Epidemiology and outcome of childhood asthma: a clinical study in an Egyptian university medical centre

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السمات الوبائية والحصائل في رَبْو الطفولة: دراسة سريرية في مركز طبي جامعي في مصر

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الخلاصة: ازداد معدل انتشار رَبْو الطفولة مؤخراً. والهدف من هذه الدراسة هو تقييم وبائيّات الرَبْو وعوامل اختطاره التي تبرِّر الإدخال في المستشفيات بين الأطفال الذين يزورون العيادات الخارجية وقسم الطوارئ في مستشفى جامعي في سوهاج، مصر. واتضح للباحثين أن معدل انتشار الرَبْو على مدى ستة أشهر بين الأطفال الذين تتراوح أعمارهم بين 3 و12 عاماً في هذا المستشفى قد بلغ 1.4٪ (178 من أصل 612 12). وقد أُدرج جميع الأطفال المصابين بالرَبْو ضمن دراسة استباقية تمَّت بالملاحظة وباستخدام استبيان. وكان معظم المصابين بالرَبْو من الذكور الذين يعيشون في مناطق ريفية والذين يصابون بعدوى متكررة في الطرق التنفسية العلوية، ويتعرّضون لدخان التبغ السلبي ويعانون من الهجمات أثناء الليل؛ وقد احتاج 38 طفلاً (21.3٪) منهم للإدخال إلى المستشفى بسبب الرَبْو. وفي التحليل التحوُّفي المتعدد المتغيرات، اتضح أن عوامل الاختطار المُعتدّ بها إحصائياً والتي تبرِّر الإدخال إلى المستشفى هي: ترافُق السعال وضيق النفس ضمن الأعراض، واستخدام المعالجة الاتّقائية، والشكوى من أعراض متواصلة (تستمر خلال الليل والنهار). ويوصي الباحثون بالاستخدام الملائم للمعالجة الاتّقائية من أجل الحصول على نتائج أفضل لدى الأطفال المصابين بالرَبْو.

ABSTRACT The prevalence of childhood asthma has increased recently. The aim of this study was to assess the epidemiology of asthma and risk factors for hospital admission among children attending the outpatient and emergency clinic in a university hospital in Sohag, Egypt. The prevalence of asthma over a 6-month period among children aged 3–12 years at this hospital was 1.4% (178/12 612). All the asthmatic children were enrolled in an observational, prospective questionnaire study. More of the asthmatics were males, living in rural areas, with recurrent upper respiratory tract infections, passive exposure to tobacco smoke and suffering attacks at night time; 38 children (21.3%) needed hospital admission for asthma. In multivariate regression analysis, significant risk factors for hospital admission were: both cough and dyspnoea as presenting symptoms; using prophylactic therapy; and complaining of continuous symptoms (during both day and night). Proper use of prophylactic therapies is recommended for better outcomes in our asthmatic children.

Épidémiologie de l'asthme chez l'enfant et résultats thérapeutiques : étude clinique dans un centre hospitalier universitaire égyptien

RÉSUMÉ La prévalence de l'asthme chez l'enfant a récemment augmenté. Cette étude visait à évaluer l'épidémiologie de l'asthme et les facteurs de risque d'hospitalisation chez des enfants consultant en ambulatoire dans un service de soins d'urgence d'un centre hospitalier universitaire à Sohag (Égypte). La prévalence de l'asthme au cours d'une période de 6 mois chez des enfants âgés de 3 à 12 ans consultant dans cet hôpital était de 1,4 % (178/12 612). Tous les enfants atteints d'asthme ont été recrutés dans une étude d'observation prospective par questionnaire. La majorité des asthmatiques étaient de sexe masculin, vivaient dans des zones rurales, souffraient d'infections des voies respiratoires supérieures chroniques, étaient exposés au tabagisme passif et avaient des crises nocturnes ; 38 enfants (21,3 %) ont dû être hospitalisés à cause de leur asthme. À l'analyse de régression multivariée, les facteurs de risque d'hospitalisation importants étaient les suivants : une toux associée à une dyspnée comme symptômes initiaux, un traitement prophylactique en cours et la présence du symptômes continus (de jour comme de nuit). Il est recommandé de bien utiliser les traitements prophylactiques pour de meilleurs résultats chez les enfants asthmatiques.

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Introduction

Asthma is a chronic inflammatory disorder of the airways in susceptible individuals, causing recurrent episodes of wheezing, dyspnoea, chest tightness, and cough. Asthma is usually associated with variable airflow obstruction, which is often reversible either spontaneously or with treatment. It is a common disease in children and represents a high burden on burden on children, their families and the community, including the cost of long-term treatment and the need for recurrent hospitalization and admission [1].

Global rates of asthma have greatly increased between the 1960s and 2008 [2,3]. Rates of asthma have plateaued in the developed world since the mid-1990s with recent increases recorded primarily in the developing world [4]. In addition to genetic variations it appears that differences in asthma prevalence between population groups are due to differential exposure to environmental factors [5]. The most common drawbacks of uncontrolled asthma are poor academic achievements due to increased school absence and unexpected emergency department (ED) visits as well as hospitalizations. In Egypt up to 1 in 4 children with asthma is unable to attend school regularly because of poor asthma control [6]. Like other chronic conditions, there are disparities in asthma outcomes. Children of lower socioeconomic status and whose parents have low literacy have higher rates of poor asthma control [7]. The aim of our study was to assess the prevalence of asthma and determine the risk factors for hospital admission for asthma in children visiting the outpatient clinic and ED in Sohag University hospital in Upper Egypt.

Methods

Study design and sample

All children aged 3–12 years with a diagnosis of asthma who presented to the paediatric outpatient clinic and paediatric ED at Sohag University hospital over a 6-month period from 1 January 2010 to 30 June 2010 were enrolled in an observational, questionnaire study. Exclusion criteria were children < 3 years of age and children whose parent(s) refused to participate in the study.

Data collection

The questionnaire was self-administered by children aged 10–12 years and was answered by their guardians in children aged 3–9 years old. We designed a structured questionnaire for the study based on well-known clinical features and risk factors for childhood asthma. Three senior paediatricians reviewed a draft of the questionnaire and a small pilot trial was run in order to ensure that the language used in the questionnaire was understandable to the children and their guardians, and assistance was offered in case of illiteracy.

A complete history and physical examination were done by the paediatric resident doctors in the outpatient clinic and the paediatric ED in Sohag University hospital. The questionnaire collected demographic data (age, sex, residence), clinical data (weight, height, presenting symptoms,), exacerbating factors (daily variations, parental smoking, exercise, upper respiratory tract infection), relieving factors (rest, bronchodilators, prophylactic drugs) and other risk factors (history of other allergic diseases, family history of asthma, presence of pets in the home, exposure to tobacco smoke at home, exposure to outdoor dust and smoke, exercise-induced asthma). Outcome was assessed by need for hospital admissions due to asthma (i.e. more than 1 previous admission). We also recorded the monthly prevalence of asthma in different seasons.

Approval of the Sohag Faculty of Medicine research ethics committee was sought before the start of the study. A written approval from the guardians of each child was taken before the start of clinical examinations.

Statistical analysis

The collected data was tabulated and statistically analysed using *SPSS*, version 10. Both descriptive and analytical analyses were done. Descriptive statistics were done for numerical data by range, mean and standard deviation (SD) and for categorical data by numbers and percentages. Comparative studies were done for numerical data using Student *t*-test for quantitative data and chi-squared test was used for categorical factors. The level of significance was taken at *P*-value ≤ 0.05.

Results

Prevalence of asthma

During the study period a total of 12 612 children presented to Sohag University hospital paediatric outpatient clinic and ED. Of these patients 178 had clinically diagnosed bronchial asthma (prevalence of asthma 1.4%). Over the 6-month study period the percentage of children presenting with asthma in each month was highest in January and February (2.0% and 1.9% respectively) and lowest in May and June (1.1% and 1.3% respectively).

Presenting symptoms

In 68.5% of the studied asthma cases the presenting symptom was both cough and dyspnoea, in 29.2% it was cough only and in 2.3% it was dyspnoea only. On physical examination, 66.3% of studied asthma cases had signs of respiratory distress. On auscultation, 80.2% of the cases had bilateral wheeze. The remaining patients (19.8%) had other auscultatory findings in addition to wheezes (crepitations, sonorous rhonchi and decreased air entry). Of the studied children 26.4% were suffering from other atopic conditions (12.3% had eczema, 8.9% had hay fever and 5.2% had both eczema and hay fever).

Demographic and clinical profile of asthma cases

Table 1 shows the risk factors for asthma among the children in our study.

The mean age of the children included in the study was 6.1 (SD 2.5) years. A significantly higher proportion of asthmatics were males than females (64.6% versus 35.4%) ($P < 0.001$) (Table 1). More asthma sufferers lived in rural than urban areas (63.5% versus 36.5%) ($P < 0.001$). Other factors that affected the prevalence of asthma were recurrent upper respiratory tract infections ($P < 0.001$) and passive exposure to tobacco smoke ($P < 0.01$). Of the asthmatics 60.7% suffered attacks at night-time ($P < 0.001$).

Relieving factors

Regarding relieving factors, 36.0% of the children reported improvement with rest, 83.1% with oral bronchodilator therapy and 99.4% with inhaled bronchodilators by nebulizer. One-quarter of children (25.8%) were on prophylactic therapy (23.0% were on inhaled corticosteroids, 1.1% on oral anti-leukotriene, 1.1% on oral long-acting theophylline and 0.6% on oral mast-cell stabilizers). No patient was on more than 1 prophylactic therapy (combination therapy).

Risk factors for hospitalization

Out of 178 children with asthma we found that 140 (78.7%) required home treatment while the remaining 38 children (21.3%) needed hospital admission ($P < 0.001$). Although 4 (2.3%) of the studied children had a history of asthma-related intensive care admission, no case was admitted to intensive care during our present study.

Table 2 shows the relation between symptoms, risk factors and relieving factors and the outcome of an asthmatic attack, using the need for hospital admission as an indicator of the severity of an asthmatic attack. The need for hospital admission was significantly higher in those who complained of both dyspnoea and cough; older children; those with a positive family history of asthma; tall children; those with exercise-induced asthma; patients who had continuous asthma symptoms (during both day and night); and those who received regular prophylactic therapy. No statistically significant difference was found between patients with other allergic diseases and those without ($P = 0.1$) in relation to asthma severity and the need for hospital admission.

The multivariate analysis showed that the only significant risk factors affecting the outcome of asthmatic children in terms of need for hospital admission were: complaining of both cough and dyspnoea as presenting symptoms; prophylactic therapy; and complaining of continuous symptoms (during both day and night) (Table 3).

Discussion

In the present hospital-based study, the prevalence of asthma among children attending the paediatric outpatient clinic and ED was 1.4%. Internationally, there are marked variations in the prevalence of asthma [8]. The prevalence of wheeze over 12 months in the 13–14 years age group shows a very wide range between countries, up to 15-fold difference, from 2.1%–4.4% in Albania, China, Greece, Georgia, Indonesia, Romania and Russia to 29.1%–32.2% in Australia, New Zealand, Ireland and the

Table 1 Risk factors for bronchial asthma in the study sample of children with asthma attending the outpatient clinic and emergency department in Sohag University hospital, Egypt

Variable	Children with asthma ($n = 178$)		*P*-value
	No.	%	
Sex			
Male	115	64.6	< 0.001
Female	63	35.4	
Residence			
Rural	113	63.5	< 0.001
Urban	65	36.5	
Family history of asthma			
Positive	95	53.4	0.23
Negative	83	46.6	
Exercise-induced asthma			
Yes	97	54.5	0.09
No	81	45.5	
Upper respiratory tract infection			
Yes	124	69.7	< 0.001
No	54	30.3	
Exposure to tobacco smoke			
Yes	103	57.8	< 0.01
No	75	42.2	
Exposure to indoor animals			
Yes	85	47.9	0.42
No	93	52.1	
Nocturnal asthma			
Yes	108	60.7	< 0.001
No	70	39.3	

Table 2 Risk factors for hospitalization in the study sample of children with asthma attending the outpatient clinic and emergency department in Sohag University hospital, Egypt

Variable	Home treatment (*n* = 140)		Hospital treatment (*n* = 38)		*P*-value[a]
	No.	%	No.	%	
Presenting symptoms					< 0.001
Cough	52	37.1	0	0.0	
Dyspnoea	2	3.1	2	5.3	
Both	86	61.4	36	94.7	
Demographic factors					
Sex					0.02
Female	53	84.1	10	26.3	
Male	87	75.7	28	73.7	
Age (years) [mean (SD)]	5.8 (2.4)		6.9 (2.6)		0.19
Environmental factors					
Residence					0.06
Rural	84	60.0	29	76.3	
Urban	56	40.0	9	23.7	
Exposure to indoor animals					0.51
No	69	49.3	16	42.1	
Cats	16	11.4	4	10.5	
Chickens	19	13.6	9	23.7	
Cats + chickens	36	25.7	9	23.7	
Exposure to outdoor dust and smoke					0.08
No	55	39.3	9	23.7	
Yes	85	60.7	29	76.3	
Exposure to tobacco smoke					0.71
No	58	41.4	17	44.7	
Yes	82	58.6	21	55.3	
Clinical factors					
Anthropometric measures					
Weight (kg) [mean (SD)]	20.0 (6.5)		22.0 (6.9)		0.09
Height (cm) [mean (SD)]	110.0 (14.4)		116.0 (16.2)		0.02
Positive family history of asthma					0.04
No	71	50.7	12	31.6	
Yes	69	49.3	26	68.4	
Diurnal variations of symptoms					0.001
Night only	94	67.1	14	36.8	
Day + night	46	32.9	24	63.2	
Exercise-induced asthma					0.052
No	69	49.3	12	31.6	
Yes	71	50.7	26	68.4	
Upper respiratory tract infections					0.56
No	41	29.3	13	34.2	
Yes	99	70.7	25	65.8	
Relieving factors					
Rest					0.16
No	86	61.4	28	73.7	
Yes	54	38.6	10	26.3	

Table 2 Risk factors for hospitalization in the study sample of children with asthma attending the outpatient clinic and emergency department in Sohag University hospital, Egypt (*concluded*)

Variable	Home treatment (*n* = 140)		Hospital treatment (*n* = 38)		*P*-value[a]
	No.	%	No.	%	
Relieving factors					
Oral bronchodilator					0.84
No	24	17.1	6	15.8	
Yes	116	82.9	32	84.2	
Inhaled bronchodilator					0.6
No	1	0.7	0	0.0	
Yes	139	99.3	38	100.0	
Prophylactic treatment					0.003
No	111	79.3	21	55.3	
Yes	29	20.7	17	44.7	

[a]*Chi-squared test was used for categorical factors and t-test for quantitative data.*

United Kingdom [8,9]. Moreover, the prevalence of asthma in the 6–12 years age group shows a more than a 5-fold difference in prevalence between countries, ranging from 4.1%–32.1%, with the lowest rates in India, Indonesia, Islamic Republic of Iran and Malaysia and the highest rates in Australia, Brazil, Costa Rica, New Zealand and Panama [8,10]. In Egypt, several studies have shown a significantly higher prevalence of asthma than our study. For example, among schoolchildren aged 5–15 years old in Cairo the prevalence of asthma was reported to be 8.2% [11], among 11–15-year-olds also in Cairo it was 9.4% [12], while among schoolchildren aged 6–15 years in Menofia governorate it was 12% [6]. Our study was hospital-based whereas other studies were community-based, which may explain the relatively lower prevalence of asthma in our study.

As in other studies [8,11,13] the prevalence of asthma in our study was higher in winter, presumably due to the higher frequency of upper respiratory tract infections, which are an important precipitating factor in childhood asthma.

In our analysis asthma was more common among male children, which is in agreement with other studies [11,12,14]. Some studies show no significant difference between males and females [15]. The need for hospital admission was significantly greater for older children in our data, which is similar to the results of other studies [13,16].

Rural dwelling children were more likely to develop asthma compared with urban children in our results, while in other studies there was higher prevalence in urban children [14,17]. This can be explained by the fact that in developing countries such as Egypt environmental pollution is higher in rural regions due to factors such as smoke from agricultural burning and emissions from brick factories. Exposure to pets is an important risk factor for asthma. However, in our study there was no statistical difference in the need for hospitalization for asthma between asthmatic children with or without indoor animals. This is not consistent with other studies [18,19]. Passive tobacco smoking and exposure to outdoor dust and smoke were significant risk factors in the prevalence of asthma but had no significant effect on the need for hospital admission in our study, whereas other studies showed that exposure to smoke increased the severity of asthma and the need for hospital admission [14,20]. These differences between our study and others may be due to the small number of cases in our study, and

Table 3 Multiple regression analysis of risk factors for hospitalization in children with asthma attending the outpatient clinic and emergency department in Sohag University hospital, Egypt (*n* = 178)

Variable	aOR (95% CI)	*P*-value
Presenting symptoms		0.002
Cough or dyspnoea	1	
Both	11.2 (2.50–50.4)	
Prophylactic treatment		0.01
No	1	
Yes	2.94 (1.23–6.77)	
Time of symptoms		0.01
Nocturnal	1	
All day	2.82 (1.27–6.26)	

aOR = adjusted odds ratio; CI = confidence interval.

the small numbers hospitalized, which may have affected the likelihood of findings significant differences.

In our study, children with positive family history of asthma were more likely to need hospital admission, which is similar to results of other studies [21,22]. Although 'the prevalence of asthma was higher in children who suffered upper respiratory tract infections in our study, which is similar to other studies [21,23], there was no significant relationship between this risk factor and the need for hospital admission.

Patients receiving prophylactic therapy in our study were significantly more likely to need hospital admission. This finding is interesting as most other studies confirmed that prophylactic asthma therapy prevents severe asthma attacks and hence prevents hospital admission [24,25]. However none of those studies were done on Egyptian patients and there are a lack of studies examining the indicators of hospital admissions in an environment such as Egypt. Since more of our asthmatics lived in rural areas we can hypothesize that they were of lower socioeconomic status and therefore compliance with prophylactic drugs might be lower [7]. In order to achieve effective prophylactic therapy for asthma we need good compliance of patients, good commitment of parents and good education about the proper technique of taking therapy. These factors are mostly lacking in our local community in Egypt.

Dyspnoea was the most frequent symptom of acute exacerbation of asthma in our results. This is in agreement with the study of Roesner and Virchow [26], who found that dyspnoea, dry cough and concomitant rhinoconjunctivitis were the main presenting symptoms of asthma. There was no statistically significant difference between complaints of other allergies, e.g. eczema or hay fever, and the need for hospital admission in our study. This result is in agreement with Gerritsen et al. [27]. However, some studies found that there was an association between the severity of the asthmatic attack and complaining of other atopic conditions [21,23,28].

Some limitations of the current study can be noted. These include: the small number of patients, which made the statistical analysis more difficult; collection of data from the children's guardians and not from children themselves; the short duration of the study (6 months) which was due to limitations of funding and time; and the lack of availability of respiratory function testing to assess asthma severity.

Conclusions

According to our data, the prevalence of asthma in our locality was relatively low. Rural families with children suffering from asthma need a comprehensive educational and drug-optimizing programme to prevent frequent asthma relapses. Importantly, children presented with both cough and dyspnoea, those with continuous symptoms, and/or those on irregular or inappropriate prophylactic treatment should have a low threshold for hospital admission.

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Global Alliance against Chronic Respiratory Diseases (GARD). 7th General Assembly Meeting 9–10 July 2012, St. Petersburg, Russian Federation.

Chronic respiratory disease (CRD) is one of the major noncommunicable diseases (NCDs). The Global Alliance against Chronic Respiratory Diseases (GARD) is a voluntary alliance of national and international organizations, institutions and agencies committed to the common goal of reducing the global burden of respiratory diseases. GARD supports the work of the World Health Organization (WHO) to tackle prevention and control of NCDs The above-mentioned report summarizes the presentations and discussions that took place during the General Meeting of the Global Alliance on 9–10 July 2012 in St Petersburg, Russia. The purpose of the Meeting was to align GARD activities with the WHO Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases 2008–2013 (WHO Global NCD Action Plan 2008–2013) and the WHO Global NCD Action Plan 2013–2020, which is under development, by reviewing country reports, discussion and agreement on recommended actions.

This report is available at: http://www.who.int/gard/publications/GARDGMReportStPetersburg2012.pdf