reported a prevalence rate of 12.7% of allergic rhinitis in school children between the age of 4 to 16 years.<sup>7</sup>

The objective of the present study was to report the prevalence of allergic rhinitis among secondary school students (16 to 18 years old boys and girls) in Riyadh, Saudi Arabia using the ISAAC questionnaire. This study also aimed to investigate the association of rhinitis symptoms with those of asthma. The present study was part of a larger survey that was conducted by the Saudi Thoracic Society to address the prevalence and characteristics of asthma, rhinitis and smoking habits among secondary school students in Riyadh, Saudi Arabia.<sup>8</sup>

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## MATERIAL AND METHODS

The present study was a cross-sectional survey that used the ISAAC questionnaire to examine secondary school students (16 to 18 years old) in Riyadh, Saudi Arabia. At the time of the study, there were 160 secondary schools (including 72 private schools) for boys and 245 secondary schools (including 113 private schools) for girls in Riyadh. The total number of secondary school students in Riyadh during the 2009-2010 academic year was 161,223; 83056 boys (51.5%) and 78167 girls (48.5%). Schools and students were selected using a two-stage cluster sample. In the first sampling stage, a random selection method was used to select 46 secondary schools from a list of 405 schools, that yielded in a total of 19834 students (9771 boys and 10063 girls). To conduct the sampling, we divided Riyadh into four districts (northern, eastern, southern, and western) based on proximity to two major highways. Fifteen percent of the boys schools and 10% of the girls schools were selected from each district based on proportional probability. Fourteen schools were selected from the eastern district (7 boys schools and 8 girls schools), 12 schools from the northern district (6 boys schools and 6 girls schools), 10 schools from the western district (5 boys schools and 4 girls schools), and 10 schools from the southern district (5 boys schools and 5 girls schools). During the second sampling stage, 3 classes (one per grade level) were selected from each school. Thus, a total of 138 classes were identified in the sample. Each class was considered to be a cluster, and all the students in the selected classes constituted the target group of the present study. The participants were interviewed by trained medical students, and the participants completed the questionnaires in the classroom under their supervision. The medical students received a half-day training session that covered an overview of the study and its methodology and were taught to avoid explanations that could interfere with the participants' answers. The following variables were collected with the ISAAC questionnaire: lifetime rhinitis symptoms (whether rhinitis had ever occurred), rhinitis symptoms in the past 12 months, associated itchy-watery eyes, rhinitis symptoms interfering with daily activities and history of hay fever.

The study was conducted with the permission from the Ministry of Education. We received approval from the Research and Ethics Committee of the Saudi Thoracic Society. Verbal consent was given by the students after we explained the purpose of the study and emphasised that the surveys would be

anonymous and that the data would be kept confidential during handling and storage.

## Statistical Analysis

The data were analysed using a statistical software tool (PASW 18.0). All of the variables were summarised and reported across the study sample using descriptive statistics. An odds ratios (OR) with a corresponding 95% confidence interval (95% CI) was calculated for the risk factors (type of school, and asthma symptoms) that exhibited a significant association with prevalence. A p-value of  $\leq 0.05$  was considered significant.

## RESULTS

A total of 3400 questionnaires were distributed to the students, and 117 students refused to participate, giving an overall participation rate of 96.5 percent. Some questionnaires were incomplete (n=210) and had to be excluded. After exclusion, the total sample size was 3073 (90.3%) students. The present study collected 1504 questionnaires from boys (48.9%) and 1569 questionnaires from girls (51.1%). The distribution of the study population is shown in table 1. The prevalence of life-time rhinitis, rhinitis during the past 12 months, and hay fever were 43.8%, 38.6% and 21.3%, respectively (Table 2). There were significant differences in the prevalence of life-time rhinitis between boys and girls (41% *versus* 46.5%,  $p=0.02$ ) and the prevalence of rhinitis during the past 12 months (35.1% *versus* 41.9%,  $p=0.001$ ). There was no significant difference, however, in the prevalence of hay fever between boys and girls (22.5% *versus* 20.2%,  $p=0.144$ ).

**Table 1. Distribution of the study sample**

	Boys No. (%)	Girls No. (%)	All No. (%)
<b>Total Students</b>	1504 (48.9%)	1569 (51.1%)	3073 (100.0%)
<b>Grade</b>			
Grade 1	510 (33.9%)	504 (32.1%)	1014 (33.0%)
Grade 2	492 (32.7%)	533 (34.0%)	1025 (33.4%)
Grade 3	502 (33.4%)	532 (33.9%)	1034 (33.6%)
<b>Type of School</b>			
Government	677 (45.0%)	817 (52.1%)	1494 (48.6%)
Private	827 (55.0%)	752 (47.9%)	1579 (51.4%)

With regard to the assessment of the severity of rhinitis symptoms, the majority of students (58%) experienced associated itchy eyes in the past 12 months, and almost half of them (49%) reported that rhinitis interfered with their daily activities (Table 2). There were significant differences in the prevalence of life-time rhinitis between students of private and governmental schools ( $p=0.004$ ). However, there was

no significant difference, in the prevalence of hay fever between type of the schools ( $p=0.288$ ). The prevalence of asthma symptoms among students who suffered from life-time rhinitis and hay fever were 35.4% and 39.9%, respectively. Asthma symptoms were strongly linked with life-time rhinitis (OR=2.5, CI 2.1-3.0,  $p$  value < 0.001) and hay fever (OR=2.4, CI 2.0-2.9,  $p$  value < 0.001).

**Table 2. The prevalence rates of rhinitis and associated symptoms**

Symptoms	Boys No. (%)	Girls No. (%)	Total No. (%)	P value
Life-time rhinitis	616 (41)	730 (46.5)	1346 (43.8)	<0.002
Rhinitis in the past 12 months	527 (35.1)	657 (41.9)	1185 (38.6)	<0.001
Itchy eyes in the past 12 months	285 (54)	402 (61.2)	688 (58)	
Rhinitis interfering with daily activities	228 (44.2)	339 (52.7)	568 (49)	
Hay fever	338 (22.5)	317 (20.2)	655 (21.3)	0.114

## DISCUSSION

The present study established the prevalence of rhinitis symptoms and hay fever among secondary school students in Riyadh, Saudi Arabia and their association with asthma symptoms. The prevalence of lifetime rhinitis, rhinitis during the past 12 months, and hay fever were 43.8%, 38.6% and 21.1%, respectively. *To the best of our knowledge, the present study was the first study to address the prevalence of rhinitis among 16 to 18 years old secondary school students in Saudi Arabia.* We used the ISAAC questionnaire, which is a validated tool that was developed to obtain the prevalence of asthma, rhinitis and eczema in various parts of the world and to compare the prevalence between countries and assess future trends in the prevalence of allergic diseases. The sparse data available till now on rhinitis in Saudi Arabia and other Eastern Mediterranean countries have primarily been collected from children who were younger than 16 years old using either the ISAAC questionnaire or other research tools.<sup>5,6,9</sup>

Large international, multi-centre studies have shown significant variations in the prevalence of rhinitis and other allergic diseases between various parts of the world, between various age groups, and between different socio-economic classes. The multi-centre studies have also indicated significant variations in the severity of each of the conditions. The multi-factorial nature of rhinitis, especially with

regards to the environment, affluence lifestyles, pollution, and climate, makes it difficult to match data with an identical population group, and the phase three ISAAC publications have demonstrated this problem.<sup>1</sup> The World Allergy Organization recently published the White Book on Allergy (2011), that reported allergic rhinitis to affect between 10% and 30% of all adults and as many as 40% of children. The World Health Organization has estimated that 400 million people in the world suffer from allergic rhinitis.<sup>10</sup>

In Gulf region, the prevalence of current allergic rhinitis among children in Kuwait, Oman, and Qatar was 30.7%, 10.5% and 22.5%, respectively.<sup>11-13</sup> Compared with the previous studies, the present study revealed the highest prevalence rate of allergic rhinitis in the region, that may be attributed to continuing changes in the region that have been observed in the last three decades, such as, changes in lifestyles, vehicular pollution, modernisation, and urbanisation. In addition, the high prevalence of rhinitis may be attributed to an increase in awareness and better reporting among the general population and healthcare workers. Nevertheless, Harfi *et al*<sup>7</sup> reported a low prevalence rate of 12.7% for allergic rhinitis in more than 1000 school children in Riyadh city. A disproportionate ratio of boys to girls (3:1) and the exclusion of children from the low socio-economic strata may have contributed to the low rate. The low prevalence rate reported by Harfi *et al*<sup>7</sup> needs to be confirmed along with continued identification of contributing factors that predispose school children to allergic rhinitis and other allergic diseases.

The present study shows that girls report more rhinitis symptoms during the preceding 12 months compared with boys. "Hormonal rhinitis" and a higher rate of cosmetic use may account for the higher reported rate of symptoms in the girls.<sup>14,15</sup> The present study also revealed that the prevalence of asthma symptoms was high in subjects with allergic rhinitis, which indicated a strong link among subjects with rhinitis and hay fever. This result was expected and is consistent with previous studies in the literature.<sup>16-18</sup> International studies<sup>16-18</sup> have demonstrated a varying association between rhinitis and asthma with a range of 40% to 90%. Asthma and rhinitis often represent a spectrum of the same disease (the one-airway hypothesis). The association between asthma and rhinitis is related to several factors, including the neural nasal-bronchial interaction, disturbances of the nasal mucosa warming and humidification functions, drainage of irritant and inflammatory materials into the lungs and the presence of similar cellular infiltrates and pro-inflammatory mediators in both the upper and lower airways.

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## CONCLUSIONS

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The present study demonstrated a high prevalence of rhinitis symptoms among 16 to 18 years old adolescents in Saudi Arabia. Rhinitis symptoms were more common in girls compared with boys. Further, the results indicated that rhinitis symptoms are also associated with a high frequency of asthma symptoms.

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