Research Article

Prevalence and risk factors of asthma symptoms in Saudi university students in Najran, southern border region of Saudi Arabia

Aamir Magzoub[1], Ihab Hamed Nourein[2], Ismail Abdelrahman[1], Naglaa Ahmed[1], Samy Ismail Ahmed[3]

[1]Department of Physiology, College of Medicine, Najran University, Najran, Saudi Arabia, [2]Department of Histopathology, College of Applied Medical Science, Najran University, Najran, Saudi Arabia, [3]Department of Anatomy, College of Medicine, Najran University, Najran, Saudi Arabia

Correspondence to: Aamir Magzoub, E-mail: aamirmagzoub70@hotmail.com

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ABSTRACT

Background: Asthma prevalence in adults is globally increasing with variations between and within countries. Data are lacking regarding the prevalence of asthma among adults in Najran area, the southern region of Saudi Arabia. **Objectives:** The study aimed at estimating the prevalence and risk factors for asthma symptoms in Najran University students. **Materials and Methods:** A cross-sectional study was performed in Najran University Saudi students during the academic year 2017–2018. A modified translated International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire was distributed to Najran University Saudi students, males and females aged 18 and above living in Najran for more than 1 year. Samples were taken using multistage random sampling. **Results:** A total of 418 participants (269 males and 149 females) with a mean age of 21.05 ± 1.56 were included in the study. The prevalence of asthma depending on the wheezing symptom in the past 12 months was 27% and physician-diagnosed asthma was 13.6%. Most of the asthmatic subjects (>85%) have intermittent symptoms. The first-degree family history, active tobacco smoking, allergic rhinitis (AR), dust, and smoke are the major risk factors for asthma symptoms. **Conclusions:** The study revealed a high prevalence of self-reported asthma symptoms among adults in Najran University associated with a high prevalence of AR, which needs particular attention by the health stakeholders.

KEY WORDS: Asthma; Prevalence; International Study of Asthma and Allergies in Childhood Questionnaire; Najran; Saudi Arabia

INTRODUCTION

Asthma is a disease characterized by chronic airway inflammation that results in wheezing, cough, and variable airflow limitation.[1] The etiology of asthma is multifactorial in origin arising from a complex interaction of genetic and environmental factors.[2,3] It seems likely that airway inflammation occurs when genetically susceptible individuals are exposed to certain environmental factors. Many factors are implicated in the development and exacerbation of asthma symptoms. These factors include dysregulated immunity, obesity, gender, allergy, indoor and outdoor air pollution, viral respiratory tract infection, diet, and drugs.[4-13]

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The global prevalence of asthma and other allergic diseases has significantly increased during the past three decades with substantial magnitude in some areas.[14]

Global asthma prevalence was mapped depending on the results of two extensive multinational studies in both adults and children: (1) The European Community Respiratory Health Survey (ECRHS) in adults and (2) The International

Study of Asthma and Allergies in Childhood (ISAAC) in children. The results of the two studies showed high asthma prevalence and respiratory allergies, which are quite variable between countries and even within different regions of the same country.[15] These variations may partly be explained by genetic differences; however, a critical role for environmental factors could not be ignored.

Conflicting results on adult studies in western countries showed an increase in wheeze and cough with age in English and Canadian and a decrease in the prevalence of wheeze in German.[16-18]

In Africa, the ISAAC study through standardized symptom-based questionnaires involving 22 centers in 16 African countries provided valuable data on the patterns of asthma prevalence and the potential risk factors for asthma, allergic rhinoconjunctivitis, and eczema. Relatively high prevalence was documented with several centers' estimates to current wheeze similar to those reported in European countries.[19] In a recent Sudanese cross-sectional study including 3974 adult subjects, the average prevalence of asthma depending on the ISAAC questionnaire was 10% and ranged between 6.5% and 13% in the different regions of the country.[20]

In the Arab world, two nationwide cross-sectional surveys in Oman as part of ISAAC Phase I (1995) and Phase III (2001) in two age groups (6–7 and 13–14 years) revealed a significant increase in the prevalence of wheeze in Omani schoolchildren from 8.7% to 13.8%.[21] In North Africa, an Egyptian study including 2645 older schoolchildren in Cairo, the ISAAC questionnaire showed an asthma prevalence of 14.7% depending on wheezing symptom, and 9.4% physician diagnosed.[22] In a total of 6543 subjects aged 8–93 years in Al-Ain, United Arab Emirates (UAE), the prevalence of self-reported asthma was found to be13%.[23]

Concerning Saudi Arabia, the prevalence of asthma was investigated in children and adolescents; however, data are lacking in adults.[24] Al-Frayh *et al*. previously reported that the prevalence of asthma was 10% among schoolchildren in Riyadh (the capital of Saudi Arabia) and ranged from 8% to 23% in different regions of Saudi Arabia.[25] In Asir (Southwest region), a study included 1325 subjects aged 11 years and more using a register of two primary health-care centers (1 at sea level and 1 at high altitude), the prevalence of asthma was found higher at sea level than in high altitude (19.5% and 6.9%, respectively).[26] Moreover, in a new cross-sectional study conducted on 3073 students (1504 boys and 1569 girls) in Riyadh city using the ISAAC questionnaire, the prevalence of asthma according to lifetime wheeze was 25.3%, depending on wheeze during the past 12 months was 18.5%, and physician-diagnosed asthma was 19.6%. The prevalence of exercise-induced wheezing and night coughing in the past 12 months was 20.2% and 25.7%, respectively.[27] In a recent cross-sectional study on 511 males 16–18-year-old students in the northern border region of Saudi Arabia using ISAAC questionnaire and Asthma Control Test, the prevalence of physician-diagnosed asthma, lifetime wheeze, and exercise-induced wheeze was 11.4%, 30.3%, and 19%, respectively.[28]

Most asthma cross-sectional studies in Saudi Arabia concentrated on the disease prevalence among children and adolescents. Data are lacking on asthma prevalence among adults in many regions of Saudi Arabia, including Najran in the southern border region of the kingdom.[24] Estimating asthma prevalence in all age groups is essential as asthma is a significant cause of morbidity and disability that affect the general health and economic costs. The costs of asthma include not only the direct cost of medicines and the use of health services but also indirect costs linked to a loss in productivity and other costs to the patient and patient's family, which are often high. Nevertheless, asthma prevalence estimatesare used as a base data for the stakeholders to plan and set the required management and control protocols that reduce morbidity, mortality, cost of medications, and improve quality of life.

In this context, the present study was designed to determine the prevalence and risk factors of asthma symptoms among Saudi students of Najran University using the internationally adopted ISAAC approach, thereby, providing a base of information to asthma problem magnitude among adults in the southern border of Saudi Arabia.

MATERIALS AND METHODS

A cross-sectional study conducted during the academic year 2017–2018. The candidates were Najran University students, males and females aged 18 and above living in Najran for more than 1 year. Samples were taken using a multistage random sampling including random selection of the colleges; then, a representative sample of students was randomly selected from lists of names. With the expectation of 10% prevalence depending on a previous study in Riyadh, Saudi Arabia, the sample size was calculated according to the following formula:

$$N = \frac{Z^2 Pq}{d^2}$$

Where, N = minimum sample size; Z = normal standard deviation 95% confidence interval (Z = 1.96); *P* = prevalence of the disease; q= (1 – prevalence); and d = margin of error (0.05).[29]

A total of 418 students were included in the study, according to the inclusion criteria.

The Questionnaire

The modified translated ISAAC questionnaire was used to estimate asthma prevalence among the randomly selected

students. The questionnaire included sociodemographic data, asthma symptoms, allergy symptoms, asthma diagnosis and symptom severity, medical history of allergic diseases, family history of asthma and allergy, and indoor and outdoor environmental factors.

Research Ethics

The study was ethically cleared by the Scientific Research Ethics Committee at Najran University and stated as ethical approved under the research code: NU/MID/043. All participants were informed about the objectives and the need for the present study. They were assured about the confidentiality of their information. Informed consent was obtained before the commencement of data collection.

Data Analysis

Data were analyzed using version 20 IBM SPSS program (IBM© Corp., Armonk, NY, USA). Descriptive statistics and Chi-square tests with odds ratios (OR) for risk estimates were used; $P \leq 0.05$ was considered statistically significant.

RESULTS

The study included 418 adult students (269 males and 149 females) with a mean age of 21.05 ± 1.56. The prevalence of asthma depending on the wheezing symptom in the past 12 months was 27%, and physician-diagnosed asthma was 13.6% [Figure 1]. Wheezing was more correlated with shortness of breathing than other asthma symptoms [Table 1]. Among asthmatics, females were more affected than males [Figure 2]. Most of the asthmatic subjects (>85%) have intermittent symptoms. The first-degree family history, active tobacco smoking, allergic rhinitis (AR), dust, and smoke are the major risk factors for asthma symptoms [Table 2]. Symptoms of AR were found to be more frequent during winter [Figure 3]. Home dust was the most significant trigger factors for AR symptoms in asthmatic subjects [Figure 4].

DISCUSSION

The present study is the first study conducted in the southern border region of Saudi Arabia to estimate the prevalence of asthma and its risk factors among the adult age group. The prevalence of asthma depending on wheezing symptom in the past 12 months as guided by the ISAAC was 27%. The prevalence of physician-diagnosed asthma was 13.6%. Females reported a higher prevalence of asthma symptoms compared to males, risk factors for asthma symptoms included a family history of asthma, AR, active smoking, and a dusty environment. Asthma and AR coexistence was observed in almost 80% of the asthmatic group.

Asthma prevalence according to wheezing symptom in the present study is higher than the results observed in the Arab

Table 1: Correlation between wheezing symptoms and other asthma symptoms

Correlation	*r***	*P*
Wheeze+SOB early morning*	0.53	<0.001
Wheeze+SOB daytime	0.50	<0.001
Wheeze+SOB night	0.38	<0.001
Wheeze+Nocturnal cough	0.27	<0.001

*SOB: Shortness of breathing, **r: Correlation coefficient

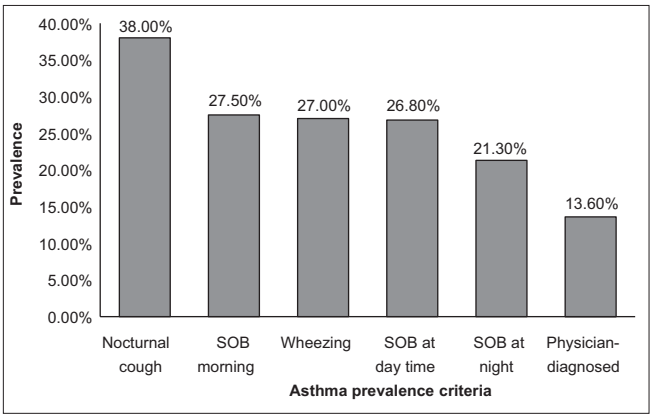

Figure 1: Prevalence of asthma symptoms according to various criteria (*n*=418)

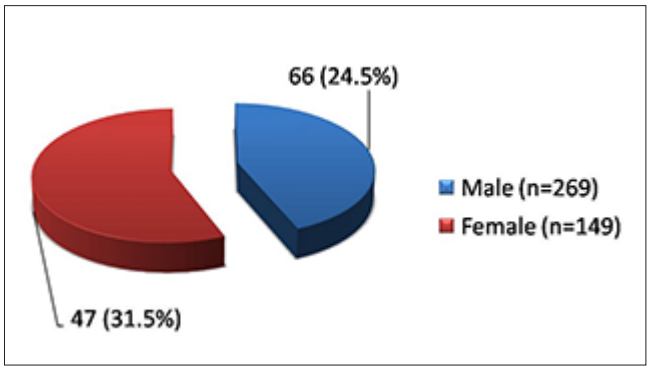

Figure 2: Gender variation in asthma symptoms

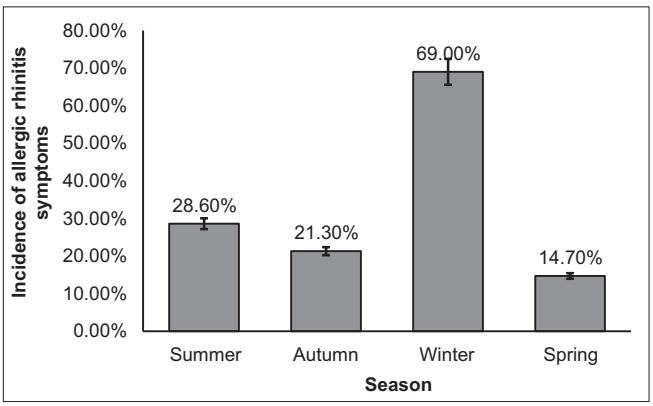

Figure 3: Symptoms of allergic rhinitis in relation to seasons among asthmatic subjects

Table 2: Risk factors for asthma symptoms and/or asthma attack

Risk factor	% in asthmatics (*n*=113) (%)	% in non-asthmatics (*n*=305) (%)	Odds ratio (95% CI)	*P*
Family history of asthma	73	44.8	3.44 (1.84–6.42)	<0.001
Active smoking	16.8	5.9	3.22 (1.62–6.39)	0.001
Allergic rhinitis	78.8	55.4	2.98 (1.8–4.9)	<0.001
Smoke	49	27	2.59 (1.46–4.57)	0.001
Dusty environment	72.5	58.6	1.86 (1.16–2.98)	0.006
Chemicals	27.4	18	1.71 (1.03–2.85)	0.026
Having eczema	29.8	10.5	1.63 (0.93–2.86)	0.05
Domestic animals	62.8	52.4	1.53 (0.98–2.38)	0.037

CI: Confidence interval

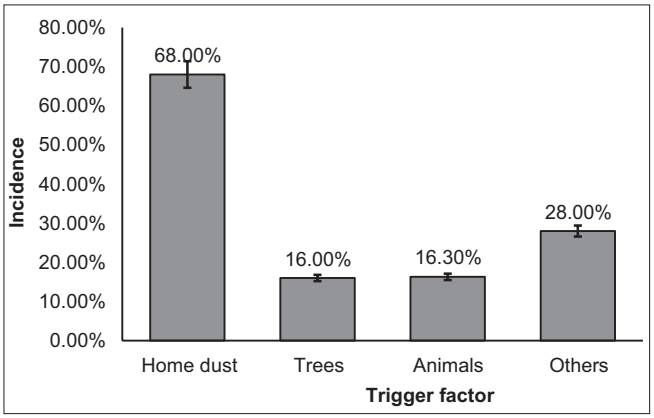

Figure 4: Symptoms of allergic rhinitis in relation to seasons among asthmatic subjects

world and to those obtained by the cross-sectional studies adopting the ISAAC method (wheezing criteria) conducted in both children and adolescents in other regions of Saudi Arabia (Riyadh [18.5%] and northern border [16.8%]).[21-23,27,28] Different environmental factors may explain this variation. Najran area has bouts of a dusty climate in most months of the year, which may be a risk factor for the higher prevalence of asthma symptoms. However, depending on wheezing symptom alone may overestimate asthma prevalence, as any noisy chest condition in the past 12 months could be self-reported as wheeze. It is strongly advised to adopt a combination of asthma symptoms (wheeze plus). According to the current results, wheezing was more correlated with early morning shortness of breathing; therefore, a combination of wheezing plus early morning chest tightness is a justified suggestion that proved to yield nearly objective asthma prevalence.[30] On the other hand, the present study showed that the prevalence of physician-diagnosed asthma was 13.6%. Although this result is within the national range of 4–23% previously reported by Al-Frayh *et al*., it is less than those reported in some regions of the Kingdom (Riyadh [19.6%]), at sea level in Asir (19.5%), and a little bit higher than in northern border (11.4%).[25-28] Nevertheless, a study in Najran schoolchildren showed a lower prevalence of physician-diagnosed asthma than the estimated adult result in the present study (27.5% vs. 13.6%).[31] Our result is almost similar to some Arabic Gulf countries (Oman [13.8%] and Al-Ain in UAE [13%]).[21,23] Self-reported asthma yields subjective estimates; therefore, pulmonary function tests (bronchial reversibility and provocation tests) are suggested to validate self-reported asthma in the questionnaire-based prevalence surveys. Concerning gender variation in asthma prevalence, the present study showed a higher prevalence of asthma among female students. This result is consistent with international literature documenting female asthma predilection.[32-34] Many asthma risk factors were reported by the present study, including a family history of asthma, AR, active smoking, and a dusty environment. These factors may explain the regional variation in asthma prevalence and the pathogenesis of asthma documented by many studies.[2-10] In this study, almost 80% of the asthmatic group reported symptoms of AR and the adjusted OR showed a 3 times chance of asthmatic to have symptoms of AR. This result is in concordance with several studies reporting a high percentage of AR among asthmatic subjects (Masuda *et al*. [78%] and Prasad *et al*. [80%]), as well as being a significant risk factor for asthma in Sudanese and Korean studies.[35-38] This finding justifies considering AR in the protocol of asthma management for better prevention and control. The symptoms of AR were found higher during winter and were mostly triggered by house dust. This may be explained by the relatively higher frequency of dusty environment during the winter season in Najran.

The strength of the current study is the use of the internationally adopted ISAAC questionnaire as a basis of asthma estimation and having a representative sample of university students depending on the previous local studies. The limitation of the present study is the generalization of its results to the whole community as the sample size is mainly university students. Therefore, the study results could be considered as a pilot for a community-based survey to estimate asthma prevalence in the whole southern border region.

CONCLUSIONS

The study showed a high prevalence of self-reported asthma symptoms among adults in Najran University associated with a high prevalence of AR, which needs particular attention by the health stakeholders.

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