Prevalence of asthma and asthma symptoms in children in urban Lebanon

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ABSTRACT

Objective: Childhood asthma is a serious problem in Beirut, Lebanon. This study was conducted to measure the prevalence and severity of asthma among school children aged 13-14 years living in Beirut.

Methods: The core and video questionnaire developed by the International Study of Asthma and Allergies in Childhood were translated to Arabic and administered to 2059 school children aged 13-14 years of both sexes.

Results: Wheezing, during the previous 12 months was 14%, while the prevalence of wheeze-ever was 23%. Post exercise wheezing was self-reported by 16% and asthma by 12%. Those who had symptoms suggestive of severe asthma was 5%.

Conclusion: The prevalence of asthma in Lebanese children aged 13-14 years was lower than that reported from developed countries; but the prevalence of severe asthma was higher. No significant differences were observed due to sex or socio-economic status.

Keywords: Asthma, wheeze, prevalence, children, ISAAC protocol.


Asthma has long been considered the most common chronic disease of childhood. It is also a very common disease in adolescence and adulthood. Its prevalence has varied from one area of the world to another and between different age groups. This variation has been partly accounted for by different methods used in determining it and the diagnostic criteria applied. However, even when a study was repeated by the same investigators in the same locality, after a period of time, differences existed. The prevalence among a certain age group in a specific locality has increased markedly over the past 15 years. Recently, efforts have been directed towards establishing a uniform protocol to collect data at the international level. As there is no satisfactory clinical definition or specific diagnostic test that can be applied in field studies, questionnaires regarding symptomatology of asthma (wheezing/whistling in the chest, attacks of wheezing, nocturnal cough and wheeze etc.) are used. This type of survey offers a number of advantages over other methods of ascertaining the diagnosis of asthma: It is cheap, requires no equipment and can be easily applied to large populations. A drawback of questionnaires is that errors may occur due to poor recall or variable interpretations of the questions.

In 1984, the Bronchial Symptoms Questionnaire was developed by the International Union Against Tuberculosis and Lung Diseases (IUATLD) and translated to different languages. It was shown to be a useful tool that could provide valid and comparable data. Subsequently, the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire was developed and was applied in 155 centers in 56 countries worldwide. In Lebanon, no

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data has been published on the prevalence of asthma except as part of a study that looked at the epidemiology of acute and chronic diseases in the Beirut population in 1984. The prevalence of asthma was found to be 1.3% and 0.9% for males and females aged 9 years and less, and 2.4% and 1% for males and females 10 to 19 years old. In this paper we report on the prevalence of asthma and its symptoms among 13-14 year old school children in Beirut as determined through the ISAAC questionnaire.

**Methods.** The study was limited to elementary and intermediate schools in Beirut, capital of Lebanon. A list of the elementary and intermediate private, semi-private and governmental schools in Beirut was obtained from the Ministry of Education. Thirty two schools (14 governmental, 10 private and 8 semi-private) were selected according to administrative areas of Beirut and accessibility. A sample size of 3000 was needed to provide sufficient precision for estimates of symptoms severity. In each school all classes of grades 7 and 8 who harbor the 13-14 years were included in the study. Approval of school authorities and consent of students was obtained prior to the study. The Ethical Review Body of the American University of Beirut, Medical Center, Faculty of Medicine approved the study.

**Study design and methods.** The ISAAC core questionnaire was translated to Arabic, validated and administered to all students in grades 7 and 8 during a period of 3 months. Two pulmonary physicians and a registered nurse visited every class and explained in detail the items of the questionnaire prior to its completion by the students.

Following the completion of the questionnaire, a video film of a young person suffering from asthma was shown. It portrayed 5 stages of asthma: wheezing at rest; wheezing after exercise; waking at night with wheezing; waking at night with cough; and a severe attack of asthma with difficulty in breathing at rest. Following each of the 5 stages, students were asked to specify whether their breathing had ever been like that of the person in the video. The terms asthma or wheezing were not mentioned at any stage. No explanation or interruptions were entertained during the film. This video sequence is as sensitive and specific for predicting bronchial hyperresponsiveness as the written questionnaire.11-13

**Data analysis.** Data was entered using a special program prepared by the ISAAC Center and was analyzed using SPSS package for Windows version 6.0 (SPSS Inc., Chicago, USA). Frequencies on demographic as well as symptomatic variables were obtained. Chi-square test was applied to examine the relationship between wheezing and asthma, sex and type of school.

**Results.** The screening questionnaire was completed by 2994 students out of whom 2059 were aged 13-14 years old. Of these 1178 were males (57%) and 881 females (43%). The majority of children were from governmental schools (44%), followed by semi-private (29%) then private (26%) schools.

The self-reported prevalence of asthma and asthma symptoms using the written and the video questionnaire are shown in Table 1. Wheezing ever, was reported by 23% of children in the written questionnaire compared to 9.5% in the video questionnaire. But when the ever positive response rates to other asthmatic manifestations (wheezing at rest, wheezing after exercise and waking up with wheezing) in the video questionnaire were combined, they added up to 24%. When the period in question was limited to the last 12 months, the positive response rate was 14% in the written questionnaire as compared to 6% in the video questionnaire. Exercise induced wheezing during the past 12 months was reported by 332 children (16%) in the written questionnaire as compared to 13% in the video questionnaire. Only 1% of children reported wheezing attacks more than 12 times during the last 12 months. Nocturnal wheeze and nocturnal cough were inquired about as 2 different manifestations of asthma.

**Table 1 - Self-reported prevalence of asthma and asthma symptoms among 2059 school children in Beirut, Lebanon.**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Self-Reported</th>
<th>Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheeze ever</td>
<td>475 (23)</td>
<td>196 (9.5)*</td>
</tr>
<tr>
<td>Wheeze in the past 12 months</td>
<td>286 (14)</td>
<td>131 (6)</td>
</tr>
<tr>
<td>Wheezing after exercise during last 12 months</td>
<td>323 (16)</td>
<td>274 (13)</td>
</tr>
<tr>
<td>Attacks of wheezing in the last 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-12</td>
<td>225 (11)</td>
<td>27 (1)</td>
</tr>
<tr>
<td>&gt;12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep disturbed by nocturnal wheezing in the past 12 months</td>
<td>177 (9)</td>
<td>101 (5)</td>
</tr>
<tr>
<td>Nocturnal cough ever</td>
<td>444 (22)</td>
<td>316 (15)</td>
</tr>
<tr>
<td>Severe attacks of wheezing limiting speech in past 12 months</td>
<td>112 (5)</td>
<td>150 (7)</td>
</tr>
<tr>
<td>Asthma ever</td>
<td>244 (12)</td>
<td></td>
</tr>
</tbody>
</table>

*If the first 3 questions in video (wheezing at rest, wheezing after exercise, and waking up with wheezing) were combined - the overall prevalence = 24%

*The corresponding question in the video related to difficulty in breathing is question No. 5.
nocturnal asthma. One hundred and one children (5%) reported nocturnal wheeze during the past 12 months, in response to the video questionnaire as compared to 9% in response to the written questionnaire. The prevalence of nocturnal cough not associated with respiratory tract infections was 15% and 22% using the video and the written questionnaire.

Severe symptoms of asthma such as attacks of wheezing that limited speech in the past 12 months were reported by 112 children (5%) in the written questionnaire. In the video 150 children (7%) said they had similar attacks of difficulty in breathing as shown in the film. A total of 244 children (12%) in the written questionnaire admitted having asthma, which represented 51% of those who reported wheezing ever and 85% of those who reported wheezing in the past 12 months. (Table 1).

Discussion. This paper describes the 1st attempt to study the prevalence of asthma and its symptoms in Lebanon using a questionnaire designed to be used at the international level. The prevalence of any wheezing was found to be approximately similar in both written and video questionnaire, 23% v 24%. The prevalence of self-reported wheezing in the last 12 months was found to be 14%, which reflects the tendency of wheezing to resolve as children grow older (Table 1). The prevalence of wheezing in our population did not differ significantly between males and females 24% v 22% (P = 0.3; x² = 2.1), nor did that of asthma 13% v 10.3% (P=0.13; x² = 4.1), Figure 1. This finding differs from earlier studies in the USA and the United Kingdom which showed a male preponderance for asthma in childhood.10,11

When the data was further broken down for socioeconomic status according to the type of school the children attended (private for the children of the highest socioeconomic status, semi-private for middle and government for the lowest), wheezing appeared to be most prevalent among children of highest socioeconomic status, lower in children of lowest socioeconomic status and lowest in children of semi-private schools, (25.5%, 23.5% and 20%, P < 0.001; x² = 17.05), Figure 2. The prevalence of self-reported asthma was however highest in children of lowest socioeconomic status 14% as compared to 11% and 10% among children in private and semi-private schools (P=0.006; x² = 14.3). It thus appears from our data that socioeconomic status in our population does not consistently affect the prevalence of asthma or of wheezing, as a symptom of asthma as had been documented in previous studies.15-16 The items in the questionnaires related to the nocturnal manifestation of asthma showed a prevalence of cough that was consistently twice as much as that of wheezing, although the questions were qualified to exclude cough precipitated by respiratory tract infections (Table 1). This observation emphasizes the importance of nocturnal cough as a manifestation of asthma in childhood, and concurs with the findings of Meijer et al who studied the frequency of nocturnal symptoms in a population of asthmatic children.17 The 12 month self-reported prevalence of asthma symptoms among the 56 countries who applied the ISAAC questionnaire was reported to be highest in the UK (37%) and lowest in Indonesia (2%). Only 6 countries from the World Health Organization Eastern Mediterranean Region, (Iran, Kuwait, Lebanon, Morocco, Oman and Pakistan), took part in the ISAAC study. Lebanon (14%) ranked 17th among all the 56 countries and 2nd to Kuwait (17%) among Eastern Mediterranean centers and Arab countries9 (Table 2). Among the 4 Arab countries, Kuwait had the highest prevalence of severe asthma symptoms as correlated by 4 attacks or more of wheeze (6%) and severe wheezing limiting speech (11%). The corresponding prevalence rates for Beirut were 3% and 5% (Table 2). Exercise induced wheeze prevalence was highest in Kuwait (25%) and lowest in Lebanon (16%). As for the prevalence of self reported asthma ever, Lebanon (12%) ranked 3rd to Oman (21%) and Kuwait.
Table 2 - The prevalence rates for asthma and asthma ever among 13-14 year old children from the written questionnaire in the 8 WHO Eastern Mediterranean Region as compared to Greece and Malta.

<table>
<thead>
<tr>
<th></th>
<th>12 months prevalence</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Written/Video (%)</td>
<td>Written (%)</td>
<td>Written/Video (%)</td>
<td>Written (%)</td>
<td>Written/Video (%)</td>
</tr>
<tr>
<td>Kuwait</td>
<td>17/17</td>
<td>6</td>
<td>6/9.5</td>
<td>11</td>
<td>12.5</td>
</tr>
<tr>
<td>Lebanon</td>
<td>14/5</td>
<td>3</td>
<td>9/5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Iran</td>
<td>12/2</td>
<td>2</td>
<td>2/2</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Oman</td>
<td>9/1</td>
<td>3</td>
<td>3/1</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Pakistan</td>
<td>8.5/9</td>
<td>2</td>
<td>2/3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Morocco</td>
<td>7/8</td>
<td>2</td>
<td>3/5</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Malta</td>
<td>16/9</td>
<td>5</td>
<td>2/4</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>Greece</td>
<td>4/-</td>
<td>1</td>
<td>1/-</td>
<td>0.1</td>
<td>-</td>
</tr>
</tbody>
</table>

(17.5%) (Table 2). Only 42 countries applied the video questions. The prevalence of asthma symptoms reported from the video questionnaire were in general lower than the written questionnaire among all countries. This is due to the fact that questions from the video questionnaire dealt with more severe symptoms of asthma (wheezing at rest) than the written questionnaire (any wheezing). Lebanon ranked 30th on the 12-month prevalence of asthma symptoms, accounting for a prevalence of 6% of wheeze, from the video questionnaire, with the highest prevalence reported in Peru (20%). The other 2 Arab countries who took part in the video questions were Kuwait 17% and Morocco 8% (Table 2).

Positive responses to exercise induced wheeze and nocturnal wheeze on the video questionnaire were reported to be higher in Kuwait (18%) than in Beirut (13%). Beirut ranked 3rd (10%) to Kuwait (14%) and Morocco (12.5%) for positive responses to nocturnal cough. Beirut (5%) ranked 3rd to Kuwait (12.5%) and Morocco (5%), for positive responses to severe wheeze among Arab countries (Table 2).

Worldwide the prevalence of wheezing ever in Beirut (23%) was intermediate between those reported from Melbourne (Australia) (37%) and La Serena (Chile) (46%), and those reported from Hong Kong (10%) and Saint Gallen (Switzerland) (13%) and comparable to those reported from New Zealand (27%), Wales (22%), Sweden (22%) and South Africa (26%). The prevalence of exercise induced asthma in the last year was 16%, comparable to that reported from Hong Kong (15%) but lower than that reported from Melbourne (20%). The prevalence of severe attacks of wheeze limiting speech (5%) or causing breathlessness (7%) in our study. It is higher than that reported from both Hong Kong (2%) and Melbourne (4%).

The prevalence of diagnosed asthma was highest in Melbourne (23%), higher in New Zealand (17%) but comparable in Beirut (12%), Wales (12%) and South Africa (11.5%) and lowest in La Serena(8%), Hong Kong (8%), Saint Gallen (6%) and Sweden (4%). These numbers may not be comparable since the diagnosis of asthma is affected by a number of factors including the availability and accessibility of medical care as well as the cultural perception of asthma as a chronic disease. The finding that severe disease is more prevalent in Beirut than in Australia, although asthma is more prevalent in Australia, suggests poor control of the disease in our population.

The differences in the prevalence of asthma among various areas of the world cannot be accounted for by the different questionnaires used in gathering the data, since all of them inquired about symptomatology, wheezing at rest, nocturnal cough and wheeze, and sleep disturbance that children and their parents can easily recognize. They can be explained on the basis of the environment and genetic factors that predispose children to wheeze, factors which unfortunately remain poorly defined. More detailed comparative studies of the different risk factors are needed to explain the varying prevalence rates and to help elucidate the pathogenic mechanisms of asthma. We are in agreement with the conclusion of the ISAAC Steering Committee that there is substantial potential for ecological analysis which needs to be based on international public health, socioeconomic, demographic and environmental data.
In conclusion, it appears from our study that asthma is fairly common in Lebanon. As compared to worldwide, Lebanon ranks 17th, as compared to Eastern Mediterranean countries, and only 2nd to Kuwait among the Arab countries, which contributed to the ISAAC study. On the other hand, the prevalence of severe asthma is higher than that reported from other areas. This finding could be due to an inadequate therapeutic strategy adopted in our population. Further studies are needed to elucidate the underlying causes of severe asthma.

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References