

# Asthma prevalence and severity among primary-school children in Baghdad

D. Al-Thamiri,<sup>1</sup> W. Al-Kubaisy<sup>2</sup> and S.H. Ali<sup>1</sup>

معدل انتشار الربو ومدى وخامته بين أطفال المدارس الابتدائية في مدينة بغداد

داود الثامري، وقار الكبيسي، شذى حسين علي

**الخلاصة:** استهدفت هذه الدراسة قياس معدل انتشار الربو ومدى وخامته بين الأطفال في مدينة بغداد. وفي إطار هذه الدراسة تم أخذ 3360 عينة عشوائية من أطفال المدارس الابتدائية وطلب من والديهم استكمال استبيانات موحدة. وبلغ معدل الاستجابة 86٪، وكانت نسبة الذكور إلى الإناث 0.75 : 1، وتراوح العمر من 6 إلى 12 عاماً. وكان معدل حدوث الأزيز في أي وقت مضى 25٪، وبلغ في الاثني عشر شهراً الأخيرة 19.9٪، وكانت نسبة الأطفال الذين تعرّضوا لأكثر من 12 نوبة أزيز 2.9٪. وأبلغ الوالدان عن حدوث أزيز ليلي بين 16.3٪ من الأطفال، وعن حدوث نوبات وخيمة مع تعثر الكلام بين 10.5٪ من الأطفال. وبلغ معدل حدوث الربو في أي وقت مضى 22.3٪. وتم اكتشاف وجود الربو لدى 81.9٪ من جملة من يعانون من الأزيز في الاثني عشر شهراً الأخيرة. وكانت نسبة الأطفال الذكور المصابين بحالة أزيز أكبر من نسبة الأطفال الإناث، في حين كانت نسبة الإناث أكبر من نسبة الذكور في حالة الربو. ولوحظ تناقص في معدل انتشار الربو، وفي معدل ظهور أعراض الربو الوخيم، مع ازدياد العمر.

**ABSTRACT** To measure asthma prevalence and severity among children in Baghdad, we randomly sampled 3360 primary-school children and had their parents complete standardized questionnaires. The response rate was 86%, male to female ratio was 0.75:1 and age range was 6–12 years. Prevalence of wheezing ever was 25.0%. Wheezing during the last 12 months was 19.9% and 2.9% of the children had more than 12 attacks. Parents reported nocturnal wheezing for 16.3% of the children and severe attacks that limited speech for 10.5%. Prevalence of asthma ever was 22.3%. Asthma was detected in 81.9% of those with wheezing in the last 12 months. Males were predominant among children with wheezing ever, whereas females were predominant among children with asthma ever. Prevalence rates of asthma and of severe asthma symptoms decreased with increasing age.

## Prévalence et sévérité de l'asthme chez des écoliers du primaire à Bagdad

**RÉSUMÉ** Afin de mesurer la prévalence et la sévérité de l'asthme chez les enfants à Bagdad, nous avons sélectionné de manière aléatoire un échantillon de 3360 écoliers du primaire et avons fait remplir des questionnaires standardisés à leurs parents. Le taux de réponse était de 86 %, le rapport des sexes masculin/féminin était de 0,75:1 et l'âge était compris entre 6 et 12 ans. La prévalence des sifflements respiratoires au cours de la vie était de 25,0 % ; au cours des douze derniers mois elle s'élevait à 19,9 % et 2,9 % des enfants avaient eu plus de 12 crises. Les parents ont rapporté des sifflements nocturnes pour 16,3 % des enfants et des crises sévères limitant la parole pour 10,5 %. La prévalence de l'asthme au cours de la vie était de 22,3 %. L'asthme a été dépisté chez 81,9 % de ceux ayant eu des sifflements respiratoires au cours des 12 derniers mois. Une prédominance masculine a été notée chez les enfants ayant eu des sifflements respiratoires au cours de la vie, tandis qu'on retrouve une prédominance féminine chez les enfants ayant souffert d'asthme au cours de la vie. Les taux de prévalence de l'asthme et de symptômes d'asthme sévère diminuaient lorsque l'âge augmentait.

<sup>1</sup>Department of Paediatrics; <sup>2</sup>Department of Community Medicine, Iraqi College of Medicine, Baghdad, Iraq (Correspondence to W. Al-Kubaisy: wagar\_abd@yahoo.co.uk).

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المجلة الصحية لشرق المتوسط، منظمة الصحة العالمية، المجلد الحادي عشر، العددان ٢/١، ٢٠٠٥

## Introduction

Childhood asthma is a major clinical concern worldwide and represents a huge burden on families and societies. It accounts for a large number of lost school days and may deprive children of both academic achievement and social interaction. Childhood asthma also places a strain on health-care resources as a result of doctor and hospital visits and cost of treatment [1]. The prevalence of childhood asthma has been reported to vary (1%–30%) in different populations [2]. These variations are possibly due to differing exposures to respiratory infections, indoor or outdoor pollution and diet [1,2].

Genetics and lifestyle and environmental factors may also play a role in these variations [3]. The prevalence of asthma seems to be higher in affluent than in non-affluent populations [2,4]. The prevalence of childhood asthma is increasing worldwide and consequently morbidity, mortality and cost of care continue to increase [2,4,5]. The combination of the genetic basis of asthma and indoor allergens like dust mites and atmospheric dusts to the increasing prevalence of asthma has been reported [6]. In the United States of America, 15 million people have asthma, and of them, nearly 4.8 million are children [5]. Multiple studies support the “hygienic hypothesis” in asthma development; this hypothesis states that childhood asthma develops as a result of decreased exposure to infectious agents during infancy and early childhood, resulting in the persistence of neonatal T helper lymphocyte 2 immunophenotype, thereby predisposing the child to atopic diseases [7].

Although many have studied asthma in Iraq, the epidemiology of this disease is still not fully understood. To the best of our knowledge, no study has yet described the

prevalence of asthma among schoolchildren in Iraq. Our study, therefore, estimated the prevalence of asthma and wheezing among primary-school children and evaluated the severity of asthma symptoms in our study group.

## Methods

We conducted a cross-sectional study of primary-school children in Baghdad between October 2000 and June 2002. We obtained from the Ministry of Education a list of the 1494 primary schools throughout Baghdad, in both urban and rural areas. The schools were of 3 types: for girls only, for boys only, or coeducational. The number of students in these schools at the time of our study was 1 002 004. Official approval was obtained from the appropriate authorities prior to the study. We randomly chose 20 schools in both urban and rural regions of any of the 3 types of primary schools. A sample of 3360 primary-school children was then selected by a cluster random method.

Letters were sent to the parents of the chosen children. The letters explained the purpose of the study and directions for the attached questionnaire. We also visited the schools on Parent’s Day and further explained the questions and the directions. The standardized questionnaire that was distributed to the 3360 children asked their parents about risk factors for asthma, triggering factors for wheezing attacks and seasonal variations. The questionnaire also covered characteristics including birth process, birth weight, feeding pattern and duration of breastfeeding, family history of asthma, level of education of parents and cigarette-smoke exposure. Another section included questions about drugs used by the child in the last 12 months. To distinguish

between asthma and wheezing, we depended upon responses to questions about the types of medications used for the child's asthma during the last 12 months. We asked parents to respond with "yes" or "no" to the key question in the questionnaire to confirm the child as asthmatic: "Had their child ever been diagnosed by a physician as having asthma?" In addition to this, we contacted parents who answered "yes" and confirmed the diagnosis of asthma with the type of medication used by the child. These questions were added to the first part of the International Study of Asthma and Allergies in Childhood (ISAAC) core questionnaire, which was translated into Arabic [8].

We defined severe asthma as cases that met one or more of the following criteria: more than 12 wheezing attacks in the last 12 months; sleep disturbed by wheezing attacks more than 4 times per month; or wheezing attacks that limited speech [5,9]. Non-severe asthma was defined as meeting one or both of these criteria: less than 12 wheezing attacks in the last 12 months or sleep disturbed by wheezing attacks less than 4 times per month [5,9].

Our limitations were that the authors themselves did not clinically examine the children because of the political situation in Iraq during the study and that there was recall bias of the parents.

The data were analysed with *SPSS*, version 10.0 and were presented in simple measures of frequency (%). The significance of difference between proportions was calculated with chi-squared test, with  $P$ -value < 0.05 as the level of significance.

## Results

Of the 3360 questionnaires that we sent out, 2889 completed questionnaires were

returned, i.e. the response rate was 86.0%. The study population ranged in age from 6 to 15 years, was in primary grades 1–6 and included 1242 boys (43%) and 1647 girls (57%). The male to female ratio was 0.75:1.

Table 1 shows the prevalence of asthma and asthma symptoms. Wheezing ever was reported for 723 children (25.0%), 574 children (19.9%) had wheezing in the last 12 months and only 84 (2.9%) reported more than 12 wheezing attacks in the past year. Nocturnal wheezing attacks disturbing sleep were reported for 470 (16.3%) children and only 88 (3.1%) had more than 4 attacks per month disturbing their sleep. Severe wheezing attacks that limited speech were reported for 304 children (10.5%).

The prevalence rate of wheezing ever was significantly higher among boys (28.3%) than girls (22.6%,  $\chi^2 = 21.020$ ,  $P = 0.007$ ). Girls, however, had significantly higher prevalence of asthma ever (22.5%) than boys (22.1%,  $\chi^2 = 18.110$ ,  $P = 0.034$ ). Girls also had significantly higher prevalence rates of severe asthma symptoms, including more than 12 wheezing attacks in the last 12 months (3.1% versus 2.6%) and nocturnal attacks disturbing sleep more than 4 times per month (3.4% versus 2.5%). The sex difference was not significant for the prevalence of wheezing in the last 12 months (Table 1).

Physicians had previously diagnosed asthma in 644 children (22.3%). Of 723 children with a history of wheezing ever, physicians had diagnosed 171 (23.7%) asthma cases, whereas 473 (21.8%) of 2166 children without a history of wheezing were diagnosed with asthma. In contrast, 81.9% of those with wheezing in the last 12 months (470 of 574 children) had been diagnosed by a physician as asthmatic (Table 2).

Table 1 Prevalence of asthma and asthma symptoms by sex

Symptom	Boys (n = 1242) No. (%)	Girls (n = 1647) No. (%)	Total (n = 2889) No. (%)	P-value	$\chi^2$
Wheezing ever	351 (28.3)	372 (22.6)	723 (25.0)	0.007*	21.020
Wheezing in last 12 months	270 (21.7)	304 (18.4)	574 (19.9)	0.055	16.630
< 4 episodes	149 (12.0)	155 (9.4)	304 (10.5)	0.366	
4–12 episodes	88 (7.1)	98 (5.9)	186 (6.4)	0.066	
> 12 episodes	33 (2.6)	51 (3.1)	84 (2.9)	0.000*	
Sleep disturbances	219 (17.6)	251 (15.2)	470 (16.3)	0.336	10.179
< 2 disturbances/month	126 (10.1)	135 (8.2)	261 (9.0)	0.023	
3–4 disturbances/month	62 (5.0)	59 (3.6)	121 (4.2)	0.116	
> 4 disturbances/month	31 (2.5)	57 (3.4)	88 (3.1)	0.004*	
Wheezing attacks limiting speech	147 (11.8)	157 (9.5)	304 (10.5)	0.171	11.575
Asthma ever	274 (22.1)	370 (22.5)	644 (22.3)	0.034*	18.110

\*Significant at  $P < 0.05$ .

Table 3 gives the prevalence of asthma and asthma symptoms by age. The prevalence of wheezing ever increased with increasing age. The numbers of children who had experienced wheezing attacks during the last year and children with physician-diagnosed asthma, however, steadily decreased with increasing age from 35.0% and 40.6% respectively for children aged

6–7 years to 14.3% and 14.3% respectively for those aged 14–15 years.

Table 4 shows the distribution of asthma severity according to age. The proportion of children who experienced more than 12 wheezing attacks during the last year varied little with age, while both prevalence rates of nocturnal wheezing attacks that disturbed sleep and attacks that limited speech decreased with increasing age from 25.9% and 21.2% respectively for children aged 6–7 years to 8.2% and 6.1% for those aged 14–15 years.

Table 2 Percentage distribution of children with asthma ever

Category	Number of children	Asthma ever <sup>a</sup> No. (%)
Total	2889	644 (22.3)
Wheezing ever	723	171 (23.7)
Without wheezing	2166	473 (21.8)
Wheezing in the last 12 months	574	470 (81.9)

<sup>a</sup>Asthma ever as confirmed by the parent's report of physician diagnosis.

## Discussion

Our study is the first nationally to measure asthma prevalence in Iraq. The higher number of females in the study population can probably be attributed to the effects of the embargo at the time of our study as many boys had left school to work. It is evident that both wheezing and asthma are major public health problems as their prev-

Table 3 Prevalence of asthma and asthma symptoms by age of primary-school children

Age group (years)	Population	Wheezing ever No. (%)	Wheezing in last 12 months No. (%)	Asthma ever No. (%)
6-7	320	18 (5.6)	112 (35.0)	130 (40.6)
8-9	582	39 (6.7)	142 (24.4)	158 (27.1)
10-11	1055	275 (26.1)	174 (16.5)	184 (17.4)
12-13	883	380 (43.0)	139 (15.7)	165 (18.7)
14-15	49	11 (22.4)	7 (14.3)	7 (14.3)
Total	2889	723 (25.0)	547 (19.9)	644 (22.3)

Prevalence rates are high (25.0% and 22.3%, respectively).

Although asthma prevalence in our study was similar to prevalence in Saudi Arabia (23%), it was higher than in other nearby countries like Turkey (14.1%), United Arab Emirates (UAE) (13%), Lebanon (12%) and Jordan (4.1%) [3,10-13]. Moreover our prevalence was much higher than in many European countries: France (14.9%), Norway (8.6%), Italy (4.6%), Sweden (7%) and Spain (10%) [14-18]. It was also higher than in Latin America (16.5%) and Brazil (20.4%) [19,20]. Fur-

thermore, it was higher than in Russia (5.1%), Malaysia (10.3%), India (15.7%) and the Republic of Korea (8.7%) [15,21-23]. Asthma prevalence in Iraq, however, was lower than rates in the United Kingdom (29.7%) and the USA (23.6%) [24,25]. Prevalence of wheezing ever was much lower than in some countries: France (25.4%), the United Kingdom (35.8%) and the USA (34.5%), while it was higher than in Turkey (22.4%), the UAE (15.6%), Lebanon (23%), Jordan (8.3%), Italy (23.2%), Malaysia (12.5%) or India (20.8%) [3,11-14,16,21,22,24,25]. These differences in

Table 4 Prevalence of severe asthma symptoms by age of primary-school children

Age (years)	Number	> 12 wheezing attacks No. (%)	> 4 sleep disturbances No. (%)	Attacks limiting speech No. (%)
6-7	320	11 (3.4)	83 (25.9)	68 (21.2)
8-9	582	16 (2.7)	115 (19.7)	82 (14.1)
10-11	1055	26 (2.5)	150 (14.2)	78 (7.4)
12-13	883	29 (3.3)	118 (13.4)	73 (8.3)
14-15	49	2 (4.1)	4 (8.2)	3 (6.1)
Total	2889	84 (2.9)	470 (16.3)	304 (10.5)

prevalence of asthma and wheezing in various regions of the world can be explained by the variability of environmental and genetic factors that predispose children to wheezing [12].

Wheezing attacks in the last 12 months were reported for 19.9% of the children in our study. This percentage was lower than the prevalence rate of wheezing ever (25.0%) and was similar to studies from different regions [3,12,14,16,21,22,24,25]. This trend reflected the tendency of wheezing to resolve as children grow older [12]. Moreover, the majority of our cases (470 of 574 children) who experienced wheezing during the last 12 months were diagnosed as asthmatics (81.9%) (Table 2). This emphasizes the importance of wheezing as a major clinical presentation of asthma. A similar study in Lebanon reported asthma in 51% of children with wheezing ever and in 85% of children with wheezing in the last 12 months [12]. Although only about 1% of children with asthma have severe asthma, its prognosis is very worrisome as 90% of children with severe asthma continue with asthma into adulthood [18]. In 1997, National Asthma Education and Preventive Program (NAEPP) guidelines recommended routine monitoring of asthma patients to identify signs and symptoms for the classification of asthma severity. Frequent exacerbations and attacks, limited speech and night-time symptoms were designated as indicators of severe asthma [5,9].

Although 19.9% of the children in our study experienced wheezing in the last 12 months, only 2.9% were severe cases who experienced more than 12 wheezing attacks during last 12 months. Similarly studies in Turkey and France reported frequent attacks (> 12 attacks) with rates of 3.3% and 4.5% respectively [3,14]. Lower figures have been reported from the United

Kingdom (2.2%) and Lebanon (1%) [8,12]. Likewise, of the children in our study who experienced attacks that disturbed sleep, only 3.1% were awakened more than 4 times per month. Studies in the United Kingdom and France reported wheezing attacks disturbing sleep more than 1–2 times per week as 4.3% and 2.2% respectively [8,14]. Rates of wheezing attacks that disturbed sleep over 12-month periods were 10% in Turkey, 9% in Lebanon and 23.2% in a city in Brazil [3,12,20].

Several regions have reported frequencies of wheezing attacks that limited speech ranging from 2.3% to 9.6%, i.e. frequencies lower than in our study (10.5%) [3,8,12,14,20]. This variation could be explained as either true severe episodes limiting speech or as overestimations of the attacks by parents. One striking finding in our study was the significantly higher prevalence of asthma ever and severe asthma symptoms for girls than for boys. Many regional studies have shown male predominance in prevalence of wheezing and asthma ever, whereas studies from Turkey, Lebanon and India found similar rates of asthma and wheezing ever for both sexes [3,8,12–14,17,22]. Our clinical observation is that girls tend to overestimate asthma symptoms more frequently than boys which may explain the female predominance in our study. Similarly, in the United Kingdom, one study identified a decrease in male to female ratio with increasing age [8].

In our study, the prevalence of asthma and wheezing in last 12 months decreased with increasing age, as it did in other studies [8,23]. It has been estimated that wheezing and asthma improve with age and that remission of asthma is about 50% [9]. We, however, found that older children had higher rates of wheezing ever, similar to a study from India [22]. This may be ex-

plained by incomplete recall of past wheezing episodes. Prevalence of wheezing attacks limiting speech and disturbing sleep in our study markedly decreased with increasing age (Table 4). This emphasizes that these attacks are better indicators of severity than are frequency of attacks. Frequency of attacks showed no constant significant differences with age among our cases. Decreasing asthma severity with increasing age was confirmed by one large study in the United Kingdom [8].

## Conclusions

Asthma is a major public health problem among Iraqi children in Baghdad. Prevalence rates of asthma and wheezing ever in Baghdad are comparable to industrialized and developed countries. Occurrences of severe asthma symptoms were similar or higher but not lower than in other coun-

tries. Significant sex differences were reflected by male predominance in wheezing ever and female predominance in asthma. Both asthma prevalence and severe asthma symptoms decreased steadily with increasing age.

Further studies in other governorates are needed to determine the prevalence of asthma and wheezing in the various geographical regions of our country.

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## References

1. Von-Mutius E. The burden of childhood asthma. *Archives of disease in childhood*, 2000, 82(suppl. 1):2112–5 [abstract].
2. Partridge MR, Alwan A. Prevention of asthma and approaches for enhanced care in the Eastern Mediterranean Region. *Eastern Mediterranean health journal*, 1997, 3(1):133–43.
3. Ece A et al. Prevalence of asthma and other allergic disorders among school-children in Diyarbakir, Turkey. *Turkish journal of pediatrics*, 2001, 43:286–92.
4. Al-Dawood KM. Epidemiology of bronchial asthma among school boys in Al-Khobar City, Saudi Arabia. *Saudi medical journal*, 2001, 22(1):61–6.
5. Rorstad A, Bhatt-Mehta V. Outpatient management of asthma in children. *Pharmacy times*, 2000 May:55–66.
6. Mochizuki H, Morikawa A. Childhood asthma. *Nippon-Rinsho*, 2001, 59(10):1919–24 [abstract].
7. Tantisira KG, Weiss ST. Childhood infections and asthma at the crossroads of the hygiene and Barker hypothesis. *Respiratory research*, 2001, 2(6):324–7 [abstract].
8. Strachan DP et al. A national survey of asthma prevalence, severity, and treatment in Great Britain. *Archives of disease in childhood*, 1994, 70:174–8.
9. Sly M. Asthma. In: Behrman RE, Kliegman RM, Jenson HB, eds. *Nelson textbook of pediatrics*, 16th ed. Philadelphia, WB Saunders Company, 2000: 664–80.
10. Al-Frayh AR et al. Increased prevalence of asthma in Saudi Arabia. *Annals of Allergy*, 2000, 85:100–104.

- ergy, asthma and immunology*, 2001, 86(3):292–6 [abstract].
11. Al-Maskari F et al. Asthma and respiratory symptoms among schoolchildren in United Arab Emirates. *Allergie et immunologie*, 2000, 32(4):159–63 [abstract].
  12. Ramadan FM et al. Prevalence of asthma and asthma symptoms in children in urban Lebanon. *Saudi medical journal*, 1999, 20(6):453–7.
  13. Abuekteish F et al. Prevalence of asthma and wheeze in primary-school children in Northern Jordan. *Annals of tropical pediatrics*, 1996, 16:227–31.
  14. Fontaine V et al. Epidemiology of childhood asthma in the department of Calvados. *Revue de pneumologie clinique*, 1999, 55(1):5–11 [abstract].
  15. Selnes A et al. Asthma and allergy in Russian and Norwegian schoolchildren. Results from two questionnaire-based studies in the Kola Peninsula, Russia, and northern Norway. *Allergy*, 2001, 56(4):344–8 [abstract].
  16. Peroni DG et al. Prevalence of asthma and respiratory symptoms in childhood in an urban area of north-east Italy. *Monaldi archives for chest disease*, 1998, 53(2):134–7 [abstract].
  17. Ronmark E et al. Asthma, type I allergy and related conditions in 7 and 8 year old children in northern Sweden. *Respiratory medicine*, 1998, 92(2):316–24 [abstract].
  18. Garde-Garde JM, Medina Pomares J. Mesa Redonda: Asma grave en Pediatría: Diagnostico y pronóstico. [Round Table: Severe asthma in paediatrics: diagnosis and prognosis.] *Allergologia et immunopathologia*, 1999, 27(2):46–53 [abstract].
  19. Mallol J et al. Prevalencia del asma en escolares chilenos. Estudio descriptivo de 24.470 niños. ISAAC–Chile. [Prevalence of asthma in Chilean students. Descriptive study of 24 470 children. ISAAC–Chile.] *Revista medica de Chile*, 2000, 128(3):279–85 [abstract].
  20. De Britto MC et al. Asthma prevalence in schoolchildren in a city in north-east Brazil. *Annals tropical paediatrics*, 2000, 20(2):95–100 [abstract].
  21. Norzila MZ et al. Prevalence of childhood asthma and allergy in an inner city Malaysian community: Intra-observer reliability of two translated international questionnaires. *Medical journal of Malaysia*, 2000, 55(2):33–9 [abstract].
  22. Chhabra SK et al. Prevalence of bronchial asthma in schoolchildren in Delhi. *Journal of asthma*, 1998, 35(3):291–6 [abstract].
  23. Lee SI et al. Prevalence symptoms of asthma and other allergic diseases in Korean children: a nationwide questionnaire survey. *Journal of Korean medical sciences*, 2001, 16(2):155–64 [abstract].
  24. Ng Man Kwong G et al. Increasing prevalence of asthma diagnosis and symptoms in children is confined to mild symptoms. *Thorax*, 2001, 56(4):312–4 [abstract].
  25. Hu HB et al. Prevalence of asthma and wheezing in public schoolchildren: association with maternal smoking during pregnancy. *Annals of allergy, asthma and immunology*, 1997, 79(1):80–4 [abstract].