Childhood Asthma Prevalence and Severity in Zarqa City, Jordan

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Abstract

Objective: to investigate the prevalence of asthma and the severity of asthma symptoms in Jordanian school children.
Methods: a random sample of 2819 students aged 6-18 years was drawn from 10 schools in Zarqa city, Jordan. Parents of children from the selected classes participated by completing the ISAAC questionnaire in relation to their child.
Results: the prevalence of wheezing in the past year was 14.8% with 5.9% of parents indicated that their child have asthma or have had asthma. The severity of asthma symptoms was manifested in the high number of attacks, besides the sleep disturbance because of wheezing experienced by most children. Exercise induced asthma was reported by 60.6% of children and 5.9% of parents indicated that their child was diagnosed with asthma.
Conclusion: the results suggest a high prevalence of asthma with severe symptoms in Zarqa. A negative impact could result if this trend continues without proper interventions.

Keywords: Asthma, child, Jordan, prevalence, severity.

(J Med J 2019; Vol. 53 (3):139-146)

Received	***Accepted***
Jan. 14, 2018	*Dec 20, 2018*

Introduction

The worldwide prevalence of childhood asthma is high[1,2] reaching up to 20% in many countries.[3,4] The prevalence is similar in Middle Eastern countries.[1,5] A few studies examined the prevalence of childhood asthma (children and adolescents) in Jordan, where a high prevalence of asthma was recorded.[6-8] One study showed that the prevalence among children aged 6-7 years and 13-14 years has increased twofold in the last ten years.[6] A study from South Jordan conducted with 1010 children aged 6–14 years found that the prevalence of physician-diagnosed asthma, and history of wheezing during the previous 12 months were 2.7% and 6.8% respectively.[7] It has been suggested that global asthma prevalence has changed considerably over the past decades.[1,9] While there was a decrease in prevalence in some developed countries, there was an increase in prevalence in developing countries.[1,10] The results of the ISAAC studies between phase 1 (1995) and 3 (2005) showed global asthma prevalence still high, with wide variations exist between countries.[4] Studies showed that asthma

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symptoms were more prevalent in high-income countries but more severe in low and middle-income countries such as Jordan.[11] A systematic review of studies conducted during the period 1990–2008 found that asthma still on the rise.[12] However, recent studies showed that the increase in prevalence may have leveled such as in Greece[13] or even fallen such as in Turkey.[14] The burden of asthma in relation to its prevalence and severity of related symptoms is high.[15] The impact on children, especially if managed poorly, can be dangerous including, impairments in quality of life, emergency hospitalizations, and fatality in some cases.[16] The increased prevalence of asthma shown in several epidemiological studies indicated an increased economic burden from this illness. In the United States, the total bill for asthma was $56 billion in 2007 compared to $53 billion spent in 2002.[2,17] The burden of asthma is not limited to the individual but extends to the family, the community, and the economy.[17]

Literature has attributed the increase in asthma rates to increased awareness about the disease and improvements in diagnostic habits.[18] However, these factors make the estimation of epidemiologic trends inaccurate, especially in the absence of a gold-standard test for the disease; hence, uncertainty persists.[19] Studies linked the increase in asthma rates of most communities to the wider adoption of western lifestyles and urbanization.[11] With the predictable increase in the world's urban population in the near future, there is a projected increase in the number and severity of children with asthma.[20]

Although data on asthma and its treatment are available, more research is required in the region to reach a better understanding of the disease and achieve more suitable management with the least risk and cost. As part of a larger project with the aim of improving asthma management in primary and secondary schools, this paper examined the prevalence of asthma and severity of asthma symptoms among children 6-18 years in Zarqa city, Jordan.

MATERIALS AND METHODS

Study Setting, Design and Sample

Jordan had a population of 8.11 million as of July 2015 with 36% of the population under 14 years of age.[21] Zarqa is the third largest municipality and the second most populated city in Jordan with an estimated population of more than one million. Its dry and dusty weather besides the presence of many oil refineries, factories, and heavy industry put the city at the first line in respiratory problems. For the purpose of the study, a descriptive, cross-sectional design was used. The selection process of participants was three folds; selecting schools, selecting classes, and selecting students. First, ten schools were selected from a list of 100 (29 males, 23 females, and 48 combined) in the second educational district of Zarqa city. To ensure gender balance, researchers selected schools based on gender where four male schools, three female schools, and three combined schools were selected from the list. The selection process ensured a diverse sample hence included schools from inner city and suburban areas representing different socioeconomic levels. The selected combined schools had more female grades (mostly 4^{th} to 8^{th} grades) in addition to the combined classes (1^{st} to 3^{rd} grades). All schools provided approval and Human Research Ethics Approval was obtained from all institutions (Hashemite University and Ministry of Education- Zarqa district, Approval number 2015/2014/2/3). All participating schools had an approximate population of 6000

students (average 500 students each (ranging between 370-1200 students). The second level was selecting classes. The selection included all classes in schools where one class made any given grade. However, a simple random technique was used to select one class from multiple classes which comprise a single grade (e.g. randomly selecting one class from 3 classes which make grade 4). In some cases where four classes were available for a single grade, two classes were randomly selected and included in the study. After selecting classes, all attending students in these classes (n=3112) were given the ISAAC questionnaire to take home to be completed by their parents along with an explanatory letter requesting their approval. Extra forms were given for teachers to give to absent children. Returned questionnaires (n=2821) were collected by class teachers and forwarded to a volunteer school administrator/teacher who collated them in a sealed envelope and later forwarded them to the researchers.

Instruments

The International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire

Students were screened for asthma and recent asthma symptoms using the Arabic version of the ISAAC written questionnaire. This tool was developed to identify children who are likely to have asthma at young ages by taking a symptomatic not diagnostic approach.[22] The questionnaire contains eight simple questions related to asthma diagnosis, asthma symptoms, and wheezing severity in the last 12 months providing simple and valid tool for international comparisons of asthma prevalence and severity.[23] Previous studies have documented the validity of the ISAAC questionnaire in school students[23,24] including a similar population in Jordan.[8] Before sending the Arabic version of the questionnaire to schools, a pilot study was conducted to ensure readability and comprehension. The recommendation was to obtain two age groups: 13–14 yrs (when mortality from asthma is more common) and 6–7 yrs (asthma tends to be most prevalent and hospital admission rates are higher) from a random sample of ten schools.[24] Other methods of asthma diagnosis such as peak flow rate or spirometry, could have been used. However, these methods were not considered in the current study because many factors were thought to hinder its accuracy as a measure of prevalence of asthma such as medications used by children and their level of asthma severity.

Data Analyses

Questionnaires were collected and data were cleaned and entered into SPSS 22.0 file for analysis. Missing data were treated by counting the valid percentage of scores. Frequencies and percentages, means and standard deviations were used to describe the sample and chi-square used to compare subgroups of dichotomous variables. The probability level was set at 0.05. The prevalence of asthma and asthma symptoms were calculated by dividing the number of positive responses to each question by the number of completed questions.

RESULTS

Asthma prevalence in children 6-18 years

Of the distributed 3112 questionnaires, a total of 2821 ISAAC questionnaires were returned, giving a very high response proportion of 90.6%. Two were not completed and excluded from the analysis. The sample included 1255 males (44.5%) and 1564 females (55.5%) aged between 6 and18 years (M=10.8,

SD= 2.7). Table 1 presents the ISAAC questionnaire results divided based on the child's gender. While 19.3% of children in the sample had wheezing in the past, 14.8% (n= 416) had wheezing in the 12 months prior to the study. Children who experienced wheezing in the 12 months prior to the study had an average of 5.7 attacks ranging between 1 and 30 attacks. Only one parent indicated that their child experienced daily attacks. For those who indicated the occurrence of wheezing in the 12 months prior to the study, 261 children (63.5%) experienced sleep disturbance because of wheezing and/or difficulty breathing one night or less per week, and 146 children (35.5%) experienced sleep disturbance more than one night per week. In addition, 7.6% of children who indicated the occurrence of wheezing in the 12 months prior to the study experienced severe symptoms enough to limit the child's speech to only one or two words at a time between breaths. Approximately 60.6% of children with asthma sounded wheezy during or after exercise during the 12 months prior to the study (8.8% of the total sample). For the total sample, 5.9% of parents indicated that their child have asthma or have had asthma before. When asked if their child had a dry cough at night, apart from a cough associated with a cold or chest infection, 20.6% agreed. When compared to females, males had significantly higher rates of wheezing, frequency of wheezing, waking at night because of wheezing or difficulty breathing, asthma diagnosis, and post-exercise wheezing (see Table 1 for chi-square results). Results have also been divided based on the child's age group (6-8 years, 9-11 years, 12-14 years, and >14 years). Although a significant difference existed between the age groups, the effect size was hardly noticeable.

Table 1: Distribution of responses to ISAAC questions and comparison based on child's gender (N=2819)

Item number	Males	Females	Total	Comparative Test/Effect size
Has your child ever had wheezing at any time in the past? (YES)	267 (21.3%)	277 (17.7%)	544 (19.3%)	X= 5.45, P=0.02 Phi= 0.045
Has your child ever had wheezing in the last 12 months? (YES)	207 (16.5%)	209 (13.4%)	416, 14.8%	X= 5.18, P=0.023 Phi= 0.044
How many attacks of wheezing has your child had in the last 12 months? (Mean (*SD*))	0.85 (*3.2*)	0.54 (*2.07*)	0.68 (*2.63*)	*t*(2817)=2.99 P=0.003
In the last 12 months, how often, has your child's sleep been disturbed due to wheezing?				
-Never	1055 (84.1%)	1356 (86.7%)	2411 (85.6%)	X= 7.72, p= 0.021
-Less than one night per week	118 (9.4%)	143 (9.1%)	261 (9.3%)	Crammers V=
-One or more nights per week	81 (6.5%)	65 (4.2%)	146 (5.2%)	0.052

Item number	Males	Females	Total	Comparative Test/Effect size
In the last 12 months, has wheezing ever been severe to limit your child's speech to only one or two words between breaths (YES)	125 (10%)	89 (5.7%)	214 (7.6%)	X=18.1, p=0.000 Phi= 0.08
Is your child diagnosed with asthma or have had it before? (YES)	98 (7.8%)	67 (4.3%)	165 (5.9%)	X=15.7, P= 0.000 Phi= 0.075
In the last 12 months, has your child's chest sounded wheezy during or after exercise? (YES)	147 (11.7%)	102 (6.5%)	249 (8.8%)	X=23.3, P= 0.000 Phi= 0.091
In the last 12 months, has your child had a dry cough at night, apart from a cough associated with a cold or infection? (YES)	277 (22.1%)	304 (19.4%)	581 (20.6%)	X= 2.95, P=0.08 Not significant

DISCUSSION

Although hindered by limitations of information and selection bias, the results show a relatively high prevalence of asthma and its symptoms among school children. The most recent publications on asthma prevalence showed that the trend has changed over the last two decades. The worldwide asthma prevalence has been reported by the ISAAC steering committee in the Global Asthma Report[25] where current wheezing has been reported in 11.5% and 14.1% among 6-7 years and 13-14 years old children, respectively. The prevalence of asthma ever was 9.4% and 12.6% for 6-7 years and 13-14 years old children respectively. The worldwide mean symptom prevalence of current wheezing changed from 13.2% to 13.7% in the 13–14 year age group and from 11.1% to 11.6% in the 6–7 year age group between the years 1995 and 2005.[1] In Jordan, the prevalence of current wheezing and asthma ever was 17% and 10% among 6-7 years olds respectively and 12.3% and 7.6% for 13-14 years old children respectively. The prevalence of current wheezing and asthma ever for the 6-18 years old children in the current study were 14.8% and 5.9% respectively. In the Eastern Mediterranean region, estimate changes in the prevalence of self-reported asthma symptoms between phase I (year 1995) and III (year 2005) decreased 0.1% among 13-14 years children and increased 0.79% among 6-7years old children.[1] However, the trends in asthma symptom prevalence showed different regional patterns. The prevalence of asthma among Jordanians rose from 4.3% in 1996 to 9.4% in 2009.[6] Different reports from different Arab countries showed a similar trend to Zarqa city especially in countries with similar weather conditions such as the Gulf countries.[5] In the USA, while asthma prevalence among persons of all ages increased from 7.3% in 2001 to 8.2% in 2009, the prevalence among children (aged <18 years) rose to 9.6%.[2] Although previous studies showed the leveling of asthma prevalence worldwide, this study shows that the prevalence of asthma is still on the rise and the number of children with undiagnosed asthma is

high. The increase in asthma prevalence shown in this and other studies could be related to a wider recognition of asthma by the community. Another possible explanation of the plateau in asthma rates is related to the environmental influences in inducing asthma in susceptible populations.[26]

In the current study, more than half of the sample experienced sleep disturbances because of wheezing and/or difficulty breathing, one third experienced sleep disturbance more than one night per week, over 7% experienced severe symptoms enough to limit the child's speech to only one or two words at a time between breaths, and more than half of children sounded wheezy during or after exercise. In previous reports, symptoms of severe wheezing among children experiencing wheezing were 61% and 62.8% among 6-7 years old and 13-14 years old Jordanian children, respectively.[25] Similar to the worldwide trend, male children suffered higher rates of asthma, and children of all ages had high rates of wheezing. Results show the illness remained high across all age groups. Environmental and lifestyle factors may continue to provoke asthma symptoms until higher levels of asthma prevalence are reached.[27]

As the population increase in Jordan with rapid man and nature made environmental changes, the prevalence could also change. Efforts on all levels are required to tackle the problem and rules need to be set and followed to provide a better environment to these children. Better access to healthcare and asthma education is required for improving asthma management hence decreasing costs related to this widespread disease.

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معدل انتشار الربو عند الأطفال وشدته في مدينة الزرقاء، الأردن

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الملخص

الهدف: دراسة مدى انتشار الربو وشدة أعراض الربو لدى أطفال المدارس في الأردن.

الطريقة: تم اختيار عينة عشوائية من 2819 طالباً تتراوح أعمارهم بين 6-18 سنة من 10 مدارس في مدينة الزرقاء في الأردن. حيث شارك آباء الأطفال الذين تم اختيارهم من الفئات العمرية وذلك بإكمال استبانة تتعلق بطفلهم.

النتائج: كان معدل انتشار الصفير الصدري في العام الماضي للدراسة 14.8٪، في حين أشار 5.9٪ من الآباء إلى أن أطفالهم مصابون بالربو أو يعانون من الربو. وظهرت شدة أعراض الربو من خلال العدد الكبير للهجمات التي تم تقريرها، هذا بالإضافة إلى اضطراب النوم بسبب الأزيز الذي عانى منه معظم الأطفال. حوالي 60.6٪ من الأطفال حدث معهم هجمات ربو بفعل التمارين الرياضية و5.9 ٪ من الآباء أشاروا إلى أن أطفالهم تم تشخيصهم بمرض الربو.

الخلاصة: تشير النتائج إلى ارتفاع معدل انتشار الربو مع أعراض حادة في مدينة الزرقاء. قد ينتج تأثير سلبي إذا استمر هذا النهج بدون تدخلات صحية مناسبة.

الكلمات الدالة: الربو، الأطفال، الأردن، الانتشار، الشدة.