

Association between allergic rhinitis and asthma symptoms in adults in Sudan

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Abstract

Background: Many published epidemiologic studies confirm a marked increase in the prevalence of asthma and allergic rhinitis (AR). Information is scarce regarding prevalence of AR and its association with asthma symptoms in Sudanese adults.

Objective: To determine the prevalence of AR symptoms in the adults in Sudan and its relation with asthma symptoms and to identify the common trigger factors for allergy symptoms.

Materials and Methods: A cross-sectional study was performed in Western, Northern, Eastern, and Central Sudan. An epidemiological questionnaire was distributed among the university students, academic staff, employees, and workers chosen randomly. The questionnaire included cardinal asthma symptoms and nasal symptoms in the past year when the subject did not have cold or “flu”, their seasonal occurrence, trigger factors, and the family history of asthma and AR.

Result: A total of 3,974 respondents in the age group of 18–67 years were included. Average prevalence of asthma symptoms in Sudanese adults was 10%. Prevalence of AR symptoms was 49% in the total sample with a significantly ($p = 0.004$) higher prevalence among patients with asthma (72.3%, $n = 458$) compared with patients without asthma (32.6%, $n = 3516$). There was a strong association between AR and asthma symptoms in all the sites (odds ratio: 2.91–4.52). Positive family history was a strong risk factor for AR in all the sites (odds ratio: 3.38–4.24). Symptoms of AR were more prevalent in winter season followed by summer and autumn. Home dust was found to be the most prevalent trigger factor for symptoms of AR in all the sites.

Conclusion: There is a high prevalence of AR symptoms in Sudanese adults, which is significantly associated with asthma symptoms.


KEY WORDS: Allergic rhinitis, asthma, Sudan

Introduction

Allergic rhinitis (AR) is a common medical problem worldwide.^[1] A recent review by Ozdoganoglu and Songu^[2] has

shown that prevalence of AR is estimated to range from 10% to 20% in United States and Europe. Two patterns are seen in AR: seasonal and perennial. Some people may experience both types of rhinitis, with perennial symptoms worsening during specific pollen seasons. Estimates show that 60% to 78% of people who have asthma also suffer from AR, which is implicated as a trigger for asthma attacks among adults and children.^[3]

Many epidemiological studies confirm the association between asthma and AR. Subjects with perennial rhinitis were more likely to have current asthma and bronchial hyper-responsiveness than subjects without perennial rhinitis.

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The association between perennial rhinitis and asthma remained significant after adjustment for possible confounders such as atopy, and was found in both atopic and nonatopic subjects; rhinitis was also found to be an independent risk factor for the onset of asthma.^[4]

Many retrospective, cross-sectional, and experimental studies have been conducted to explain the nature of the coexistence between asthma and rhinosinusitis. A retrospective study by Seybt *et al.*^[5] has supported the concept of “one airway one disease” or “united airways.” A cross-sectional study by Stelmach *et al.*^[6] has supported the theory of airway anatomical abnormalities, a link for the coexistence.

A recent experimental study by Liang *et al.*^[7] has investigated the systemic inflammatory reaction because of circulating inflammatory mediators that explain asthma and AR comorbidity.

In this study, we aim to determine the prevalence of AR symptoms in the adults in Sudan and its association with asthma symptoms. Moreover, we would like to determine whether AR is a risk factor for asthma in Sudan or not.

Materials and Methods

A cross-sectional study was performed in Elobeid (Western Sudan), Dongola (Northern Sudan), Kassala (Eastern Sudan), and Khartoum (Central Sudan) during 2006/2007–2009/2010. A total of 3,974 respondents were included. The participants were adult Sudanese university students, staff, employees, and workers; males and females aged 18 and above living in the study site for more than 1 year. Samples were taken using a multistage random sampling. The total universities in the four sites under study were 27. In each randomly selected university, faculties were first randomly selected from a list of all university faculties, then the staff, employees, and workers were randomly selected from the lists of names, and then the students were randomly selected from the list of registered ones. The study was approved by the Research Ethics Committee of the National Ribat University. All participants were informed about the objectives and the need of this study; self-confidentiality was assured and all participants accepted to get enrolled in the study.

The Questionnaire

A modified translated International Study of Asthma and Allergy in Childhood (ISAAC) questionnaire for adults was filled out by all the randomly chosen participants.

The epidemiological questionnaire included the following:

1. Nasal symptoms in the past year namely sneezing, runny nose, and blocked nose when the subject did not have cold or “flu”
2. Nasal symptoms accompanied by itchy watery eyes (rhinoconjunctivitis)
3. Season of the year in which nasal symptoms occur
4. Family history of AR
5. Previous medical diagnosis of AR
6. Triggers of nasal symptoms including home dust, animals, and plants

It also included asthma symptoms namely wheezing, cough, and shortness of breathing.

Data Analysis

Descriptive analysis was used to estimate the prevalence of AR symptoms, and case–control analysis was used to determine the possible association between AR and asthma in addition to estimation of the risk factor. Data were statistically analyzed using version 16 SPSS program. Chi-square test, odds ratio, and *p*-value <0.05 were used to determine the risk estimate and the possible significant association between AR and asthma symptoms.

Result

A high prevalence of AR symptoms was found in the group of patients with both asthma and without asthma, and a significantly higher prevalence was found among the subjects with asthma as compared with those without asthma (control group) in all the four sites [Table 1 & 2]. A significant association was found between AR and the asthma symptoms in all the sites (odds ratios: 4.11 in Elobeid, 5.47 in Dongola, 4.52 in Khartoum, and 2.91 in Kassala) [Table 3]. Rhinoconjunctivitis was reported in 68.6%, 64.3%, 42.1%, and 48.3% of the subjects with asthma in Elobeid, Dongola, Khartoum, and Kassala, respectively, and doctor’s diagnosis of AR was reported in 46.4%, 50%, 33.8%, and 37.1% in Elobeid, Dongola, Khartoum, and Kassala, respectively. Symptoms of AR in the four sites were more prevalent in winter season particularly in Dongola, followed by summer and autumn [Figure 1]. Home dust was found to be the most prevalent trigger factor for the symptoms of AR in all the sites followed by trees and the least prevalent was animals [Figure 2]. Family history of AR was present in 78.6%, 54.8, 48.3%, and 46.2% in Elobeid, Dongola, Khartoum, and Kassala, respectively. Positive family history was found to be a significant risk factor for AR in all sites (odds ratio = 3.55–4.24, *p* < 0.001).

Table 1: Prevalence of AR symptoms among patients who were asthmatics and who were nonasthmatics in the study sites

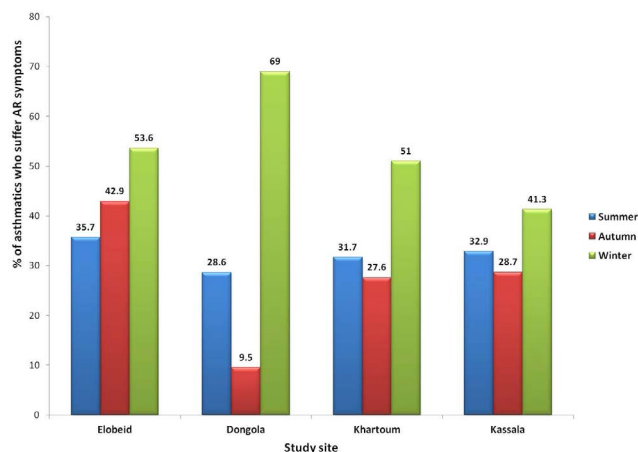
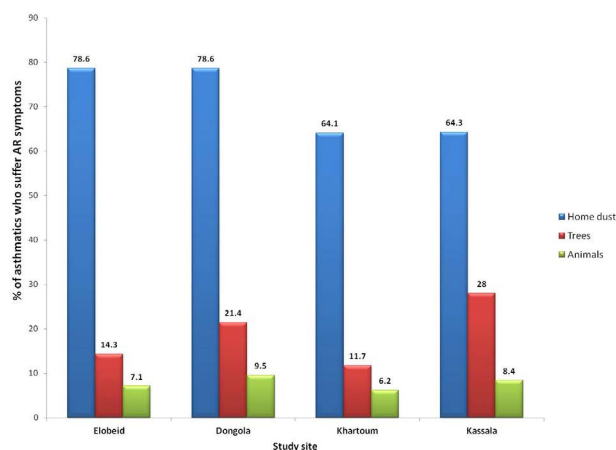
Study Site	Elobeid		Dongola		Khartoum		Kassala	
	Asthmatic (n = 28)	Nonasthmatic (n = 42)	Asthmatic (n = 42)	Nonasthmatic (n = 394)	Asthmatic (n = 245)	Nonasthmatic (n = 2,046)	Asthmatic (n = 143)	Nonasthmatic (n = 692)
Frequency and % of AR symptoms	22 (78.6%)	181 (47.1%)	29 (69%)	114 (28.9%)	179 (73.1%)	539 (26.3%)	101 (70.6%)	313 (45.2%)

AR, allergic rhinitis.

Table 2: Prevalence of AR symptoms in the total sample

Total Subjects	Asthmatic (n = 458)	Nonasthmatic (n = 3,516)	Total sample (n = 2,974)
Frequency and % of AR symptoms	331 (72.3%)	1147 (32.6%)	1478 (49.6%)

AR, allergic rhinitis.

**Figure 1:** Symptoms of allergic rhinitis in relation to seasons among subjects who were asthmatics in the study sites.**Figure 2:** Trigger factors for allergic rhinitis symptoms among subjects who were asthmatics in the study sites.

Discussion

The present study has revealed a high total prevalence of self-reported AR in Sudanese adults (49.6%). This figure is higher than those obtained by the prevalence studies conducted among adolescents in El-Ain, UAE (36%)^[8] and ISAAC nationwide study in UK (18.2%)^[9] but lower than a study conducted by Uthaisangsook^[10] in a University population in

Table 3: Association of allergic rhinitis with asthma using odds ratios and *p*-values in the four sites under the study

Site	Odds Ratio	95% confidence interval		<i>p</i> -value
		Lower	Upper	
Dongola	5.47	2.75	10.91	< 0.001
Elobeid	4.11	1.63	10.36	0.001
Kassala	2.91	1.97	4.3	< 0.001
Khartoum	4.52	3.36	6.08	< 0.001

Thailand (57.4%). This variation in the prevalence pattern of AR could be attributed to social, environmental, and genetic factors. A study carried out in Tehran by Ghazi et al.^[11] showed that the environmental factors and family history of allergy are important risk factors in the incidence of AR. Another study by Kilpeläinen et al.^[12] showed significant association between indoor environmental factors and AR. In our study, a positive family history was found to be a significant risk factor for AR in subjects who were asthmatic plus who were nonasthmatics, which is consistent with the long recognized genetic component of AR.^[13] Prevalence of rhinoconjunctivitis (nose plus eye symptoms) among subjects with asthma was found to range from 42.1% to 68.6%. These figures were higher than those obtained by phase III ISAAC study in which prevalence of allergic rhinoconjunctivitis ranged from 7.2% to 27.3%.^[14] However, these values were lower when compared with AR with nose-only symptoms (69%–79%), which justifies the use of combination of eye and nose symptoms that have a high positive predictive value in the diagnosis of AR as evidenced by a study validating ISAAC core question on rhinitis in a population of Swiss school children.^[15]

In this study, maximum 50% of the subjects from asthmatic group have been medically diagnosed with AR indicating the need for better practice in asthma and allergy clinics. Prevalence of AR symptoms was found significantly higher among subjects who were asthmatics than those who were nonasthmatics with a range of 69%–79% seen in the asthmatic group. This is in concordance with a recent study by Masuda et al.^[16] who described a high prevalence (78%) and early onset of AR in children with bronchial asthma, and another study by Prasad et al.^[17] in which patients with asthma had associated AR in 80% of the cases. A significant strong association between AR and asthma evident by odds ratios (2.91–5.47) and *p*-values (0.001 and <0.001) was found in all the sites in our study. This finding is consistent with many studies relating AR and asthma including recent ones.^[18]

Regarding trigger factors, house dust was found to be the most common trigger factor for symptoms of AR in asthmatic group, followed by trees, and animals being the least one in all the study sites. A similar pattern with a bit higher values was shown in a previous Sudanese study by Musa et al.^[19] in which factors that increase the nasal symptoms in patients with both asthma and AR were found to be house dust (83.3%), plants (38.9%), and animals (19.4%).

With regard to season, symptoms of AR were found to be more in winter followed by autumn and summer particularly in Dongola. Dongola area is dry and colder than other study sites favoring the exaggeration of symptoms of AR during the winter season.

Conclusion

In conclusion, we found that prevalence of self-reported AR is high among Sudanese adults especially those with asthma symptoms and regional differences were small. The coexistence of AR and asthma symptoms is a significant health challenge in Sudan and good protocol programs are needed for their control. The strength of the study is the representative sample size that included Sudanese adults from the four major regions in Sudan as well as using a modified ISAAC questionnaire for adults, which included the local trigger factors for asthma and AR symptoms. The limitation of the study is that depending on self-reported symptoms may overestimate the results of AR prevalence. Nevertheless, the questionnaire was translated into the Arabic language to minimize the misunderstanding of the questions. Furthermore, including combination of symptoms, for example, eye and nose symptoms as well as using a validated method, for example, score for allergic rhinitis (SFAR) and skin prick testing will empower the prevalence of surveys results.

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