Med. J. Cairo Univ., Vol. 62, No. 2 June : 505-518, 1994

Epidemiology of Childhood Asthma in Cairo

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Abstract

Asthma is a difficult disease to study epidemiologically because of its many definitions. Egypt is a tropical country, where the prevalence of asthma is considered low. In this study 20000 questionnaires were distributed among children 3-15 years old, with different socioeconomic classes. 13028 Questionnaires were returned. The prevalence of asthma was 8.2%. The prevalence in relation to illeterate parents, low socioeconomic class, houses with one bed room was 10.2%, 10.2% and 11.2% respectively ($p < 0.0001$). If only one person shared the patients room the prevalence rate was 6.3% compared to 9.9% if 4 or more persons slept in the same room (Crowding index).

Introduction

WHEEZING respiratory illness and asthma are responsible for a significant proportion of both acute and chronic illness in childhood [1,2]. One problem that has greatly hindered progress in the epidemiology of asthma is the lack of a clear definition as well as a standardized instrument for detecting the condition [3]. However, in the context of an epidemiological investigation; clinical, physiologic and questionnaire approaches can be used to evaluate the prevalence of asthma, its associated risk factors and its natural history [4].

Because children may be unable to cooperate adequately with physiological testing and for reasons of feasibility in

epdiemiological studies of childhood asthma, questionnaires are the most widely used method for classifying subjects as affected [4].

Asthma in Egypt is a common health problem which caused considerable morbidity and appreciable mortality and impose much demand on the time and costs of medical and hospital care. In Cairo 2.2% of diseased children attending the pediatric outpatient clinic (Cairo University Hospital) were found to be complaining from bronchial asthma [5]. In Giza, Egypt, the prevalence of asthma was 4.6% among school boys 10-19 years old [6].

The purpose of the present survey was to assess the prevalence of asthma among children 3-15 years old in Cairo, and to identify the importance of certain risk factors associated with childhood asthma.

Subjects and Methods

The present study was conducted in Cairo, the capital of Egypt, Cairo's population is about 12 million. In winter the minimum temperature may be 6°C and rain occurs, though infrequently. In summer the average temperature is 32-36°C with a maximum of 40°C on few days. Humidity may be sometimes high.

Questionnaires in Arabic language were developed specificially for the purpose of this survey. The questionnaires were distributed to children 3-15 years old attending nursery, elementary and junior high schools in Cairo. A questionnaire was given to each student attending the chosen school and return was mandatory.

In this survey, asthma was defined as a history of recurrent wheezing or symptoms of paroxysmal attacks of cough, dyspnea and a wheeze relieved spontaneously or with treatment.

Results and Their Analysis

Results of this study were summarized in figures 1-3 and in tables 1-4.

Data was entered on an IPMPC computer. The statistical analysis system (SAS) jackage was used for statistical analysis and Harvard graphics for drawing figures. Qi-square tests were employed to determine statistical significance between categories. P-values less than 0.05 were considered significant.

On the 20.000 school children in Cairo receiving questionnaires, 13028 responded back: a response rate of 65.14%.

Analysis of school children in Cairo according to the questionnaires showed the overall prevalence of asthma to be 8.2% (Fig. 1). Males had a higher prevalence of asthma (1.2:1) than females.

The age of onset of symptoms in the asthmatic children is shown in Fig. (2). Symptoms developed in 22.1% before the age of 1 year, in 44% before the age of 2 years, in 57.9% before the age of 5 years and in 42.1% after the age of 5 years.

Table (1) shows the prevalence of asthma among school children in relation to level of fathers' and mothers' education. Asthma was significantly more prevalent in children of illiterate fathers compared to those of college graduate fathers (10.2% vs 6.3%). This was statistically signfi-cant ($p < 0.0001$). Asthma was also more prevalent in children of illiterate mothers comapred to those of graduate mothers (9.2% vs 5.8%). This was statistically significant ($p < 0.0001$).

Table (2). shows asthma prevalence in relation to family income. Prevalence was substantially higher in these families with monthly incomes of ≤ 50 L. E. compared to those with monthly incomes over 300 L. E. (10.2% vs 6.4%). This was statisti-cally significant ($P < 0.001$). The fre-quency of asthma in relation to the num-ber of persons in the family was not found to be statistically significant (Table 3).

The relationship between the fequency of asthma and the number of rooms in the house is shown in Table (3). The preva-lence of asthma was significantly higher in homes with 1 or 2 rooms compared to those with 4 or more rooms (11.2% vs 5.8%) - this was statistically significant ($P < 0.001$).

The frequency of asthma was also sig-nificantly related to the number of persons sharing the same bedroom with the asth-matic child (Table 3). Asthma prevalence was 10.5% if or more persons shared the same room with the asthmatic child, com-pared to 6.3% if only one person shared the room with the child. This was statisti-cally significant ($P < 0.0001$). The Crowd-ing index (number of person/number of room in significant house) bore a strong direct relation to the a frequency of asthma. The higher the crowding index the more prevalent was the asthma (fig. 3 & Table 3). This was found to be statistically sig-nificant ($P < 0.0001$). If the crowding in-dex was < 1.5 asthma prevalence was 5.9%, after which asthma prevalence increased gradually up to 10.5% with a crowding in-dex of 5.5 or more

In our study a positive family history of asthma or other allergic illnesses in the family increased the likelyhood that the child will have asthma. In families with negative family history of asthma the prev-alence of asthma in children was 7.0%, whereas in families with a positive history of asthma the prevalence of asthma in chil-dren was 25.1%. If family history was negative for other allergic illnesses, the prevalence of asthma was 6.8%, whereas prevalence increased significantly to 20.1% if the family history was positive. Similar-ily, if the students had a negative history of other allergies the prevalence of asthma in the group was 7.1% increasing up to 16.7% if the student's history was positive. All the above correlation between asthma prevalence and either family or personal history of atopy were considered statisti-cally significant ($p < 0.001$) (Table 4). A

child's history of other allergic illnesses was found to increase the likelyhood of earlier onset of asthma. This relation was statistically significant ($P < 0.001$).

Table (1): Frequency of Asthma Among School Children in Relation to Parents Education in Cairo.

Education	Father		Mother	
	Total N	Asthmatic N (%)	Total N	Asthmatic N (%)
Illiterate	2896	296 (10.2)	4923	452 (9.2)
Read and write	3274	239 (7.3)	2608	211 (8.1)
Preparatory school	949	88 (9.3)	958	90 (9.4)
Secondary school	1582	132 (8.3)	1824	119 (6.5)
University	4328	274 (6.3)	2715	157 (5.8)
Total	13028	1029 (7.9)	13028	1029 (7.9)
p-value		< 0.0001	< 0.0001	

Table (2): Frequency of Asthma Among School Children in Relation to Family Income Month in Cairo.

Income	Total N	Asthmatic N (%)	*p*-value
≤ 50	1801	184 (10.2)	
≤ 100	3615	332 (9.2)	
≤ 150	1229	81 (6.6)	
≤ 200	939	66 (7.0)	
≤ 300	1048	77 (7.4)	
over 300	1083	69 (6.4)	< 0.0001
Total	9715	809 (8.3)	

Table (3): Frequency of Asthma Among School Children in Relation to Crowding in Cairo.

Crowding measures	Total N	Asthmatic N (%)	*p*-value
Number of persons in family			
1 - 2	3443	257 (7.5)	
3 - 4	6144	495 (8.1)	
> 5	3359	272 (8.1)	N.S.
Total	12946	1024 (7.9)	
Frequency missing = 82			
Number of rooms in hourse			
1			
2	1777	199 (11.2)	
3	3541	317 (8.9)	
4	3671	280 (7.6)	
5 +	2132	123 (5.8)	
	1800	102 (5.7)	< 0.0001
Total			
Frequency missing = 107	12921	1021 (7.9)	
Number of persons sleeping with student in same room			
1	4833	305 (6.3)	
2	3326	261 (7.9)	
3	2022	180 (8.9)	
4	1107	101 (9.1)	
5+	1740	182 (10.5)	< 0.0001
Total	13028	1029 (7.9)	
Crowding index			
< 1.5	4248	251 (5.9)	
1.5-2.4	3391	257 (7.6)	
2.5-3.4	2319	218 (9.4)	
3.5-4.4	1168	108 (9.3)	
4.5-5.4	967	72 (10.3)	
5.5+	1098	115 (10.5)	< 0.0001
Total	12921	1029 (7.9)	

Table (4): Frequency of Asthma Among School Children in Relation to History of Allergy in Cairo.

History of allergy	Total N	Asthmatic N (%)	*p*-value
Family history of asthma			
-ve	12366	863 (7.0)	
+ve	662	166 (25.1)	< 0.0001
Family history of other allergy			
-ve	11984	819 (6.8)	
+ve	1044	210 (20.1)	< 0.0001
Student history of other allergy			
-ve	12197	865 (7.1)	
+ve	831	164 (19.7)	< 0.0001

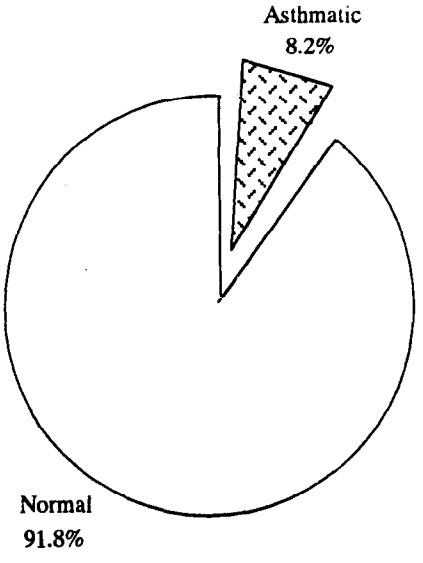

Fig. (1): Prevalence of asthma among school children in Cairo

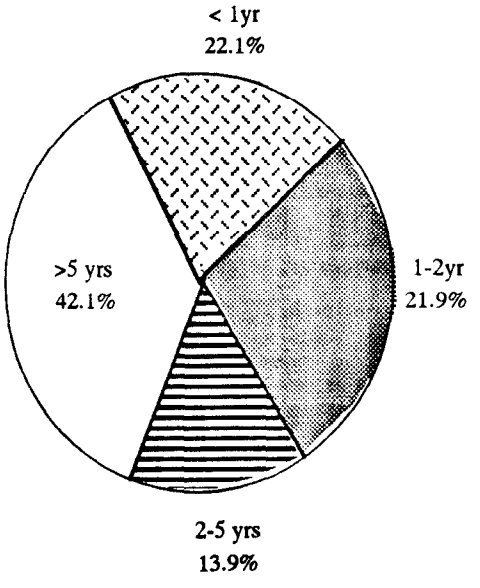

Fig. (2): Age of onest of asthma among school children in Cairo

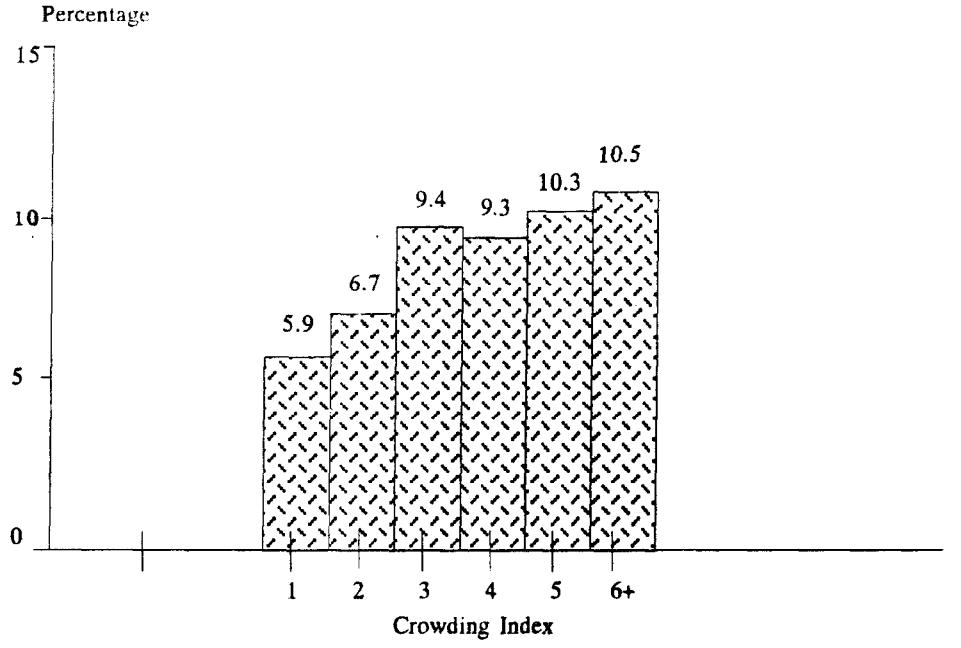

Fig. (3): Prevalence of asthma among school children in Cairo in relation to crowding index.

Discussion

Population surveys offer the most statistically approach to evaluation of asthma prevalence. Although survey questionaires that identify individuals with pulmonary disease have been validated by pulmonary function testing, yet, little agreement exists as to what are the best questions for defining asthma [7].

In the present survey the trend in prevalence of childhood asthma in Cairo, Egypt was determined from the data collected through questionnaires distributed to school children 3-15 years old. The overall prevalence of asthma was 8.2% among school children studied in Cairo.

In Penssylvania, USA, asthma prevealence was about 8.5% in children 5-14 years old [8]. A national survey among school children 3-17 years old in the USA reported a prevalence rate of 6.7% [7].

Prevalence of current asthma cannot be directly compared among studies, because of differences in the definition of asthma, the age, sex groups and geographic locations surveyed [7].

Worldwide, data from cross-sectional surveys indicate a wide range for prevalence of childhood asthma. In Scandinavia figures vary between 0.5% - 2.0% [9], in the U.K. between 1.8% - 24.7% [10], in the U.S.A. between 4.9% - 12.9% in

Australia between 4.6%%-23.1% [12,13] and in New Zealand up to 27.1% [14].

Compared with more developed countries, deveoping countries in general have a lower prevalence of asthma : 0.2% in Patna, India [15], 0.6% in Papua, New Guinea [16], 0.1% in Xhosa, South Africa [17]. Few asthmatic children were identified in Nigeria [18], Kenya [19] and Ethiopia [20].

Environmental factors are probably a major cause of variation in asthma prevalence among different populations [21]. The relative infrequency of asthma in tropical countries has been attributed to parasitic infestations supposedly through antigenic competition or saturation of IgE receptors on mast cells [22] or through inhibition of mast cell degranulation by parasite soluble products [23]. However, Egypt is a subtropical country in which parasitic infestations are prevalent, yet asthma is a common problem and its prevalence in the present study is comparable to that reported in other Western populations. In fact, a study of asthmatic Egyptian children suggests that hypersnesitivity to parasite antigens may potentiate a nonspecific LgE response to common environmental allergens which may influence the development of unrelated hypersensitivity to such allergens, at least, in genetically predisposed individuals [24]. Furthermore, the prevalence of asthma and immediate hypersensitivity reactions to common environmental antigens in patients who have IgE mediated anti-parasite skin responses suggests that their mast cells are not necessarily saturated by parasite specific IgE and are able to participate in allergic responses [24].

Epidemiological studies suggest that ambient air pollution increases the prevalence of and exacerbate asthma [4, 25, 26]. This relationship could, at least, partially explain the significant differences between asthma prevalence in school children in Cairo (8.2% in the present study) on one hand and in Benha (3.6%) and Tanta (3.01%) on the other hand [27.28]. Cairo, a big industrialized city has more pollution whereas Benhas and Tanta (60 Km and 90 Km north of Cairo) are closer to agricultural area with less pollution.

The well recognized higher prevalence of asthma in male children was noted in our study. The male to female ratio was 1.2 : 1 An incerased prevalence of asthma in male chidren had long been appreicated [1, 29]. During early childhood, asthma affects twice as many boys as girls with the ratio narrowing towards adolescence [30]. Although as yet not well understood the cause of this difference have been attributed to the finding that during early childhood boys have small airways at a given lung size than girls, in addition to the fact that boys have a higher incidence of respiratory tract infections [30].

In the present survey, asthma started very early in life. About 22.1% developed

symptoms before the age of 1 year, and 44% before the age of 2 years. In 42.1% asthma started after 5 years of age.

In a study of wheezy Egyptian infants and young children up to 3 years old, the age of onset of symptoms was before 6 months of age in 71.6% within the first year of life in 91.6% and within the second and third years of life in 8.3% [31].

More than 50% of children have their first symptoms of asthma before 2 years of age [38]. About 15% of children develop their asthma before the age of 1 year, and just over 40% before the age of 2 years.. By the age of 7 years, 80% of children will have symptoms and about 20% have their first obvious symptoms between 7 and 16 years of age [2, 33].

the effect of socioeconomic standard on the prevalence of asthma is as yet controversial. Although recent studies are in agreement with the observation of no relationship between socioeconomic status and asthma [34, 35, 36], nevertheless several other investigators have observed a higher prevalence of asthma in association with poor socioeconomic status [37, 38, 39].

Socioeconomic standard can be assessed in a number of ways, the commonest being education, occupation and income of the head of the family and the living conditions of the family.

In the present survey, the prevalence of asthma varied significantly with the degree of parental education. Asthma occurred in 10.2% and 9.2% of children of illitrate fathers and mothers, respectively. On the other hand, asthma was observed in only 6.3% and 5.8% of children of college graduate fathers and mothers respectively. In Benha, prevalence was 6.3% and 5.2% in children of illiterate fathers and mothers respectively compared to 2.3% in children of highly educated parents [27].

Family income had a significant influence on asthma prevalence in our survey in Cairo. Prevalence rate was 10.2% if family monthly income was ≤ 50 L. E., compared to 6.4% in families with monthly incomes of over 300 L. E. In Benha the prevalence was 5.1% if the monthly income was ≤ 50 L. E. and 3% if it was more than 300 L. E.

Family size had little effect on asthma prevalence in the present study. Prevalence was 7.5% if family size was either 1 or 2 persons and 8.1% if the number of the persons in the family was 4 or more. The fewer the number of rooms at home, however the higher was the prevalence of asthma. Prevalence rate was 11.2% for single-room homes compared to 5.8% if the number of rooms was 4 or more.

Crowding index as measured by the number of household members per room was a significant predictor of asthma in our study. Asthma prevalence was 6.3% if only one person shared the same room with the

asthmatic child. Prevalence rate increased up to 10.5% when 5 or more persons shared the same room. The prevalence rate or asthma was 5.9% if the crowding index was 1.5% and it was 10.5% if the corwding index was 5.5.

Several epidemiological surveys report a more frequent and a more severe asthma in families whose living conditions are poor or overcrowded. In damp and poorly heated dwellings exposure to indoor air pollution or to aeroallergens such as house dust mite, molds or cockroach is especially high [1, 39, 41, 48], while overcrowding enhances the transmission of viral respiratory infections such as the respiratory syncytial virus, rhinovirus, influenza and para influenza viruses [4, 39, 42]. It is possible that poor children may be exposed to and become sensitized to aeroallergens that are more likely to enhance bronchial responsiveness and asthma, e. g, house dust mites and molds [1]. Regarding respiratory tract infections as a risk factor for athma the evidence is strongest for bronchiolitis most often associated with respiratory syncytial virus [4]. Investigations of lung funciton abnormalities in children with documented histories of lower respiratory infection suggest that these illnesses may predispose to the later development of asthma [43].

Atopy plays a major role in childhood asthma [1]. Atopy in parents or children does predict increased risk of asthma and its presence or absence may be used as an empiric predictor [4]. Questionnaire evaluation of diseases associated with atopy such as infantile eczema and allergic rhinitis in the asthmatic child and assessment of parental history of illnesses associated with atopy as a marker of genetic predisposition may be used in the context of an epidemiological survey [4].

In the present study, asthma prevalence was 25.1% in those children with a positive family history of asthma whereas it was 7% in those with a negative family history. Similarly, the prevalence of asthma was 20.1% in children with a positive family history of other allergies and was 6.8% if the family history was negative. The prevalence of asthma had also a direct relationship with the child's personal history of other allergies; prevalence rate was 19.7% in children with a positive history of other allergic disorders and was 7.1% in those with a negative history. All the above relationships were considered statistically significant indicating a link between asthma and atopy.

The child history of other allergic disorders besides asthma was found to significantly increase the likelyhood of an earlier onset of asthmatic symptoms. Other factors investigated in our survey including parental education, monthly income or crowding did not play any significant role in determining the age of onset of childhood asthma.

In conclusion, our survey has described some risk factors associated with child-

hood asthma in Cairo. Caregivers may help to reduce or eliminate possibly reversible risks outlined earlier by parental education and improvement of the living conditions of young children.

Ackowledgement

This research project is carried out under Grant. No. 82014 by the Foreign Relation Coordination Unit of the Supreme Council of Universities.

The authors thank Prof. Leila Kamel for designing the questionnaire and Dr. Inas El-Attar for the statistical work.

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