

Prevalence of allergic rhinitis among female secondary school students, in Arar city, Saudi Arabia

To Cite:

Alruwaili YS, Hammad SM, Elwan A. Prevalence of allergic rhinitis among female secondary school students, in Arar city, Saudi Arabia. *Medical Science*, 2021, 25(108), 363-373

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Peer-Review History

Received: 01 January 2021

Reviewed & Revised: 03/January/2021 to 06/February/2021

Accepted: 07 February 2021

Published: February 2021

Peer-review

External peer-review was done through double-blind method.

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ABSTRACT

Background: There has been no study done in Northern Borders region in the kingdom of Saudi Arabia exploring the prevalence of allergic rhinitis among female students in secondary schools, so this study conducted to assess the prevalence rate and understand risk factors associated with it. **Methodology:** A cross-sectional study was conducted during one year. The data was collected from students in October 2019 on female secondary schools in Arar city, KSA. A multistage cluster probability sample technique was used. The sample was drawn from 3 female secondary schools randomly using self-administered questionnaire. Data entry and analysis was performed using the statistical package social sciences program (SPSS) version 20, $P < 0.05$ were given to indicate statistical significance. **Results:** 15.1% of participants were 15 years old, 33.9% were 16 years, 36.2% were 17 and 14.8% were 18 years old. 98% of study participants were Saudi. Among all 24 allergic rhinitis patients; 54.2% suffer from stuffy nose once, 20.8% twice and 16.6% three times. Stuffy nose was reported to affect daily activity in 97.1% of all cases. Allergic rhinitis severely affects sleeping of 29.2% of cases, daily activities of 16.7% and study activities of 25% of patients. Of all studied sample; 3% answered yes when asked about allergy to specific food, 8.2% for dust, 5.6% for animals, 7.2% for moth insect and 0.3% were allergic to temperature changes. Family history of allergy was positive in 11.5% of sample. 6.9% of all participants answered yes for sneezing, 5.6% runny nose, 6.3% nasal obstruction, 5.3% itchy nose and 5.3% itchy skin or watery eyes. 7.8% of students were previously diagnosed with allergic rhinitis, 0.3% with eczema, 3% with eye allergy and 6.9% with asthma. **Conclusion:** In our study; the reported prevalence of allergic rhinitis was 7.8% which was lower than most reported figures. Effective preventive interventions may reduce the mortality, morbidity, and disability induced by this public health issue, such as raising awareness of the incidence of allergic disease and its risk factors and treatment options.

Keywords: Prevalence, Allergic Rhinitis, Female Secondary School Students, Arar, Saudi Arabia



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1. INTRODUCTION

Allergic rhinitis (AR) is a hypersensitivity reaction caused by inhalation particles contact with nasal mucosa and induce an immunoglobulin E (IgE)-mediated inflammatory response (Zhang et al., 2014). The common symptoms are nasal itching, sneezing, rhinorrhea, or nasal blockage (Kim et al., 2018). Postnasal drip, cough, irritability, and fatigue are also present. Some patients complain of itching of palate and inner ear, other patients report symptoms of eye-allergy like itching, tearing and burning (Skoner, 2001). Atopy, weather, and environmental conditions are influential factors on AR. The main allergens in seasonal AR are pollens of plants/grasses, and spores of mildew, while permanent AR is mostly associated with household allergens like mites, dust, molds, animal waste (Zamani et al., 2018).

Allergic rhinitis is classified according to the persistence of symptoms: Intermittent, when symptoms are less than four days per week or for less than four weeks, and Persistent, when symptoms are present for more than four days per week or more than four weeks. Another Classification according to severity depends on the presence of these symptoms: Sleep disturbance, Impairment of daily activities, leisure, or sport, and Impairment of school or work. Severity is considered Mild if none of these symptoms are present, whereas Moderate to Severe when one or more of symptoms are present (Skoner, 2018). AR has a negative impact on psychological well-being and health-related quality of life of the patient (Shin et al., 2018). The annual economic burden of allergic rhinitis in UA was \$3.7 (2.3–4.7) billion (David et al., 2016). Prevalence of Allergic rhinitis in the Asia region as Korea was 27%, in Kuwait was 20.4 %, both were done in 2017, and in Malaysia, it was 18,8% in 2016 (Chong et al., 2001). Alqahtani (2016) found that the prevalence of AR was 6.3% among Saudi Schools children in Najran city. Also, Mahnashi et al., (2019) found the prevalence of AR was 27.1 among Saudi Schools children in Jazan city.

There has been no study done in Northern Borders region in the kingdom of Saudi Arabia exploring the prevalence of allergic rhinitis among female students in secondary schools, so this study conducted to assess the prevalence rate and understand risk factors associated with it.

Objectives

This study aims to investigate the prevalence and the factors associated with of allergic rhinitis among female secondary schools students in Arar city, Northern Saudi Arabia.

2. METHODOLOGY

Study design

A cross-sectional study was conducted during one year. The data was collected from student's in October 2019.

Study setting

Female secondary schools in Arar city, there are 18 schools.

Study population

Female students in secondary schools in Arar city

Inclusion criteria: All female secondary schools students, aged between 15-18 years.

Exclusion criteria: literacy students (education of elders), home based students.

Sample size

The sample size of this study is calculated by using (sample size open epi online). Assuming $\pm 5\%$ error, 95% confidence interval, based on the prevalence of 27.1, among students in Jazan study (Mahnashi et al., 2019). The estimated sample size based on the above was 284 from a total female student secondary schools population of 4180, in Arar city.

Sampling Technique

A multistage cluster probability sample technique was used. The sample was drawn from 3 female secondary schools randomly. Each school was a cluster (95 students each), from which two classes will be further sampled from each grade (31 students): first, second, third grade of secondary schools. The data was collected in 4 days per week for 1 month duration.

Study tool

Using self-administered questionnaire (Arabic). It has been adopted from Riyadh study and modified, partially pre-tested for validity and reliability (Alharethy et al., 2017). The modified questionnaire was tested for validity from 3 consultants.

The data collection tool has the following main variables

- 1-demographic data such as age, marital status, school performance, sleep time.
- 2-clinical data such as if ever had a history of sneezing, runny nose, or blocked nose when did not have a cold or the flu, history of itchy-watery eyes, seasonal variation, trigger factors, personal and family history of allergic diseases.
- 3 - Effect of rhinitis symptoms on their lives.

Data Collection Method

Pilot study

The pilot study was initially in 8th female high school, 30 students were asked to fill the questionnaire to test its clarity relevance, and time needed to answer all questions. Before distributing the study participants, a brief introduction to the aim of the study and explaining how to complete the questionnaire was done.

Ethical considerations

Before starting the interview, informed consent from all study participants was taken to assure them confidentiality of data during the study. Research clearance and approval was obtained from the ethical research committee of Northern Borders General health Affairs. Also, approval was taken from the administrator of each school.

Data analysis

Data entry and analysis was performed using the statistical package social sciences program (SPSS) version 20, P <0. 05 were given to indicate statistical significance.

3. RESULTS

According to Table 1; 15.1% of participants were 15 years old, 33.9% were 16 years, and 36.2% were 17 and 14.8% were 18 years old. 98% of study participants were Saudi. 97.7% were single, 1.6% married and 0.3% was recorded for each widowed and divorces. 11.5% and 14.1% of participants’ fathers and mothers were uneducated respectively while 33.2% of fathers and 33.9% of mothers were highly educated (university or more). 33.6% of participants’ fathers had military job, 35.2% in government sector and 21.4% retired. Only 25% of mothers work and 75% do not work. School performance level was excellent in 56.3% of participants, very good in 38.5% and good in 5.3%. Of all students, 0.7% was smokers.

Variables	Frequency (No.)	Percent (%)	
Age (in years)	≤15	46	15.1
	16-	103	33.9
	17-	110	36.2
	≥18	45	14.8
Nationality	Saudi	298	98.0
	Non-Saudi	6	2.0
Marital status	Single	297	97.7
	Married	5	1.6
	Divorced/widow	2	0.6
Father Education level	Uneducated	35	11.5
	Primary	12	3.9
	Intermediate	47	15.5
	Secondary	109	35.9
	University and higher	101	33.2

Mother Education level	Uneducated	43	14.1
	Primary	25	8.2
	Intermediate	64	21.1
	Secondary	69	22.7
	University and higher	103	33.9
Fathers job	Military	102	33.6
	government sector	107	35.2
	private	30	9.9
	retired	65	21.4
Mother work	Working	76	25.0
	Housewife	228	75.0
Family income	<= 5000	60	19.7
	5001-10000	82	27.0
	>= 10000	162	53.3
School performance level	Excellent	171	56.3
	Very good	117	38.5
	Good	16	5.3
Smoking	Smokers	2	0.7
	Non-Smokers	302	99.3

Among all 24 allergic rhinitis patients; 12 patients (50%) reported that symptoms last for Less than 4 days a week or less than 4 weeks and 10 patients (41.6%) reported that symptoms last for more than 4 days a week or more than 4 weeks. 54.2% suffer from stuffy nose once, 20.8% twice and 16.6% three times. Stuffy nose was reported to affect daily activity in 97.1% of all cases. Difficulty of breathe due to nasal blockage was reported in 75% of patients, stuffy nose caused sleep problems in 95.8%, nasal obstructions led emergency department in 37.5%, allergic rhinitis caused sleep in hospital in 4.2% and allergic rhinitis caused absent from school in 79.2%. Allergic rhinitis severely affects sleeping of 29.2% of cases (Figure 1), daily activities of 16.7% and study activities of 25% of patients (Figure 2). As mentioned in Table 2.

Table 2 Complaints of the participants with allergic rhinitis (N=24)

	Variables	Frequency (No.)	Percent (%)
Duration of symptoms	Less than 4 days a week or less than 4 weeks	12	50.0
	More than 4 days a week or More than 4 weeks	10	41.6
	No	2	8.3
Frequency of occurrence of stuffy nose	1-2 times	18	75.0
	3-4 times	5	20.8
	No occurrence of stuffy nose	1	4.2
Stuffy nose affect daily activities	Yes	22	91.7
	No	2	8.3
Difficulty of breathe due to stuffy nose	Yes	18	75
	No	6	25
Stuffy nose caused sleep problems	Yes	23	95.8
	No	1	4.2
Nasal obstructions led emergency department	Yes	9	37.5
	No	15	62.5
Hospital admission due to	Yes	1	4.2

allergic rhinitis	No	23	95.8
Allergic rhinitis caused school absenteeism	Yes	19	79.2
	No	5	20.8
Allergic rhinitis affects sleep quality	Not affected	1	4.2
	Little Affects	11	45.8
	Moderately Affects	5	20.8
	Severely Affects	7	29.2
Allergic rhinitis affects the daily activities	Not affected	7	29.2
	Little Affects	6	25
	Moderately Affects	7	29.2
	Severely Affects	4	16.7
Allergic rhinitis affects studying activities	Not affected	6	25.0
	Little Affects	5	20.8
	Moderately Affects	7	29.2
	Severely Affects	6	25.0

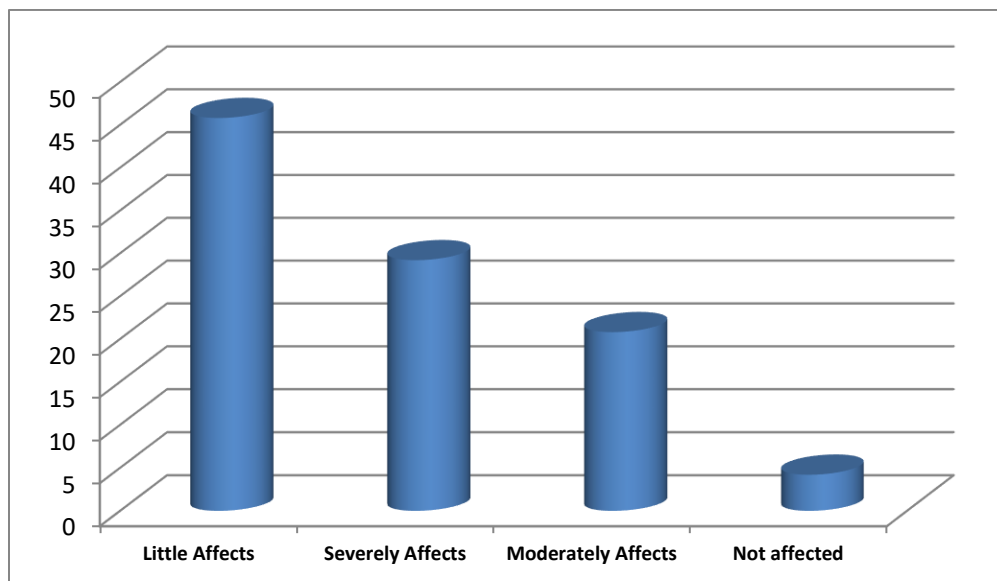


Figure 1 Allergic rhinitis affects sleep quality of the cases (N=24)

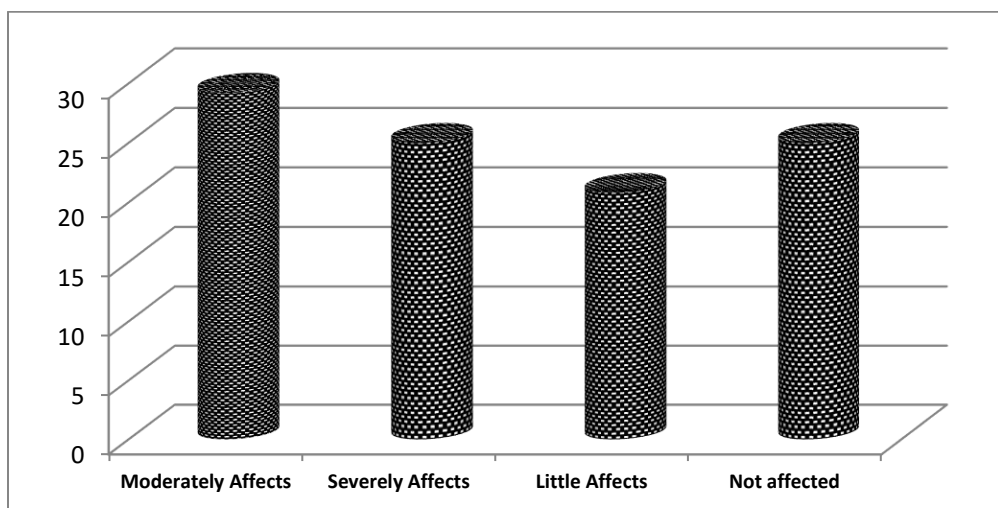


Figure 2 Allergic rhinitis affects studying activities of the cases (N=24)

Concerning Table 3; Of all studied sample; 3% answered yes when asked about allergy triggers to specific food, 8.2% for dust, 5.6% for animals, 7.2% for moth insect and 0.3% were allergic to temperature changes (figure 3). Family history of allergy was positive in 11.5% of sample, 1% had fathers with asthma and 1.6% had fathers with allergic rhinitis. 4.3% had siblings with asthma and 1.6% had siblings with allergic rhinitis. Regarding sign and symptoms of allergy; 6.9% of all participants answered yes for sneezing, 5.6% runny nose, 6.3% nasal obstruction, 5.3% itchy nose and 5.3% itchy skin or watery eyes. Rajab month was found to be the highest month with reported allergy symptoms 5.9%. When asked about symptoms in winter and spring; 4.3% and 5.3% said yes respectively. 7.8% of students were previously diagnosed with allergic rhinitis, 0.3% with eczema, 3% with eye allergy and 6.9% with asthma (figure 4). 6.3% of all study participants reported taking anti-allergic drugs and 7.9% reported taking other medications. According to table (4); there was a statistical significance between allergic rhinitis and age, nationality and marital status ($P > 0.05$) while there was no significance with family income, smoking and school performance ($P < 0.05$).

Table 3 Allergy symptoms, triggers, seasons, diagnosis and treatment among study participants (N= 304)

Variables		Frequency (No.)	Percent (%)
Allergy Triggers	Specific food	9	3.0
	Dust	25	8.2
	Animals like dogs cats	17	5.6
	Moth insects	22	7.2
	Temperature changes	1	.3
Family history of allergy	Family history of allergy in all of the family members	35	11.5
	Father with asthma	3	1.0
	Father with allergic rhinitis:	5	1.6
	Father eczema	1	.3
	Mother with asthma	3	1.0
	Mother with allergic rhinitis	9	3.0
	Sibling with asthma	13	4.3
	Sibling with allergic rhinitis	5	1.6
Sign and Symptoms of Allergy	Sneezing	21	6.9
	Runny nose	17	5.6
	Nasal Obstruction	19	6.3
	Itchy nose	16	5.3
	Itchy skin and/or watery eyes	16	5.3
Allergy relation to certain period of the year	Summer	19	6.2
	Spring	16	5.3
	Winter	13	4.3
	Autumn	8	2.6
Types of allergy by physician diagnosis	Allergic rhinitis	24	7.8
	Asthma	21	6.9
	Eye allergy	9	3.0
	Skin allergies	1	0.3
Received treatment	Taking anti allergic drugs:	19	6.3
	Taking other medicines:	24	7.9

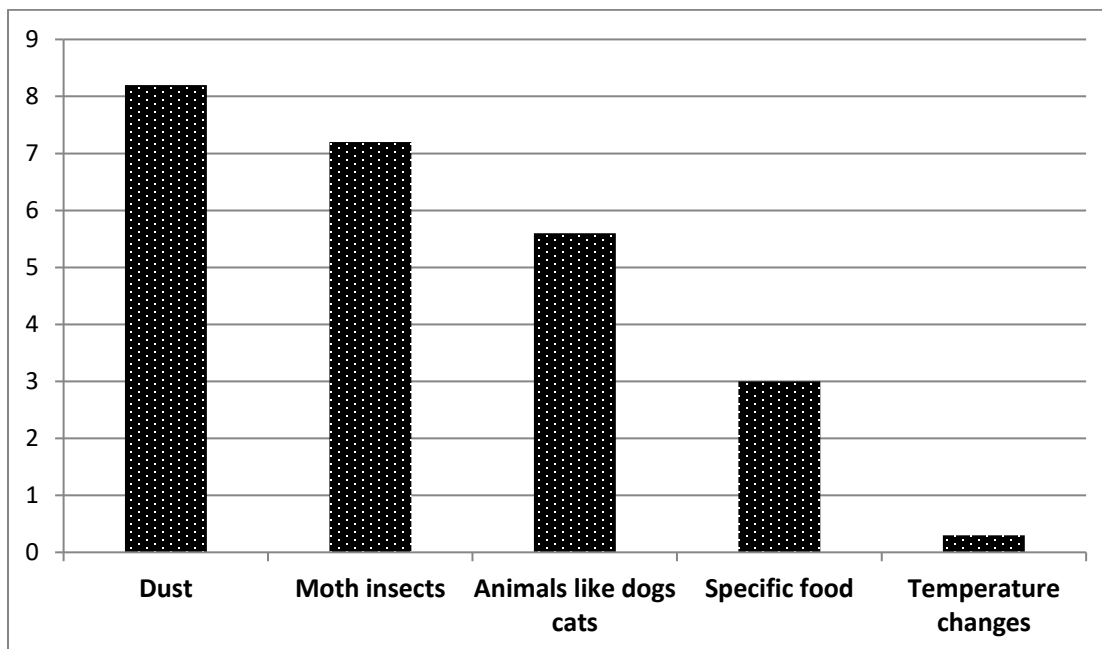


Figure 3 Allergy Triggers among the studied participants

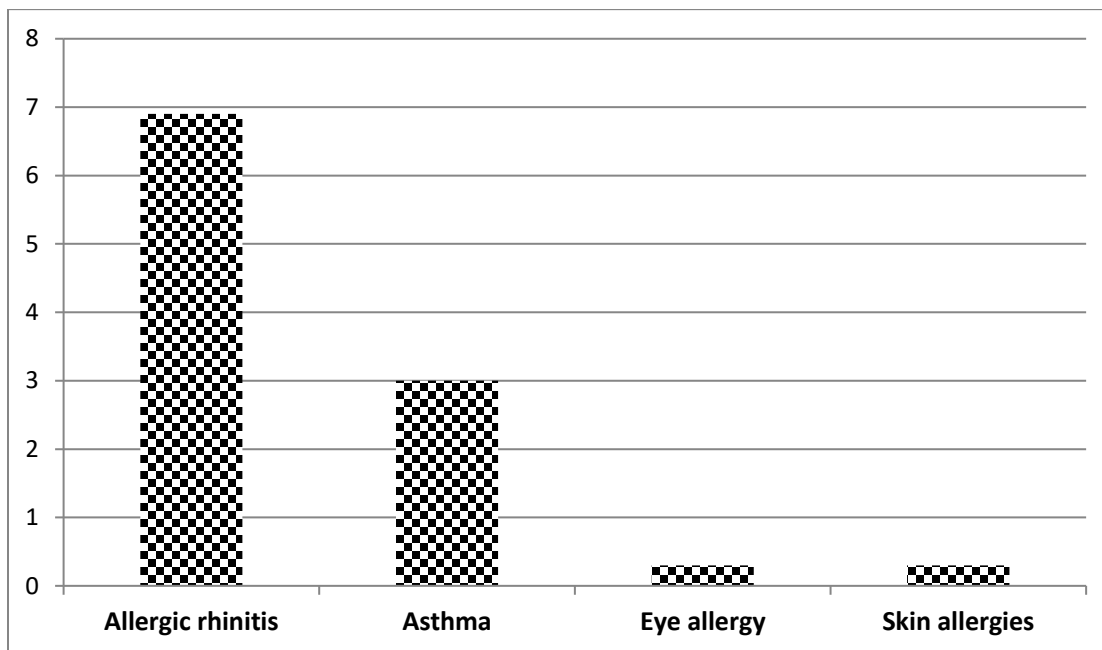


Figure 4 Types of allergy by physician diagnosis among the studied participants (N=304)

Table 4 relationship between allergic rhinitis and socio-demographic characteristics of the studied population

Variables		Allergic rhinitis		Total (N=304)	P value
		Yes	No		
Age (in years)	≤15	4	44	48	0.048
		16.7%	15.7%	15.8%	
	16-	7	94	101	
		29.2%	33.6%	33.2%	
17-	5	105	110		
	20.8%	37.5%	36.2%		
18-	8	37	45		

		33.3%	13.2%	14.8%	
Nationality	Saudi	22	276	298	0.020
		91.7%	98.6%	98.0%	
	Non-Saudi	2	4	6	
		8.3%	1.4%	2.0%	
Family income	<= 5000	3	57	60	0.200
		12.5%	20.4%	19.7%	
	5001-10000	4	78	82	
		16.7%	27.9%	27.0%	
	>= 10000	17	145	162	
		70.8%	51.8%	53.3%	
smoker	Smoker	16	131	147	0.061
		66.7%	46.8%	48.4%	
	Non-Smoker	8	149	157	
		33.3%	53.2%	51.6%	
School performance level	Excellent	13	159	172	0.780
		54.2%	56.8%	56.6%	
	Very good	9	107	116	
		37.5%	38.2%	38.2%	
	Good	2	14	16	
		8.3%	5.0%	5.3%	

4. DISCUSSION

According to our results; 7.8% of all studied sample had AR. In other global studies; the prevalence of AR varied between 0.8 to 14.9% in 6-7 years old and 1.4 to 39.7% in 13-14 years old worldwide (Strachan et al., 1997). In Asia, this disease affects a large population, ranging from 27% in South Korea (An et al., 2015) to 32% in the United Arab Emirates (Alsowaidi et al., 2010). In a study among secondary school students; the total prevalence of AR was (19.3%), of whom (52.6%) were girls and 138 (47.4%) were boys (Amizadeh et al., 2013). Another study reported that; AR was diagnosed in 397 (40.8%) cases that 190 (47.8%) and 130 (32.7%) showed seasonal and permanent AR, respectively (Salarnia et al., 2015). Other studies conducted in Iran indicated prevalence of AR 17% in elementary school students (Ghaffari et al., 2012), 31.9% among 6–7-year-old school students, in Kashan (Gharagosloo et al., 2003) and over 14% of AR in 6–7-year-old elementary school students (Mohammadzadeh et al., 2010). Findings these studies were considerably higher than reported by studies conducted in different regions of Croatia among their 6–7 and 13–14-year-old school children (Stipić-Marković et al., 2003 & Banac et al., 2004) as well as 6–7-year-old school students of Spain (Arnedo-Pena et al., 2005). Estimation of AR for the worldwide was reported as (10%–30% of the population) but lower as compared to that of similar population-based study in the Netherlands (van de Ven et al., 2006), Finland (Huurre et al., 2004), Australia (Robertson et al., 1998), or United States (Jackson et al., 2013). Compared to other cities in the South East Asian region, the rates in Surabaya were found to be higher than in Kota Bahru (Malaysia) (Quah et al., 2005) or Taoyuan (Taiwan) (Kao et al., 2005), but similar to metropolitan cities as Bangkok (Thailand) (Vichyanond et al., 1998), or Metro Manila (Republic of The Philippines) (Abong et al., 2012). In another study, the prevalence of allergic rhinitis in guidance school was 18.1% and 21.7% in rural and urban areas in this region respectively (Mohammadzadeh et al., 2013). Another study reported point prevalence rate of 34.7% was reported with female predominance and 15-16 age groups (Abraham et al., 2019).

Regarding sign and symptoms of allergy; among all studied sample 6.9% of all participants answered yes for sneezing, 5.6% runny nose, 6.3% nasal obstruction, 5.3% itchy nose and 5.3% itchy skin or watery eyes. Another study reported symptoms during the preceding 12 months among students with AR included nose itching (54.3%), congestion (64.3%), and rhinorrhea (76.6%). The rate of eye itching and epiphora was 76.3% (Amizadeh et al., 2013). Symptoms such as itch and watery eyes were reported in 97 (10%) of cases of other survey (Salarnia et al., 2018). A study found that sneezing and rhinorrhea were seen in 29.8% of allergic rhinitis patients in the last year but ever sneezing and rhinorrhea was seen in 22.4%. Nasal pruritus and eye involvement such as redness, Lacrimation was observed in 35.6% (Zamanfar et al., 2016). Another study reported that sneezing (65.9%) was the

commonest nasal symptom and hypertrophied inferior turbinate (61.8%) the commonest physical finding (Abraham et al., 2019). These findings is consistent with several other studies which found nasal symptoms to be more predominant, of which blocked nose was the most common and troublesome symptom. Nasal blockage was found to reduce sleep time, resulting in decreased day time activity, particularly sport involvement which is more popular among adolescents headache (68%) and sneezing (45.8%) were the most common prevalent symptoms (Shedden, 2005).

In our study; allergy triggers were found as 3% specific food, 8.2% for dust, 5.6% for animals, 7.2% for moth insect and 0.3% were allergic to temperature changes. Other study reported cockroach (42.85%) and fungi/mold spore (42.85%) were the most common allergens in primary school children. House dust mites was the most common allergen in secondary school (63.16%) and undergraduate students (58.82%) (Sundberg et al., 2007). History of pets contact and smoking was positive 6.6% and 36 % respectively as reported in another study (Zamanfar et al., 2016). Another survey reported the commonest aeroallergen was the house dust mite (77.3%) and the least was dog fur (5.9%) (Abraham et al., 2019). This agreed with other study reporting most common allergic symptom in the participants was sneezing, and the most common triggering factor was house dust (Soegiarto et al., 2019). Another study (John et al., 2014) found that; about (22%) of the students, dust was the most common triggering factor for allergies. Alzahrani et al. (2020) found that allergies associated with pollen, food, and drugs were less frequent. The most common inhalant allergens were house dust mites (71.7%) and mold (15.9%).

Regarding severity of allergy; difficulty of breathe due to nasal blockage was reported in 75% of our patients, stuffy nose caused sleep problems in 95.8%, nasal obstructions led emergency department in 37.5%, allergic rhinitis caused sleep in hospital in 4.2% and allergic rhinitis caused absent from school in 79.2%. Allergic rhinitis severely affects sleeping of 29.2% of cases, daily activities of 16.7% and study activities of 25% of patients. However, Amizadeh et al. (2013) found that 43.1% of all cases with moderate-to-severe AR had a persistent condition and 56.9% had intermediate symptoms, 28.6% had a persistent condition and 71.4% had intermediate symptoms, showing significant differences among those with AR. Another study on AR patients found that; daily activity was affected by AR in 84 students (8.7%) (Salarnia et al., 2018). John et al. (2014) found that allergic conjunctivitis interfered with daily activities, social and extracurricular activities, academic performance, and college attendance in 32 (45.1%), 25 (35.7%), 13 (19.4%), and 11 (16.9%) students, respectively. Allergic dermatitis interfered with daily activities in social and extracurricular activities, academic performance, and college attendance in 46.7%, 29.8%, 19.6%, and 13.5% students correspondingly.

Regarding other associated allergies; 6.3% of our studied students were previously diagnosed with allergic rhinitis, 0.3% with eczema, 3% with eye allergy and 6.9% with asthma. A study by Pinart et al. (2014) showed eczema (atopic dermatitis), allergic rhinitis, and asthma coexisted with a high percentage of relative risk in children. Ar study found a scientifically significant relationship between both eczema-AR ($p=0.006$), and asthma-AR ($p<0.001$) in chi-square test results which are in accordance with the literature (Kef et al., 2020). Another study found asthma had already been diagnosed in 18.6% of cases, compared with eczema in 4.1% of cases and AR in 12% ($P<0.001$ versus healthy controls) (Amizadeh et al., 2013). Commonest allergies among the students in another survey were allergic conjunctivitis (104 (40.8%)), allergic dermatitis (89 (34.9%)), and eczema 14.9% (John et al., 2014). A study reported that; the most common allergic disease found was allergic rhinitis (23.0%), followed by asthma (6.8%), food allergy (3.4%), and atopic dermatitis/eczema (1.8%) (Soegiarto et al., 2019).

Family history of allergy was positive in 11.5% of our sample, 1% had fathers with asthma and 1.6% had fathers with allergic rhinitis. 4.3% had siblings with asthma and 1.6% had siblings with allergic rhinitis. A study reported that; (60.8%) of AR patients had at least one of the parents (father, mother, or both) suffered from any allergic disease (Soegiarto et al., 2019). Another study found that; family history of allergies was strongly associated with occurrence of allergic conjunctivitis and allergic dermatitis (John et al., 2014).

5. CONCLUSION

In our study; the reported prevalence of allergic rhinitis was 7.8% which was lower than most reported figures. Effective preventive interventions may reduce the mortality, morbidity, and disability induced by this public health issue, such as raising awareness of the incidence of allergic disease and its risk factors and treatment options.

Authors' contributions

Dr. Yusra Saad Alruwaili shared in setting the study design, research objectives, preparing study instrument, pilot administration, data collection, and reviewing the results. Prof. Sabry Mohamed Hammad, held study approvals and supervised study phases. Dr. Amal Elwan, shared in preparing study proposal, logistics plan, data collection plan, supervised data entry and conducted the statistical analysis, data display, discussion guidelines, and final write up. All authors read and approved the final manuscript.

Funding

This study has not received any external funding.

Informed consent

Written and oral informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

The study was approved by the Research Ethics Committee of the General Directorate of the Health Affairs of the Northern Border Region of Saudi Arabia. Ethical approval number (H-09-A-51) at 3/1/1441.

Conflict of interests

The authors declare that they have no conflicts of interest.

Data and materials availability

All data associated with this study are present in the paper.

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