

Prevalence of asthma in Jordan: Comparison between Bedouins and urban schoolchildren using the International Study of Asthma and Allergies in Childhood phase III protocol

Faisal Abu-Ekteish, M.R.C.P., F.R.C.P.C.H.,* Sameer Otoom, M.D., Ph.D.,# and Iman Shehabi, M.D.§

ABSTRACT

The aim of this cross-sectional study was to compare the prevalence of asthma and its symptoms in children aged 6–7 years and 13–14 years in an urban (Amman city) area and among Bedouins in northern Jordan. The number of students included in both studied groups was 9108. This study is part of the International Study of Asthma and Allergies in Childhood (ISAAC), phase III. The response rate was 84% for urban schoolchildren compared with 68% among Bedouin schoolchildren. There was no statistical significance in prevalence of asthma diagnosed by a physician between the Amman city group and Bedouins (8.8% versus 9.5%). Wheeze induced by exercise and night cough was significantly common in schoolchildren aged 13–14 years compared with primary schoolchildren (18.5 and 25.3% versus 11.1 and 22.6%; $p < 0.001$). Wheezing ever and sleep disturbances were significantly more common in male subjects (27.5%, $p < 0.01$, and 12.2%, $p < 0.001$, respectively). Primary schoolchildren aged 6–7 years had significant wheezing ever (27.2%) compared with older children (25.1%; $p < 0.05$). Bedouin children had significant exercise-induced wheeze (16.4%) compared with children in Amman city (13.1%, $p < 0.001$), but the latter had significant prevalence of night cough (25%) compared with the Bedouin group (22.6%; $p < 0.01$). In conclusion, this study shows that asthma is moderately common in Jordan. There was no difference in prevalence of asthma diagnosed by a physician between an urbanized region and Bedouins having low socioeconomic status. Asthma was common in male children, which is similar to other reports elsewhere. There is a twofold increase in the prevalence of asthma in Jordan in the last 10 years.

(Allergy Asthma Proc 30:181–185, 2009; doi: 10.2500/aap.2009.30.3208)

Key words: Asthma, Bedouins, children, ISAAC, Jordan, prevalence, socioeconomic, urban

Asthma is the leading chronic childhood illness associated with a substantial burden on affected children and their families.¹ Its prevalence has varied from one area of the world to another and between different age groups.² Higher prevalence rates have been found among children in industrialized western countries than in developing countries such as in Asia, Africa,² and Latin America.³ Studies have suggested that asthma is more common in urban areas than in rural areas.^{4,5} This variation has been explained partly by the differences in methods used to study asthma and diagnostic criteria applied by physicians.^{6,7} Previous reports on the prevalence of asthma in the Middle East area ranged between 5 and 23%, but, in general, is lower than in developed countries.^{8–10} The highest rate was reported among people who lived in deserts such

as Saudi Arabia¹¹ and the lowest is among the Palestine population.¹²

This study was designed to determine the prevalence of asthma and its symptoms among schoolchildren of the Bedouin area in northern Jordan and compare the results with an urban area in the capital city of Amman. The International Study of Asthma and Allergies in Childhood (ISAAC) questionnaires were applied in this study.

METHODS AND MATERIALS

Study Area and Population

One of the best-known groups from Jordan's population is the Bedouin group. Most of Jordan's Bedouins live in the vast wasteland that extends east from the desert highway. Bedouins are often stereotyped as constantly wandering the desert. This is not always true, because a small portion of Bedouins may still be regarded as true nomads, whereas many have settled down to cultivate crops rather than drive their animals across the desert. Our target study groups were the schoolchildren of northeastern Badia desert (Almafraq Province) and the capital of Amman.

From the Departments of *Pediatrics and #Pharmacology, Jordan University of Science and Technology, Irbid, Jordan, and §Princess Basma Teaching Hospital, Irbid, Jordan

Address correspondence and reprint requests to Faisal Abu-Ekteish, M.R.C.P., F.R.C.P.C.H., Department of Pediatrics, Faculty of Medicine-Jordan University of Science and Technology, P.O. Box 3030, Irbid, Jordan

E-mail address: faisal@just.edu.jo

Copyright © 2009, OceanSide Publications, Inc., U.S.A.

Table 1 Age, sex, and place of residence of studied children

	6–7 yr n (%)	13–14 yr n (%)	Total
Amman			
Boys	1449 (54)	1241 (46)	2690
Girls	1149 (49)	1206 (51)	2355
Total	2598 (52)	2447 (48)	5045
Almafraaq			
Boys	1086 (53)	951 (47)	2037
Girls	1107 (55)	919 (45)	2026
Total	2193 (54)	1870 (46)	4063

The survey was performed in both regions in 2002 after the approval of the Jordanian Ministry of Education and Ethical committee of Jordan University of Science and Technology. The target age groups included in the study are schoolchildren between 6 and 7 years and 13 and 14 years (boys and girls). The students involved in both study groups were randomly selected, taking into considerations the type of school and the geographic distribution.

Questionnaires

The ISAAC written core and video questionnaires were used after being validated and translated into Arabic. Local expressions were used when it was felt the student might not understand the equivalent Arabic terms. The video questionnaires consisted of five sequences of different symptoms 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 a difficulty in breathing at rest. The study was limited to elementary and intermediate schools in Amman, the capital of Jordan, and in the northeast Badia desert (Almafraaq province). The video questionnaires were used for those aged 13–14 years, only, in both areas.

Data Analysis

A sample size of 3000 boys and 3000 girls from each region was needed to provide sufficient precision for an estimate of symptom severity. The sample size was in agreement with phase III of the ISAAC—suggested protocol for calculating sample size for asthma and allergic diseases.^{13,14} The data were coded and entered into a computer. The data were analyzed using SPSS software package (SPSS, Inc., Chicago, IL).

RESULTS

The total response rate of both age groups was 84% in Amman city schoolchildren compared with 68% among Bedouin children. It was more common in boys (79%) of both studied groups compared with 73% in girls. The characteristics of children who participated

in the study are detailed in Table 1. The prevalence of asthma and wheezing symptoms according to the age, sex, and place of residency is summarized in Tables 2 and 3. Wheezing ever and sleep disturbances were significantly more common in boys (27.5%, $p < 0.01$, and 12.2%, $p < 0.001$, respectively). Primary schoolchildren (aged, 6–7 years) had significantly more wheezing ever and frequent attacks of wheeze compared with older children (27.2%, $p < 0.05$, and 5.2%, $p < 0.01$, respectively). There was no statistical significance in prevalence of asthma diagnosed by a physician between the Amman city group and Bedouin group (8.8% versus 9.5%). However, it was significantly more common in boys (10.1%, $p < 0.001$) compared with girls (8%). The average figure of current wheezes for both groups was 14.7% based on a written questionnaire. There were no significant differences between the two age groups studied. Wheeze and night cough induced by exercise was significantly more common in schoolchildren aged 13–14 years compared with primary schoolchildren (18.5% and 25.3% versus 11.1% and 22.6%). The Almafraaq city group had significantly more exercise-induced wheeze (16.4%) compared with Amman city (13.1%); however, the later had a prevalence of night cough of 25% compared with 22.6% in the Bedouin group. Wheezing ever, wheezing attacks in the past 12 months, and exercise-induced wheeze were significantly common in both boys and girls of Bedouin schoolchildren aged 13–14 years. Physician-diagnosed asthma was significantly higher among boys aged 13–14 years (12.8%) in Al-mafraq city schoolchildren compared with Amman schoolchildren (7.7%). Wheezing ever and night cough in the last 12 months were significantly higher among Amman schoolchildren aged 6–7 years compared with Bedouin schoolchildren. Frequent attacks of wheezes, physician-diagnosed asthma, and exercise-related wheezes were significantly more common among girls of Amman schoolchildren compared with Bedouin schoolchildren aged 6–7 years.

Table 2 Prevalence of asthma among schoolchildren by age, place, and gender

Symptoms	Amman			Al-Mafraq			Gender	
	6–7 yr	13–14 yr	Total	6–7 yr	13–14 yr	Total	Boys	Girls
Total number	2598	2447	5045	2193	1870	4063	4725	4381
Wheezing ever (%)	30.5*	22.8	26.8	23.5	28.0*	25.5	27.5**	24.8
Wheezing in the past 12 mo (%)	16.8*	12.4	14.6	13.5	16.5*	14.8	15.3	14.1
Wheezing attacks of ≥ 1 –3 (%)	9.8*	8.1	8.9	8.8	10.7*	9.6	9.4	9.0
Wheezing attacks of ≥ 4 (%)	4.4	4.9	4.9	2.7	4.2*	4.2	4.8	4.3
Sleep disturbances in the past 12 mo (%)	11.7	10.7	10.7	9.7	10.3	10.3	12.2***	8.8
Speech disturbance due to wheezing in the past 12 mo (%)	5.7	5.6	5.6	4.5	4.7	4.7	5.4	5.0
Physician-diagnosed asthma (%)	10	8.8	8.8	8.7	9.5	9.5	10.1***	8.0
Exercise-related wheezing in the past 12 mo (%)	11.8	13.1	13.1	10.3	16.4**	16.4***	14.6	14.5
Night cough without cold or chest infection in the past 12 mo (%)	25	25	25**	19.4	22.6*	22.6	23.6	24.2

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

DISCUSSION

Despite the advances in the understanding of asthma pathogenesis and treatment in recent years, it remains a significant public health concern with its considerable morbidity and mortality worldwide.^{15,16} This is the first study in Jordan using the ISAAC questionnaire to study the prevalence of asthma and wheezing symptoms and to study the differences between urban and Bedouin populations. To our knowledge, this is the first study of asthma among Bedouin populations. The response rate to the questionnaire was 84% among urban schoolchildren compared with 68% among Bedouin schoolchildren. This low response rate among the Bedouin group could be explained by their educational, social, and environmental factors.

The novel finding in this study is that there is no statistical difference in the prevalence of asthma between urban schoolchildren living in the Capital city and Bedouin schoolchildren living in a desert environment. This is contrary to other reports from developed^{17,18} and developing countries,^{19,20} who reported that poverty and low socioeconomic status are associated with high prevalence of asthma. A recent study by Baqueiro *et al.*²¹ revealed a higher prevalence rate of asthma among high socioeconomic populations. Poverty was usually associated with deprivation behaviors, such as smoking, large family size, and high indoor and outdoor pollution, as well as the characteristics of diet.^{22,23} A high level of air pollution is not certainly responsible for the observed variation in asthma prevalence within and among countries.^{24,25}

The prevalence of physician-diagnosed asthma in Amman city and Bedouin schoolchildren was 8.8 and 9.5%, respectively, with no statistical significant differ-

ence noticed between the two groups. However, when we further analyzed the data according to their ages, the physician-diagnosed asthma rate was slightly higher among 6- to 7-year old children (9.4%) compared with (8.8%) the 13- to 14-year-old group. This figure is consistent with the Trakultivakron *et al.* study in which the same questionnaire was used.²⁶ We had previously reported, 10 years ago, a prevalence rate of 4.3% of physician-diagnosed asthma among primary schoolchildren in northern Jordan.⁸ The recent prevalence rate yielded a twofold increase in the prevalence of asthma over a 10-year period, which is consistent with the global rise in the rate of asthma for the last 40 years.^{27,28} These changes in the prevalence rate are consistent with the report of the ISAAC Steering Committee, which reported that Arab countries have moderately low to moderately high prevalence rates of recent wheeze, compared with developed countries.²⁹ Marked variations in the prevalence of asthma, with up to 15-fold differences between countries, was reported from phase 1 of the ISAAC.²⁹ The prevalence of physician-diagnosed asthma in this study is comparable with reports from Palestine (9.4%), but lower than the rate reported from Saudi Arabia (23%).^{11,30}

We found that the rate of physician diagnosis of asthma was higher in boys (10.1%) compared with that in girls (8%; $p < 0.001$). This seems to reflect a true gender difference in the prevalence of asthma that is consistent with previous studies.^{31,32} The prevalence of physician-diagnosed asthma in this study does not seem to be increasing with increasing age, a finding that had been reported by Backlund *et al.*²⁸ The prevalence rate of wheezing ever among urban schoolchildren and Bedouin schoolchildren was 26.8 and 25.5%,

respectively, with no significant difference between them. These figures are comparable with those reported from New Zealand (27%) and Wales (22%), but they are lower than the 37% reported from Australia and higher than 10% from Hong Kong.^{33,34} The prevalence rate of wheezing attacks in young children was 5.2%, and sleep disturbance rate was 11%. Similar figures have been reported by others.^{8,10,32} There is a significant association of wheezing after exercise in older schoolchildren (18.5%) compared with that in the younger age group (11.1%; $p < 0.001$). The most likely explanation for these differences is the lack of awareness of parents to the presence of such symptoms in their young children. The prevalence of exercise-related wheeze was significantly more common among Bedouin schoolchildren (16.4%) compared with in Amman schoolchildren (13.1%; $p < 0.001$). The most likely explanation for these differences is related to the quality of lifestyle between both groups where urbanization leads to having less exercise on daily life basis. These findings are contradictory to reports from other developing countries.³⁵ Night cough was significantly more common among Amman schoolchildren of both age groups (25%) compared with Bedouin schoolchildren ($p < 0.01$).

In conclusion, this study shows that asthma is not uncommon in Jordan. There was no statistical difference in prevalence of asthma diagnosed by physicians between urbanized regions and Bedouin regions having low socioeconomic status. In addition, an international study on socioeconomic status and prevalence of asthma is needed to determine if there is a real difference between urban and rural areas.

REFERENCES

- Anderson HR, Baily PA, Cooper JS, and West S. Morbidity and school absence caused by asthma and wheezing illness. *Arch Dis Child* 58:777, 1983.
- Beasley R, Crane J, Lai CK, and Pearce N. Prevalence and etiology of asthma. *J Allergy Clin Immunol* 105:466–472, 2000.
- Del-Rio-Navarro B, Del Rio-Chivardi JM, Berber A, et al. Asthma prevalence in children living in north Mexico City and a comparison with other Latin American cities and world regions. *Allergy Asthma Proc* 27:334–340, 2006.
- Weinberg EG. Urbanization and childhood asthma: An African perspective. *J Allergy Clin Immunol* 105:224–231, 2000.
- Hijazi N, Abalkhail B, and Seaton A. Asthma and respiratory symptoms in urban and rural Saudi Arabia. *Eur Respir J* 12:41–44, 1998.
- Nystad W, Magnus P, and Gulsvik A. Increasing risk of asthma without other topic disease in school children: A repeated cross-sectional study after 13 years. *Eur J Epidemiol* 14:247–252, 1998.
- Ninan TK, and Russell G. Respiratory symptoms and atopy in Aberdeen schoolchildren: Evidence from two surveys 25 years. *BMJ* 304:873–875, 1992.
- Behbehani NA, Abal A, Syabbalo NC, et al. Prevalence of asthma, allergic rhinitis, and eczema in 13 to 14-year-old children in Kuwait: An ISAAC study, International Study of Asthma and Allergies in Childhood. *Ann Allergy Asthma Immunol* 85:58–63, 2000.
- Abuekteish F, Alwash R, Hassan M, and Daoud AS. Prevalence of asthma and wheeze in primary school children in northern Jordan. *Ann Trop Paediatr* 16:227–231, 1996.
- El-Sharif N, Abdeen Z, Qasrawi R, et al. Asthma prevalence in children living in villages, cities and refugee camps in Palestine. *Eur Respir J* 19:1026–1034, 2002.
- Al Frayh AR, Shakoor Z, Gad EL, and Rab MO. Increased prevalence of asthma in Saudi Arabia. *Ann Allergy Asthma Immunol* 86:292–296, 2001.
- Hasan MM, Gofin R, and Bar-Yishay E. Urbanization and the risk of asthma among schoolchildren in the Palestine Authority. *J Asthma* 37:353–360, 2000.
- ISAAC Steering Committee and the ISAAC Phase Three Study Group. Phase III modules of the international study of asthma and allergies (ISAAC). International Data Center Auckland, New Zealand, 18–19, 2000.
- Asher MI, Keil U, Anderson HR, et al. International Study of Asthma and Allergies in Childhood (ISAAC): Rational and methods. *Eur Respir J* 8:483–491, 1995.
- Lai CKW, de Guia TS, Kim YY, et al. Asthma control in the Asia-Pacific region: The Asthma Insights and Reality in Asia-Pacific Study. *J Allergy Clin Immunol* 111:263–268, 2003.
- Rabe KF, Adachi M, Lai CKW, et al. Worldwide severity and control of asthma in children and adults: The global asthma insights and reality surveys. *J Allergy Clin Immunol* 114:40–47, 2004.
- Weitzman M, Gortmaker S, and Sobol A. Racial, social, and environmental risks for childhood asthma. *Am J Dis Child* 144:1189–1194, 1990.
- Mielck A, Reitmeir P, and Wjst M. Severity of childhood asthma by socioeconomic status. *Int J Epidemiol* 25:388–393, 1996.
- Mallol J, Sole D, Asher I, et al. Prevalence of asthma symptoms in Latin America: The international study of Asthma and allergies in Childhood (ISAAC). *Pediatr Pulmonol* 30:439–444, 2000.
- Weinberg EG. Urbanization and childhood asthma: An Africa perspective. *J Allergy Clin Immunol* 105:224–231, 2000.
- Baquerio T, Pontes-de-Carvalho L, Carvalho FM, et al., Medical Student's Group. Asthma and rhinitis symptoms in individuals from different socioeconomic levels in a Brazilian city. *Allergy Asthma Proc* 28:362–367, 2007.
- Rona RJ. Asthma and poverty. *Thorax* 55:239–244, 2000.
- Kivity S, Sade K, Abu-Arisha F, et al. Epidemiology of bronchial asthma and chronic rhinitis in schoolchildren of different ethnic origins from two neighboring towns in Israel. *Pediatr Pulmonol* 32:217–221, 2001.
- Gray EJ, Peat JK, Mellis CM, et al. Asthma severity and morbidity in a population sample of Sydney schoolchildren. Part I: Prevalence and effect of air pollutants in coastal regions. *Aust NZ J Med* 24:168–175, 1994.
- Wilki AT, Ford RPK, Pattemore P, et al. Prevalence of childhood asthma symptoms in an industrial suburb of Christchurch. *NZ Med J* 108:188–190, 1995.
- Trakultivakron M, Sangsupawanich P, and Vichyanond P. Time trends of the prevalence of asthma, rhinitis and eczema in Thai children-ISAAC (International Study of Asthma and Allergies in Childhood) Phase Three. *J Asthma* 44:609–611, 2007.
- Crater D, Heise S, Perzanowski M, et al. Asthma hospitalization trends in Charleston, South Carolina, 1956 to 1997: Twenty-fold increase among black children during a 30-year period. *Pediatrics* 108:e97, 2001.
- Backlund AB, Perzanowski MS, Sandstrom T, et al. Asthma during the primary school ages-prevalence, remission and the impact of allergic sensitization. *Allergy* 61:549–555, 2006.
- ISAAC Steering Committee. Worldwide variation in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. *Lancet* 351:1225, 1998.

30. Ramadan FM, Mroueh SM, Hajjar TA, and Khogali M. Prevalence of asthma and asthma symptoms in children in urban Lebanon. *Saudi Med J* 20:453–457, 1999.
31. Shohat T, Golan G, Tamir R, et al. Prevalence of asthma in 13–14 yr-old schoolchildren across Israel. *Eur Respir J* 15:725–729, 2000.
32. Kaur B, Anderson HR, Austin J, et al. Prevalence of asthma symptoms, diagnosis, and treatment in 12–14 year old children across Great Britain (International Study of Asthma and Allergies in Childhood, ISAAC UK). *BMJ* 316:118–124, 1998.
33. Burr MI, Limb ES, Andrae S, et al. Childhood asthma in four countries: A comparative survey. *Int J Epidemiol* 23:341–347, 1994.
34. Leung R, Bishop J, and Robertson CF. Prevalence of asthma and wheeze in Hong Kong schoolchildren. An international comparative study. *Eur Respir J* 7:2046–2049, 1994.
35. Addo Yobo EO, Custovic A, Taggart SC, et al. Exercise induced bronchospasm in Ghana: Differences in prevalence between urban and rural schoolchildren. *Thorax* 52:161–165, 1997. □

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.