

# Epidemiology of Allergic Rhinitis among Children in Jazan Region, Saudi Arabia

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**Abstract:** The prevalence of allergic rhinitis and other allergic diseases has increased globally, and the geographical prevalence rates vary.

**Objective:** This study was designed to identify the prevalence of allergic rhinitis symptoms among school age children in Jazan Region Saudi Arabia.

**Methods:** A cross-sectional study was conducted among children from elementary and intermediate schools in Jazan region. The study used the International Study of Asthma and Allergies in Children (ISAAC) questionnaire.

**Result:** The number of students studied was 1152 the boys were 591 (57.3%) and the girls were 441 (42.7%). The symptoms suggestive of ever-having had AR were common, affecting 25.7% of children overall, with an estimated 19.3% experiencing symptoms of sneezing in the last 12 months. The prevalence of children with parental reports of ever having a clinician diagnosis of allergic rhinitis was 13.1% overall. The prevalence and frequency of symptoms according to the seasons (winter, summer, spring and autumn) was 140 (13.6%), 224 (21.7%), 99 (9.6%) and 37 (3.6%) respectively. The frequency symptoms may involved the nose only, eye only or both was 130 (12.6%), 107 (10.4%) and 108 (10.5%) respectively. According to the severity of symptoms 131 (12.7%) students had nose problem interfere with their daily activities in the last 12 months.

**Conclusion:** This study found the prevalence of AR among school age children in Jazan was 25.7%, although it is within range of reported prevalence rates from various parts of the world. Only 24.5% of those with AR-related symptoms were confirmed by doctors, they do not consider AR as a disease.

**Keywords:** prevalence, allergic rhinitis, ISAAC, Jazan region.

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## 1. INTRODUCTION

Allergic rhinitis (AR) is defined clinically by nasal hypersensitivity symptoms induced by an immunologically mediated inflammation mostly IgE dependent after the exposure to an offending allergen. Symptoms of rhinitis include rhinorrhea, nasal obstruction or blockage, nasal itching, sneezing, and postnasal drip that are reversible spontaneously or under treatment. Allergic conjunctivitis often accompanies allergic rhinitis.

Allergic rhinitis represents a global health problem affecting 10 to 20% of the population, which is not reflecting the true prevalence of this condition. Many patients do not consider AR as a disease and actually the prevalence of AR is increasing worldwide [1]. Despite AR is not usually a severe disease, it affects patients' social life, school performance, and work productivity. Most of patient surveyed in several regions of the world missed work or had their work performance affected by allergies in the past year, with work productivity decreasing by 30% in patients from the Middle East when allergy symptoms were at their worst (23% in America, 24% in Asia Pacific and 33% in Latin America) [2].

There are few studies reporting the prevalence of the allergic rhinitis in Saudi Arabia (SA), the most recent studies determine prevalence around 10-25 % [2-4]. The limited available data in SA on allergic disorders are largely confined to asthma, with studies indicating that the prevalence in SA varies anywhere between 8–15% in children, these studies are, however, relatively small-scale, are affected by methodological limitations [5-6]. These self-reporting studies could underestimate the prevalence (by not recognizing the symptoms as a disease or not having a medical diagnosis) or overestimate (by considering any kind of rhinitis not only allergic rhinitis).

The International Study of Asthma and Allergy in Children (ISAAC) phase I protocol was designed to identify the symptoms of asthma, AR and eczema. The data generated from these surveys can estimate the prevalence of these health problems, which based on the symptomatology and participants perception.

The aim of this study was to estimate the prevalence of AR in children in SA using the validated Arabic version of the ISAAC questionnaire.

## 2. MATERIAL AND METHOD

### *Study Area:*

This study conducted in Jazan (also called Gizan) region is one of the thirteen regions of the Kingdom of SA. It is located on the tropical Red Sea coast in southwestern Saudi Arabia. Jazan covers an area of 11,671 square kilometers, including some 5,000 villages and towns with a total population of 1.5 million. This study was cross-sectional study conducted among school children within Jazan region, Saudi Arabia over a period of 3 months to fulfill the proposed objectives.

### *Sample Design and Size:*

The ultimate objective of the study was to estimate the prevalence of AR among school children in Jazan region, SA. For this purpose, multistage cluster random sampling utilized. Jazan Region geographically is classified into three geographical distinct zones, the mountain, hills and the coastal zones. Following Cochran (1977), the suitable sample size determined on the bases of the standard formula given by:

$$n = \frac{Z^2 \pi(1 - \pi)}{d^2}$$

Where:

n: the sample size.

$\pi$ : is an anticipated proportion here, the prevalence of asthma.

Z: the standardized variable that corresponds to 95% level of confidence.

d: the desired marginal error.

Since there is no prior knowledge about the prevalence of AR in Jazan region we will set the values  $\pi = 0.5$  to provide the maximum sample size, d the desired marginal error = 0.05 and  $z=1.96$ , the study sample size, denoted (n), is given by:

$$n = \frac{(1.96)^2 \times (0.5) \times (0.5)}{(0.05)^2} = 384$$

Since the sample proportion to the total population is less than 0.05 of the total number of school students in Jazan region, we don't need to use the finite population correction factor to adjust the sample size. However, in order to increase precision, which might be lost as a result of adopting multi-stage cluster sampling method, we multiply the sample size (n) by the design effect factor, which is the ratio of the variance of estimates for a particular sample design to the variance of estimates for a simple random sample of the same size. The design effect is equal to the number of geographical zones in Jazan region, so that the minimum sample size required is 1152. The sample size distributed between both sexes according to the sex ratio in the schools. The schools as well students in the different clusters selected using simple random technique. For that the sample were distributed according to the three geographical areas costal, plain and mountain as 236, 808 and 108 respectively.

### *Data collection and analysis:*

Data collected using structured questionnaire that developed by ISAAC. The questionnaire written in Arabic and were mainly address to target group and filled by their parents. These data had been entered and analyzed using Statistical Package for Social Sciences (SPSS) software version 20.0.

## 3. RESULT

A total of 1152 questionnaires were distributed to the students, 18 questionnaires were removed due to incomplete data. The overall response rate was 91.0% for that the final total sample size was 1052 students. Most of the study population was Saudi 911 (88.3%). Male students completed 591 (57.3%) questionnaires, and female completed 441 (42.7%). The background characteristics of the study population are shown in Table I. The mean age of them was  $13.2 \pm 1.5$  years. Most of study population was lived in plain area 718 (69.6%) and intermediate school students were 643 (62.3%) of all study population.

**Table I: The background characteristics of the study population**

Total students		Gender		Total
		Boys	Girls	
		591 (57.3%)	441 (42.7%)	1032 (100%)
Age	10 years old	20 (1.9%)	18 (1.7%)	38 (3.6%)
	11 years old	67 (6.5%)	50 (4.8%)	117 (11.3%)
	12 years old	121 (11.7%)	67 (6.5%)	188 (18.2%)
	13 years old	139 (13.5%)	99 (9.6%)	238 (23.1%)
	14 years old	95 (9.2%)	96 (9.3%)	191 (18.5%)
	15 years old	149 (14.5%)	111 (10.8%)	260 (25.3%)
	<b>Total</b>	<b>591 (57.3%)</b>	<b>441 (42.7%)</b>	<b>1032 (100%)</b>
Nationality	Saudi	506 (49.0%)	405 (39.3%)	911 (88.3%)
	Non-Saudi	85 (8.3%)	36 (3.4%)	121 (11.7%)
	<b>Total</b>	<b>591 (57.3%)</b>	<b>441 (42.7%)</b>	<b>1032 (100%)</b>
Residency	Urban	307 (29.8%)	271 (26.2%)	578 (56.0%)
	Rural	284 (27.5%)	170 (16.5%)	454 (44.0%)
	<b>Total</b>	<b>591 (57.3%)</b>	<b>441 (42.7%)</b>	<b>1032 (100%)</b>
Geographical Distribution	Coastal	149 (14.4%)	62 (6.0%)	211 (20.4%)
	Plain	383 (37.1%)	335 (32.5%)	718 (69.6%)
	Mountain	59 (5.8%)	44 (4.2%)	103 (10.0%)
	<b>Total</b>	<b>591 (57.3%)</b>	<b>441 (42.7%)</b>	<b>1032 (100%)</b>
Level of education	Elementary	228 (22.1%)	161 (15.6%)	389 (37.7%)
	Intermediate	363 (35.2%)	280 (27.1%)	643 (62.3%)
	<b>Total</b>	<b>591 (57.3%)</b>	<b>441 (42.7%)</b>	<b>1032 (100%)</b>

The prevalence of AR-related symptoms is shown in Table II, which revealed the symptoms suggestive of ever-having had AR were common, affecting 25.7% of children overall, with an estimated 19.3% experiencing symptoms of sneezing in the last 12 months. The prevalence of children with parental reports of ever having a clinician diagnosis of allergic rhinitis was 13.1% overall. The prevalence and frequency of symptoms according to the seasons (winter, summer, spring and autumn) was 140 (13.6%), 224 (21.7%), 99 (9.6%) and 37 (3.6%) respectively. The frequency symptoms may involved the nose only, eye only or both was 130 (12.6%), 107 (10.4%) and 108 (10.5%) respectively. According to the severity of symptoms 131 (12.7%) students had nose problem interfere with their daily activities in the last 12 months as shown in table II.

**Table II: Prevalence of AR-related symptoms**

#	Items	M	F	Total	P
1	Ever had a problem with sneezing, or a runny, or blocked nose when you DID NOT have a cold or the flu?	141 (13.7%)	124 (12.0%)	265 (25.7%)	0.131
2	Sneezing, or a runny, or blocked nose in the last 12 months when you DID NOT have a cold or the flu?	111 (10.7%)	88 (8.5%)	199 (19.3%)	0.633
3	Nose problem been accompanied by itchy watery eyes in the last 12/12	57 (5.5%)	63 (6.1%)	120 (11.6%)	0.024
4	Nose problem interfere with your daily activities in the last 12/12	67 (6.5%)	64 (6.2%)	131 (12.7%)	0.097
5	Prevalence of AR symptoms in Winter (Dec – Mar)	75 (7.3%)	65 (6.3%)	140 (13.6%)	0.359
6	Prevalence of AR symptoms in Summer (Jun – Sep)	93 (9.0%)	131 (12.7%)	224 (21.7%)	0.000
7	Prevalence of AR symptoms in Spring (Mar – Jun)	44 (4.3%)	55 (5.3%)	99 (9.6%)	0.008
8	Prevalence of AR symptoms in Autumn (Sep – Dec)	19 (1.8%)	18 (1.8%)	37 (3.6%)	0.500
9	Have you ever had hay fever (Nose only)	63 (6.1%)	67 (6.5%)	130 (12.6%)	0.037
10	Have you ever had hay fever (Eye only)	57 (5.5%)	50 (4.9%)	107 (10.4%)	0.409
11	Have you ever had hay fever (Nose + Eye)	61 (5.9%)	47 (4.6%)	108 (10.5%)	0.918
12	Allergy confirmed by doctor	77 (7.5%)	58 (5.6%)	135 (13.1%)	1.000

Table III showed frequency of AR-related symptoms (ever-having had AR symptoms) according to the geographical distribution, residency and level of education. According to geographical distribution plain area had more number of students with AR- related symptoms (18.2%) than other areas (costal area 5.3% and mountain 2.1%). There was no clear statistical significant difference in prevalence of AR-related symptoms between urban and rural area students (13.9 and 11.7% respectively) ( $p = 0.556$ ). The prevalence according to the level of education was 95 (9.3%) in elementary school students Vs 170 (16.4%) in intermediate school students without clear statistical significance difference ( $p = 0.472$ ). There was statistical significant difference in frequency of symptoms in winter (Dec – Mar) between male and female according to their residency (4.9% and 2.1% respectively) with ( $p = 0.001$ ). Those with symptoms interfere with their daily activities were 94 (9.1%) in plain area, 73 (7.1%) in urban area and 91 (8.9%) enrolled in intermediate schools.

**Table III: Frequency of AR-related symptoms according to the geographical distribution, residency and level of education.**

#	Items		Geographical Distribution				Residency			Level of Education			Total (N = 1032)
			Costal (N = 217)	Plain (N = 718)	Mountain (N = 102)	P	Urban (N = 578)	Rural (N = 454)	P	Elementary (N = 389)	Intermediate (N = 643)	P	
1	Ever had a problem with sneezing, or a runny, or blocked nose when you DID NOT have a cold or the flu?	M	38 (3.7%)	89 (8.6%)	14 (1.3%)	0.859	63 (6.1%)	78 (7.3%)	0.053	50 (4.9%)	91 (8.3%)	0.383	141 (13.7%)
		F	17 (1.6%)	99 (9.6%)	8 (0.8%)	0.268	81 (7.3%)	43 (4.2%)	0.328	45 (4.4%)	79 (7.6%)	0.953	124 (12.0%)
		Total	55 (5.3%)	188 (18.2%)	22 (2.1%)	0.571	144 (13.9%)	121 (11.7%)	0.566	95 (9.3%)	170 (16.4%)	0.472	265 (25.7%)
2	Sneezing, or a runny, or blocked nose in the last 12 months when you DID NOT have a cold or the flu?	M	30 (2.9%)	70 (6.3%)	11 (1.0%)	0.885	46 (4.4%)	65 (6.3%)	0.014	39 (3.7%)	72 (7.0%)	0.408	111 (10.7%)
		F	14 (1.4%)	68 (6.6%)	6 (0.6%)	0.499	57 (5.3%)	31 (3.0%)	0.541	22 (2.1%)	66 (6.4%)	0.012	88 (8.5%)
		Total	44 (4.3%)	138 (13.4%)	17 (1.7%)	0.665	103 (9.9%)	96 (9.3%)	0.203	61 (5.8%)	138 (13.4%)	0.023	199 (19.3%)
3	Nose problem been accompanied by itchy watery eyes in the last 12 months	M	18 (1.7%)	36 (3.3%)	3 (0.3%)	0.294	28 (2.7%)	29 (2.8%)	0.678	22 (2.1%)	35 (3.4%)	0.998	57 (5.5%)
		F	8 (0.8%)	52 (5.0%)	3 (0.3%)	0.284	41 (4.0%)	22 (2.1%)	0.577	20 (1.9%)	43 (4.2%)	0.396	85 (8.1%)
		Total	26 (2.5%)	88 (8.5%)	6 (0.6%)	0.153	69 (6.7%)	51 (4.9%)	0.770	42 (4.0%)	78 (7.6%)	0.517	120 (11.6%)
4	Prevalence of AR symptoms in Winter (Dec – Mar)	M	16 (1.5%)	48 (4.7%)	11 (1.1%)	0.300	25 (2.4%)	50 (4.9%)	0.001	30 (3.0%)	45 (4.3%)	0.787	75 (7.3%)
		F	9 (0.9%)	51 (4.9%)	5 (0.5%)	0.793	43 (4.2%)	22 (2.1%)	0.490	17 (1.6%)	48 (4.7%)	0.060	65 (6.3%)
		Total	25 (2.4%)	99 (9.6%)	16 (1.5%)	0.737	68 (6.6%)	72 (7.0%)	0.067	47 (4.6%)	93 (9.0%)	0.279	140 (13.6%)
5	Prevalence of AR symptoms in Summer (Jun – Sep)	M	14 (1.4%)	68 (6.6%)	11 (1.1%)	0.048	38 (3.7%)	55 (5.3%)	0.024	27 (2.6%)	66 (6.4%)	0.039	93 (9.0%)
		F	40 (3.8%)	90 (8.7%)	1 (0.1%)	0.000	86 (8.3%)	45 (4.4%)	0.284	27 (2.6%)	104 (10.1%)	0.000	131 (12.7%)
		Total	54 (5.2%)	158 (15.3%)	12 (1.2%)	0.018	124 (12.0%)	100 (9.7%)	0.879	54 (5.2%)	170 (16.5%)	0.000	224 (21.7%)
6	Prevalence of AR symptoms in Spring (Mar – Jun)	M	15 (1.4%)	29 (2.8%)	0 (0.0%)	0.044	18 (1.8%)	26 (2.5%)	0.158	14 (1.4%)	30 (2.9%)	0.338	44 (4.3%)
		F	1 (0.1%)	47 (4.6%)	7 (0.7%)	0.019	37 (3.5%)	18 (1.8%)	0.377	22 (2.1%)	33 (3.2%)	0.565	55 (5.3%)
		Total	16 (1.5%)	76 (7.4%)	7 (0.7%)	0.256	55 (5.3%)	44 (4.3%)	1.000	36 (3.5%)	63 (6.1%)	0.774	99 (9.6%)
7	Prevalence of AR symptoms in Autumn (Sep – Dec)	M	8 (0.8%)	11 (1.1%)	0 (0.0%)	0.300	8 (0.7%)	11 (1.1%)	0.486	10 (0.9%)	9 (0.9%)	0.201	19 (1.8%)
		F	3 (0.3%)	12 (1.2%)	3 (0.3%)	0.793	14 (1.4%)	4 (0.4%)	0.216	9 (0.9%)	9 (0.9%)	0.225	18 (1.8%)
		Total	11 (1.0%)	23 (2.3%)	3 (0.3%)	0.358	22 (2.1%)	15 (1.5%)	0.737	19 (1.8%)	18 (1.8%)	0.051	37 (3.6%)
8	Nose problem interfere with your daily activities in the last 12 months	M	23 (2.2%)	41 (4.0%)	3 (0.3%)	0.183	29 (2.8%)	38 (3.7%)	0.299	22 (2.1%)	45 (4.4%)	0.294	67 (6.5%)
		F	6 (0.6%)	33 (3.1%)	5 (0.5%)	0.302	44 (4.3%)	20 (1.9%)	0.355	18 (1.7%)	46 (4.5%)	0.500	64 (6.2%)
		Total	29 (2.8%)	94 (9.1%)	8 (0.8%)	0.339	73 (7.1%)	58 (5.6%)	0.321	40 (3.8%)	91 (8.9%)	0.249	131 (12.7%)
9	Have you ever had hay fever (Nose only)	M	18 (1.7%)	45 (4.4%)	0 (0.0%)	0.020	35 (3.4%)	28 (2.7%)	0.592	27 (2.6%)	36 (3.3%)	0.460	63 (6.1%)
		F	5 (0.5%)	56 (5.3%)	6 (0.6%)	0.209	39 (3.8%)	28 (2.7%)	0.587	25 (2.4%)	42 (4.1%)	0.882	67 (6.5%)
		Total	23 (2.2%)	101 (9.7%)	6 (0.6%)	0.019	74 (7.2%)	56 (5.4%)	0.850	52 (5.0%)	78 (7.6%)	0.562	130 (12.5%)
10	Have you ever had hay fever (Eye only)	M	6 (0.6%)	51 (4.9%)	0 (0.0%)	0.000	29 (2.8%)	28 (2.7%)	0.890	21 (2.0%)	36 (3.3%)	0.777	57 (5.5%)
		F	3 (0.3%)	42 (4.1%)	5 (0.5%)	0.214	28 (2.7%)	22 (2.2%)	0.441	15 (1.5%)	35 (3.4%)	0.310	50 (4.9%)
		Total	9 (0.9%)	93 (9.0%)	5 (0.5%)	0.217	57 (5.5%)	50 (4.8%)	0.607	36 (3.5%)	71 (6.9%)	0.361	107 (10.4%)
11	Have you ever had hay fever (Nose + Eye)	M	18 (1.7%)	42 (4.1%)	1 (0.1%)	0.067	35 (3.4%)	26 (2.5%)	0.418	23 (2.2%)	38 (3.7%)	0.882	61 (5.9%)
		F	8 (0.8%)	34 (3.2)	5 (0.5%)	0.302	27 (2.6%)	20 (2.0%)	0.835	15 (1.5%)	32 (3.1%)	0.489	47 (4.6%)
		Total	26 (2.5%)	76 (7.3)	6 (0.6%)	0.918	62 (6.0%)	46 (4.5%)	0.838	38 (3.7%)	70 (6.8%)	0.570	108 (10.4%)
12	Allergy confirmed by doctor	M	19 (1.8%)	49 (4.7%)	9 (0.9%)	0.366	40 (3.9%)	37 (3.6%)	1.000	30 (3.0%)	47 (4.5%)	0.941	77 (7.5%)
		F	5 (0.5%)	46 (4.5%)	7 (0.7%)	0.407	44 (4.3%)	14 (1.4%)	0.020	19 (1.8%)	39 (3.8%)	0.525	58 (5.6%)
		Total	24 (2.3%)	95 (9.2%)	16 (1.6%)	0.577	84 (8.1%)	51 (5.0%)	0.137	49 (4.8%)	86 (8.3%)	0.719	135 (13.1%)

Table IV revealed that only 65 (6.3%) of all total population, which account 24.5% of those have clinical diagnosed AR had confirmed diagnosis by doctor. Only 35.4% of those with hay fever had symptoms confirmed by doctor as AR. A considerable number of students having symptom during last 12 months had confirmed diagnosis (26.1%) students out of 199 students. Allergy confirmed by doctor in relation to positive symptoms in relation to seasons (winter, summer, spring and autumn) were 20.0%, 17.9%, 30.3% and 37.8% respectively, with only clear statistical significant difference in allergy confirmed by doctor and symptoms occurred during summer months ( $p = 0.000$ ).



Table IV show: the relation between AR-related symptoms with confirmed one

#	AR-related symptoms	Allergy confirmed by doctor			
		Yes	No	Total	P
1	Ever had a problem with sneezing, or a runny, or blocked nose when you DID NOT have a cold or the flu?	65 (24.5%)	200 (75.5%)	<b>265 (100%)</b>	0.131
2	Sneezing, or a runny, or blocked nose in the last 12 months when you DID NOT have a cold or the flu?	52 (26.1%)	147 (73.9%)	<b>199 (100%)</b>	0.633
3	Nose problem been accompanied by itchy watery eyes in the last 12 months	29 (24.2%)	91 (75.8%)	<b>120 (100%)</b>	0.024
4	Prevalence of AR symptoms in Winter (Dec – Mar)	28 (20.0%)	112 (80.0%)	<b>140 (100%)</b>	0.359
5	Prevalence of AR symptoms in Summer (Jun – Sep)	40 (17.9%)	184 (82.1%)	<b>224 (100%)</b>	0.000
6	Prevalence of AR symptoms in Spring (Mar – Jun)	30 (30.3%)	69 (69.7%)	<b>99 (100%)</b>	0.008
7	Prevalence of AR symptoms in Autumn (Sep – Dec)	14 (37.8%)	23 (62.2%)	<b>37 (100%)</b>	0.500
8	Have you ever had hay fever (Nose only)	52 (40.0%)	78 (60.0%)	<b>130 (100%)</b>	0.037
9	Have you ever had hay fever (Eye only)	28 (26.2%)	79 (73.8%)	<b>107 (100%)</b>	0.409
10	Have you ever had hay fever (Nose and eye)	42 (38.9%)	66 (61.1%)	<b>108 (100%)</b>	0.918

#### 4. DISCUSSION

Allergic rhinitis represents a global health problem affecting 10 to 45% of the world population [7]. Widespread variations in the prevalence of AR have been reported worldwide [8,9]. The overall prevalence across Europe (Belgium, France, Germany, Italy, Spain and Britain) is about 23%, (lowest in Italy and highest in Belgium) [10]. The prevalence of physician-diagnosed allergic rhinitis in five Middle East countries (Egypt, Iran, Lebanon, SA, and United Arab Emirates) is 9%, with dust being the main trigger [11]. Allergic diseases in Saudi Arabia are increasing according to recent epidemiological and aerobiological studies [12]

The current study established the prevalence of AR-related symptoms among school age children in Jazan Region, Saudi Arabia. The prevalence of lifetime AR, AR symptoms during the past 12 months, and hay fever were 25.7%, 19.3% and 10.5%, respectively, Which is close to the previous study that conducted as national survey of hearing impairment (26.5%) [4]. Another national survey conducted in SA showed the same result where the prevalence of AR increased from 20% in 1986 in Riyadh and Jeddah to 25% in 1995 in Hail and Gizan [13]. Increase prevalence of AR among students living plain area (18.2%) can be explained by windy months (*Ghubra*) and this area rich with farms and animals, which may play great role in generating air-borne allergens. Air pollution and smoking exposure may damage the respiratory epithelial cells and thus predispose to allergic diseases as AR and asthma. Increase number of cars with no emission controls increases the level of pollution. Changing life-style of the Saudi population have been changed recently and with the change in eating and food habits and more shift to the fast food, both in consumption and diversity of foods rich in proteins and fats. Diet is a major source of exposure to allergens in infancy [14]. Careful attention to food allergies and the presence of household allergens during infancy and early childhood may limit potential sensitizations.

#### 5. CONCLUSIONS

This study revealed that the prevalence of AR among school age children in Jazan was 25.7%, although it is within range of reported prevalence rates from various parts of the world. Only 24.5% of those with AR-related symptoms were confirmed by doctors, most likely they do not consider AR as a disease. This study should be followed by another study to list and identify the importance of environmental factors in relation to AR and its symptoms and other allergic conditions.

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