ABSTRACT

Background: Asthma is a major public health problem worldwide with wide differences in prevalence and severity. It is one of the most common chronic conditions affecting both children and adults.

Methodology: This study is a community-based cross-sectional study conducted on a representative sample of children in the Kingdom of Saudi Arabia, during the period from June 1, 2018 to July 31, 2018. The statistical analysis was carried out using SPSS software for Windows (version 16.0). Chi-square test was used for comparing qualitative variables. A 5% level was chosen as a level of statistical significance in all statistical tests used in this study.

Results: The prevalence of physician-diagnosed bronchial asthma among Saudi children was 42.7%. It was more prevalent in the age group less than 1 year by 51.5%. Males reported a high prevalence rate than females (51.8% vs. 48.2%), respectively. Concerning the manifestations, chest wheezes by 67.6%, allergic rhinitis 69.5%, difficulty in respiration 77.7%, cough 75.2%, insomnia and restlessness 75.7%, and continuous sense of tiredness in 70%. Regarding treatment, we found that 98.1% of cases had received medical treatment; regarding medications, 55.6% received short-acting bronchodilators, 26.4% inhaled corticosteroids, and 7.1% oral cortisone.

The following are the precipitating factors of bronchospasm: the common cold attack in 76.6%, exhaustion 70%, exposure to animal hair, some chemicals, and dust 67%, hot weather 60.5%, and fish, egg, soybeans, or peanuts intake 26.4%.

Conclusion: Bronchial asthma is still one of the most common chronic diseases among children in KSA. Male children with allergic rhinitis, family history of asthma, and exposure to passive smoking showed high prevalence among asthma cases; common cold attack, exposure to animal hair, some chemicals, and dust, hot weather, and exhaustion were found to be precipitating factors. Most cases improved on treatment.

Keywords: Bronchial asthma, children, prevalence, precipitating factors, treatment.

Introduction

Asthma is one of the most common chronic conditions affecting both children and adults [1]. It is a chronic inflammatory airway disease in which cells and cellular elements play a significant role in its pathogenesis [2]. It impairs the quality of life of children and their caregivers [3]. It is estimated that the prevalence of asthma globally was between 1% and 18% [4]. As for Saudi Arabia, it is estimated that more than 2 million Saudis have asthma, and the percentage ranges from 8% to 25% in Saudi children [5]. The wide variations of asthma prevalence globally are related to environmental variations among countries, in addition to the use of different measurement tools and different epidemiological definitions of asthma.
Childhood bronchial asthma

[6]. Childhood asthma often manifests with recurrent episodic cough, wheezing, chest tightness recognized by older children, exercise intolerance, and breathlessness [2]. However, severe asthma in children is characterized by sustained symptoms even after treatment with high doses of inhaled or oral corticosteroids and represents approximately 5% of childhood asthma cases [7, 8]. Regarding risk factors, although genetic predisposition is clearly evident, environmental factors such as infections and exposure to endotoxins may be protective or may act as risk factors, some prenatal risk factors, including maternal smoking, have been firmly established, but diet and nutrition, stress, use of antibiotics, and mode of delivery [9].

A cross-sectional study conducted in Jazan, Saudi Arabia, among school-age children to evaluate the prevalence of asthma reported that students with a medical history of bronchial asthma were 212 (15.1%), with no clear statistically significant difference in frequency between males and females (P = 0.161). Asthma was confirmed by the doctor in 10% of the participants [10].

The aim of this study is to show the prevalence, manifestations, risk, and precipitating factors of bronchial asthma among children in KSA.

Participants and Methods

Study design and setting

This study is a community-based cross-sectional study conducted on a representative sample of children in the Kingdom of Saudi Arabia, during the period from June 1, 2018 to July 31, 2018 by using a research-made questionnaire. The sample size was calculated using the sample size equation: $n = \frac{Z^2p(1 - p)}{e^2}$. Data were collected from 859 children aged between 1 month and 15 years.

Data collection

The research-made online-disseminated questionnaire was filled by participants after a brief introduction or explanation of the idea of the research to the public. The questionnaire included questions about age and sex of the child, risk and precipitating factors of asthma and its manifestations, diagnosis, and treatment. Also, the questionnaire included inquiries about family history of asthma and its other related health problems.

Statistical analysis

Collected data were coded and analyzed using the statistical package for the social sciences (SPSS, version 22). Sample characteristics were summarized as numbers and percentages for categorical variables. Descriptive statistics for the prevalence and quantitative variables were used.

Ethical considerations

The questionnaire had a brief introduction explaining the idea of the research. Parents were informed that participation is completely voluntary. No names were recorded on the questionnaires. All questionnaires were kept safe.

Results

Our study included 859 patients; more than half (51.3%) of them were males. The family history of asthma was present in 20.1%. Exposure to passive smoking is 25.5%, and the prevalence of physician-diagnosed bronchial asthma among Saudi children was 42.7% [see table 1]. Regarding the relation of bronchial asthma with age and sex, our study found that it was more prevalent in the age group less than 1 year by 51.5%. Males reported a high prevalence rate than females (51.8% vs. 48.2%), respectively. Concerning the manifestations of childhood bronchial asthma, we reported chest wheezes by 67.6%, allergic rhinitis 69.5%, difficulty in respiration 77.7%, cough 75.2%, lung congestion symptoms 78.2%, insomnia and restlessness 75.7%, and continuous sense of tiredness 70% [Table 2]. Regarding the treatment of bronchial asthma, our study found that 98.1% of cases had received medical treatment. Regarding the type of medications, there were 55.6% of cases who received short-acting bronchodilators, 26.4% inhaled corticosteroids, and 7.1% oral cortisone. Regarding the precipitating factors of bronchospasm, our study reported a common cold attack by 76.6%, exhaustion 70%, exposure to animal hair, some chemicals, and dust 67%, hot weather 60.5%, and fish, egg, soybeans, or peanuts intake 26.4% [Table 3].

Discussion

Asthma is a major public health problem worldwide with wide differences in prevalence and severity throughout the world. Significant increases in the prevalence and severity have been noticed globally over the past few decades in certain geographical regions. Asthma is the most common chronic illness of children and adolescents. It has a major impact on the lifestyle and accounts for millions of missed school days each year. Thirty percent of the young people with asthma have limited activity, compared with 5% of youngsters without asthma [11]. Asthma is considered the major common chronic disease in children; it is characterized by repeated attacks of breathlessness and wheezing. Its prevalence varies widely from country to country. At the age of 6–7 years, the prevalence ranges from 4% to 32%. The same range holds good for ages 13 and 14. The United Kingdom has the highest prevalence of severe bronchial asthma in the world [12]. Childhood bronchial asthma has multifactor causation. Geographical location, environmental, racial, and factors related to behavior and lifestyle are found to be associated with the disease [13].

This is a cross-sectional study conducted among 859 cases in Saudi Arabia. This study aims to show the prevalence, manifestations, risk, and precipitating factors of bronchial asthma among children in KSA.
In this study, the prevalence of physician-diagnosed bronchial asthma among Saudi children was 42.7%. In general, the prevalence of childhood asthma in Saudi Arabia was ranged between 8% and 25%, and the highest prevalence (25%) of physician-diagnosed asthma in KSA was reported by Sobki and Zakzouk in 2004 [14]. This was less than that reported in our study.

In Taif, Saudi Arabia, a cross-sectional prospective study was carried out among 1700 children; the asthma
prevalence rate among children was 13.4% [15]. The prevalence of asthma among Saudi school children was found to be 10% in Riyadh, compared to 13% in Jeddah and Qassim, and 17% in Abha [16]. In Egypt, a community-based cross-sectional descriptive study included 1,500 children with 13.4% overall prevalence of bronchial asthma [17]. Childhood bronchial asthma appears to be prevalent also in different Arabic countries and represents a major health problem; its prevalence was estimated to be 22.3% in Iraq [18] and 20.7% in Oman [19]. In Nigeria, a descriptive, cross-sectional survey of the epidemiology of asthma among 811 of primary school children aged 6–11 years, a total of 101 pupils was diagnosed with asthma, thus giving a disease prevalence of 12.5% [20].

Regarding the relation of bronchial asthma with age and sex, our study found that it was more prevalent in the age group less than 1 year by 51.5%. Males reported a high prevalence rate than females (51.8% vs. 48.2%). It has been reported that asthma occurs more common in boys during childhood with a male-to-female ratio of 2:1 until puberty when the male-to-female ratio becomes 1:1 and symptoms are more likely to decrease in boys by adolescence [21]. However, in Taif city, another study found that asthma prevalence among girls (14.4%) was higher than boys (12.4%), but this was insignificant, and the highest prevalence of asthma (29.7%) was among the younger children (<3 years) followed by the group aged 3–6 years (28.9%), and the lowest prevalence (11.1%) was reported for children aged 12–18 years [15]. These results revealed that the prevalence of asthma is decreasing significantly (P = 0.001) as the children getting older, possibly airways could develop some kind of protection with advancing age [15]. In Egypt, another study reported that the prevalence was significantly higher in <5-year-old age group compared to 5–9 and 10–17-year-old groups (17.2%, 12.3%, and 7.6%, respectively), and it was significantly higher in males than in females (15.4% vs. 11.3%) [17].

Concerning the manifestations of childhood bronchial asthma, we reported chest wheezes by 67.6%, allergic rhinitis 69.5%, difficulty in respiration 77.7%, cough 75.2%, lung congestion symptoms 78.2%, insomnia and restlessness 75.7%, and continuous sense of tiredness 70%. Another study revealed that a cough was the most frequently occurred symptoms (33.7%) among asthmatic children. Difficulties in breathing were ranked the second common symptom (21%) while the wheezing prevalence was the least frequent occurred symptom (3.4%) [15]. However, in Riyadh, Bender et al. [22] found that breathlessness was the most common symptom among asthmatic children by 12.13% followed by wheezing 11.86% and cough 7.9%. Another study reported that 74.2% of cases had one to three episodes of wheezing and 25.8% had more than three, 78.0% also suffered from rhinitis, and 70.5% were diagnosed with atopic rashes [23]. In Upper Egypt, another study showed that the prominent symptoms of asthma were wheezed 100%, cough 96.4%, and dyspnea 40.5% [24].

Regarding the treatment of bronchial asthma, our study found that 98.1% of cases had received medical treatment. Regarding the type of medications, there were 55.6% of participants who received short-acting bronchodilators, 26.4% inhaled corticosteroids, and 7.1% oral cortisone. Another study reported that 58.8% of participants used inhalation bronchodilator for the treatment of asthma, while 20.0% of asthmatic children used syrup [15]. Regarding the precipitating factors of bronchospasm, our study reported a common cold attack by 76.6%, exhaustion 70%, exposure to animal hair, some chemicals, and dust 67%, hot weather 60.5%, and fish, egg, soybeans, or peanuts intake 26.4%. Another study reported that asthma cases in Saudi Arabia (N = 367).

### Table 3. Treatment characteristics of childhood bronchial asthma cases in Saudi Arabia (N = 367).

<table>
<thead>
<tr>
<th>Seeking medical care</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>14</td>
<td>3.8</td>
</tr>
<tr>
<td>Yes</td>
<td>353</td>
<td>96.2</td>
</tr>
<tr>
<td>Well examined clinically</td>
<td>26</td>
<td>7.1</td>
</tr>
<tr>
<td>No</td>
<td>341</td>
<td>92.9</td>
</tr>
<tr>
<td>Investigations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Blood tests</td>
<td>25</td>
<td>6.8</td>
</tr>
<tr>
<td>Chest X-ray</td>
<td>165</td>
<td>45.0</td>
</tr>
<tr>
<td>Allergic skin tests</td>
<td>36</td>
<td>9.8</td>
</tr>
<tr>
<td>Lung function tests</td>
<td>103</td>
<td>28.1</td>
</tr>
<tr>
<td>No investigations</td>
<td>38</td>
<td>10.4</td>
</tr>
<tr>
<td>Receiving medical treatment</td>
<td>7</td>
<td>1.9</td>
</tr>
<tr>
<td>No</td>
<td>360</td>
<td>98.1</td>
</tr>
<tr>
<td>Medications</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral cortisone</td>
<td>26</td>
<td>7.1</td>
</tr>
<tr>
<td>Inhaled corticosteroids</td>
<td>97</td>
<td>26.4</td>
</tr>
<tr>
<td>Theophylline</td>
<td>14</td>
<td>3.8</td>
</tr>
<tr>
<td>Licotrynes enhancers</td>
<td>3</td>
<td>.8</td>
</tr>
<tr>
<td>Beta-active stimuli</td>
<td>14</td>
<td>3.8</td>
</tr>
<tr>
<td>Short-acting bronchodilators</td>
<td>204</td>
<td>55.6</td>
</tr>
<tr>
<td>Improvement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>86</td>
<td>23.5</td>
</tr>
<tr>
<td>Yes</td>
<td>281</td>
<td>76.6</td>
</tr>
</tbody>
</table>
to house dust (84.6%), exposure to cigarette smoke (81.5%), and playing and physical activity (58.5%).

**Conclusion and Recommendations**

Bronchial asthma is still one of the most common chronic diseases among children in KSA. Male children with allergic rhinitis, family history of asthma, and exposure to passive smoking showed high prevalence among asthma cases; common cold attack, exposure to animal hair, some chemicals, and dust, hot weather, and exhaustion were found to be precipitating factors. Most cases improved on treatment. We recommend health education to the parents to avoid risk and precipitating factors and to seek medical advice as early as possible. Population-based screening and diagnosis studies are recommended. Organization of community-level awareness programs is recommended. Healthcare providers must be aware of community perceptions and practices.

**List of Abbreviations**

- **d**: desired precision (5%)
- **n**: sample size
- **P**: expected true proportion (0.5)
- **SPSS**: statistical package for the social sciences
- **Z**: level of confidence (2 sided 95% confidence interval, Z=1.96 for 95% CI)

**Conflict of interests**

The authors declare that there is no conflict of interest regarding the publication of this article.

**Funding**

None.

**Consent for publication**

Informed consent was obtained from all the participants.

**Ethical approval**

The research proposal was approved by Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.

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**References**

21. El-Saify M, Malak A, Sahar MA. 10 years retrospective study of pediatric asthma in pediatric chest clinic Ain Shams University. MD thesis, Faculty of Medicine, Ain Shams University, Cairo, Egypt, 2005.