

Wheezing alone is not enough to validate asthma diagnosis among Libyan adults: A questionnaire-based study reinforced with pulmonary function test

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Abstract

Background: Asthma remains an increasing cause of morbidity and mortality in adults, especially in developing nations. In Libya, no previous study has reported the diagnosis of asthma among adults. The primary objective of this work is to validate the diagnosis of asthma through a survey questionnaire for adult Libyans, by using a digital spirometer as a recommendation to diagnose asthma. The specific objective of this study included the search for a correlation between asthma symptoms and its diagnosis. **Materials and Methods:** An adapted International Study of Asthma and Allergies in Childhood questionnaire was distributed to 1800 participants >18 years. **Results:** Females comprised 56.7% of the sample. Pulmonary function tests (spirometry) were performed on respondents who reported wheezing and chest tightness at rest and during daily activity. Approximately, 17.6% of the participants reported having wheezes during the past 12 months, while 18.4% had chest tightness at rest and during daily activities. A significant correlation was found between wheezing and chest tightness ($P < 0.001$). About 44% of the participants showed a positive reversibility test. **Conclusion:** Chest tightness at rest and wheezing are more reliable for diagnosing asthma. The city of Sirte in Libya requires the establishment of the common pollens which trigger asthma.

Key words: Asthma, Libyan, spirometry, wheezing

INTRODUCTION

Asthma is an ancient respiratory disease where patients experience profound and difficult breathing. This was noted by Hippocrates, who described these patients to be asthmatic. The word “asthma” was labeled by the

Greeks, meaning panting.^[1] Because bronchial asthma is a heterogeneous condition, a widely acceptable definition is still used to define asthma; some of these definitions have been used since 1995. An overlap exists between asthma and bronchial hyperreactivity, and physicians face difficulties in diagnosing asthma as hyperreactivity could present in many people who do not have asthma.^[2] At the same time, some milder forms of asthma could be missed and diagnosed as hyperreactivity. To avoid these limitations, many studies and guidelines now

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use questionnaires to diagnose asthma. The diagnosis of asthma is largely a clinical one because it involves heterogeneous symptoms and conditions, some of which are personal, while others may be related to the patient's family and medical history.^[3] When making a diagnosis of bronchial asthma, physicians should bear the International Consensus Report definition of asthma in mind. Spirometry is used to measure lung function by estimating air flow.^[3,4] It is a useful device to diagnose obstructive lung diseases such as asthma. Similar to most North African countries, the prevalence of asthma in Libya is not exactly known. In fact, there is no precise way to define asthma in our population.^[1] The International protocol to study Asthma and Allergies among Childhood (ISAAC) has been put forward and legislated by the International Society for Augmentative and Alternative Communication (ISAAC) who is responsible for improving the lives of children and adults. The society had also worked on revealing to educate public global society of the warning signs and symptoms in some North African countries; however, this study did not include Libya.^[4] In Libya, no study has investigated the prevalence of asthma in adults.

Many factors are believed to either cause or exacerbate bronchial asthma, especially in young adults and children.^[5,6] In fact, asthma and allergy are common conditions with complex and heterogeneous etiologies.^[7,8] Asthma and allergic disease often co-occur in the same individual or in different individuals within the same family. However, there is still debate about whether this co-occurrence reflects distinct conditions with shared pathogenic pathways or different clinical manifestations of the same disease. Some studies, however, have challenged the assumption that childhood asthma was largely of allergic etiology.^[9,10] The primary objective of this study is to validate the diagnosis of asthma through a questionnaire and supportive supplementary pulmonary function tests among Libyan adults in Sirte City. The specific objective of this study included the search for a correlation between asthma symptoms and its diagnosis.

MATERIALS AND METHODS

This cross-sectional study was performed to validate asthma diagnosis by pulmonary function tests using the modified ISAAC questionnaire for adults among Libyans aged 18–60 years visiting the Sirte Chest Clinic in Sirte, Libya. A digitalized spirometer (Spirolab III)^[3,11] was used to validate pulmonary function among all participants who reported symptoms of asthma. A total of 2000 participants were targeted.

Of these, 1800 responded to the questionnaire, representing a response rate of 90%. Participants were recruited provided they were aged >18 years, Libyan nationals, and residents of Sirte for more than 1 year. Patients with other obstructive lung diseases, such as chronic obstructive pulmonary disease, were excluded from the study. A questionnaire was distributed to all patients who visited Sirte Chest Clinic between January 1 and July 2, 2015. The questionnaire captured patients' data, asthma symptoms, allergy symptoms, and environmental issues. Spirolab III was used to test pulmonary function in patients assumed to have asthma. The data were analyzed using IBM SPSS Statistics for Windows, version 21.0 (IBM Corp., Armonk, NY, USA). Results are presented in tables and significance was set at $P < 0.05$. The test was applied in either a standing or a sitting position. Forced expiratory volume in one second, forced vital capacity, and peak expiratory flow rate were measured and recorded before inhalation of bronchodilator (prevalues).

RESULTS

A total of 1800 participants were recruited. Of these, 56.7% were female ($n = 1021$). The majority of the participants were aged 18–27 years ($n = 1333$; 74.1%). In the past 12 months, 316 respondents (17.8%) reported having wheezes [Table 1]. In addition, patients with allergic rhinitis were significantly more likely to have wheezes. Factors which triggered allergic rhinitis, such as perfumes, positively correlated with wheezes in the past 12 months ($P = 0.036$). Furthermore, 33% of the participants with allergic rhinitis experienced wheezing during winter [Figure 1]. House dust was found to be the most important triggering

Table 1: Frequency of symptoms in the sample

Symptoms	Yes/no	Frequency (%)
Had wheezing during the past 12 months	No	1483 (82.4)
	Yes	316 (17.6)
Shortness of breath during the day without exertion or exercise during the past 12 months	No	1468 (81.6)
	Yes	331 (18.4)
Shortness of breath that awakens the patient at night in the past 12 months	No	1547 (86.0)
	Yes	248 (13.8)
Night cough that awakens the patient at night in the past 12 months	No	1287 (71.5)
	Yes	508 (28.2)
History of asthma	No	1423 (79.1)
	Yes	342 (19.0)
Asthma attack during the past 12 months	No	1668 (92.7)
	Yes	161 (8.9)
Family history of asthma	No	1216 (67.6)
	Yes	568 (31.6)

factor (41.4%). Seasonal distribution of symptoms was found to be highest in winter [Figure 2].

Reversibility testing

Of the 320 participants who had wheezing, 34 declined the spirometry test, and of the remaining 287 participants, 127 (44%) had a positive reversibility test. One hundred and sixty patients (56%) had a negative response to reversibility testing.

- Reversibility test results for patients who complained of wheezing: Reversibility testing was performed in 287 participants, and the results are summarized in Table 2
- Correlation between reversibility testing and demographic data among patients with wheezing: No correlation was found between reversibility testing and a history of wheezing in the past 12 months ($P = 0.409$), gender ($P = 0.164$), or age ($P = 0.231$). Spirometry test results were positive in 41.3% of the participants who reported wheezing in the past 12 months. Among participants with positive reversibility test results, females comprised 24% of the sample versus 20% for males
- Correlation between wheezing in the past 12 months and other asthma symptoms: There was a statistically significant correlation between wheezing in the past 12 months and at least five other asthma symptoms [$P < 0.05$; Table 3]
- Indoor and outdoor factors which seem to predispose to wheezing: A Chi-square test showed that indoor or outdoor smolder and house cockroaches were significantly correlated with wheezing in the past 12 months [Table 4]

- Family history of asthma as a risk factor for wheezing: A family history of asthma was not statistically correlated with wheezing in the past 12 months ($P = 0.082$)
- Correlation between reversibility testing and a combination of asthma symptoms (wheezing + other symptoms): Although there was no statistically significant correlation between positive reversibility testing and wheezing alone ($P > 0.05$), there was a statistically significant correlation when wheezing was combined with shortness of breath that awakened the patient at night ($P = 0.027$) and nocturnal cough ($P = 0.001$).

DISCUSSION

This study demonstrated that wheezing alone is not enough to confirm a diagnosis of asthma. The objective of this study was to confirm and validate the diagnosis of asthma using the modified ISSAC survey questionnaire combined with lung function tests. According to the ISAAC protocol, a diagnosis of asthma was only based on patients' reports of wheezing in the past 12 months. However, no confirmatory test such as spirometry was used, contrary to our study. The ISSAC protocol showed a high prevalence of asthma symptoms in Sudanese children compared to children in other African countries (12.5%).^[6] In our study, participants who had reported wheezing were subjected to lung function tests by spirometry. A pulmonary function test is an essential component of asthma diagnosis. In this study, wheezing was considered the predominant symptom. The prevalence of wheezing

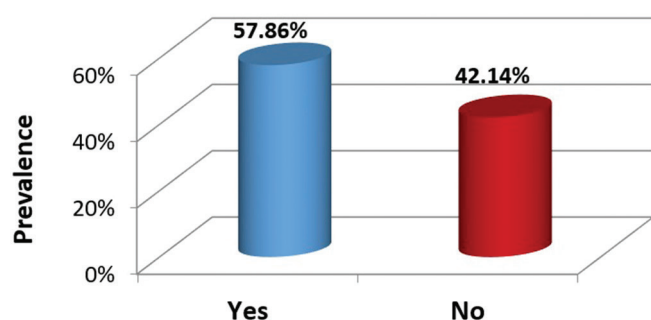


Figure 1: Percentage of participants with allergic rhinitis

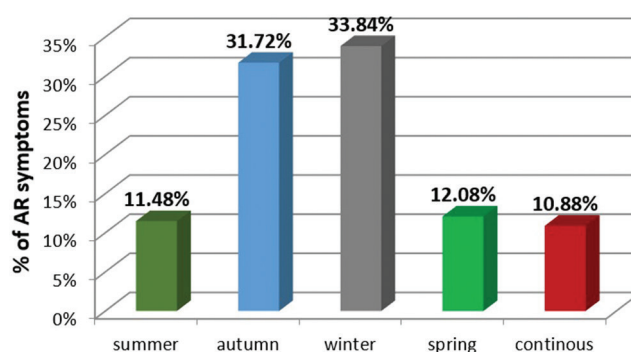


Figure 2: Seasonal distribution of symptoms

Table 2: Summary of reversibility test results

Test result	Frequency	Relative proportion based on participants with wheezing (n=287)	Relative proportion based on the total sample (n=1800)
Negative	160	56	8.8
Positive	127	44	7
Total	287	100	15.7

Table 3: Correlation between wheezing in the past 12 months and other asthma symptoms

Asthma symptom	P
Shortness of breath during the day without exertion or exercise during the past 12 months	<0.001
Shortness of breath that awakens the patient at night in the past 12 months	0.049
Night cough that awakens the patient during night in the past 12 months	0.001
History of asthma	0.001
Asthma attack during the past 12 months	<0.001

Table 4: Factors that predisposed to wheezing

Factors	P
Inside home pesticides	0.120
Trucks	0.173
Dust	0.132
Indoor or outdoor smolder	0.013
House cockroach	0.016
Pollen (trees)	0.075
House animals	0.380
Chemicals	0.246
House carpets	0.152
Air conditioning	0.422

in the past 12 months was 17.6%, and the frequency of other asthma symptoms ranged between 7% and 28%. There are no published data of asthma in Libya, but the prevalence of wheezing in adults reached 3.4%–3.9% in three Maghreb countries, including Algeria, Morocco, and Tunisia.^[5] Asthma prevalence among children, based on the ISAAC questionnaire, ranged between 5% and 19% in 2008 in Algeria, Morocco, and Tunisia.^[5] A previous study conducted in Algeria by Adeloie D *et al.*^[6] showed that asthma was emerging as a public health problem in middle-income persons, with an incidence of 800 cases per 100,000 population. In Sudan, the prevalence of asthma in 2007 was 13%.^[11] In this study, reversibility testing was positive in 33 (44%) and negative in 42 (56%) of 75 symptomatic participants. Most of the participants in this study who complained of wheezing showed a positive correlation with other asthma symptoms. However, wheezing alone was not found to be reliable as an indicator of asthma symptoms,^[12] contrary to our expectation. Reversibility testing was performed in patients who had at least one other symptom in addition to wheezing (wheezing plus shortness of breath that awakened the patient at night or wheezing plus nocturnal cough). Our finding that allergic rhinitis was significantly correlated with wheezing is consistent with those reported by other authors.^[13,14] Based on our questionnaire data, we identified two major triggering factors, including indoor and outdoor smolder and house cockroaches, which are well documented in the literature.^[15]

CONCLUSION

The prevalence of asthma symptoms among adults in Sirte using the modified ISSAC questionnaire was 17.6%, which is comparable with findings reported in other North African countries; however, when validated by pulmonary function tests, the prevalence was only 6.9%. Reversibility testing alone and the presence of one symptom (wheezing) might not be enough to reach a diagnosis of asthma among adult patients. Therefore, a large-scale study with more tests is warranted. Furthermore, we believe that two symptoms should be considered reliable to reach a diagnosis of asthma.

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Conflicts of interest

There are no conflicts of interest.

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