Original article

Epidemiology of bronchial asthma among preparatory school children in Assiut district

Background: *The prevalence of asthma and allergies is increasing in both Western and developing countries. Few studies evaluated asthma prevalence in Egypt .* ***Objectives:*** *Determination of the prevalence and risk factors of asthma among preparatory school children in Assiut district, in Upper Egypt.* ***Methods:*** *A cross sectional study was conducted among preparatory school students in Assiut city and two rural areas in Assiut district in Upper Egypt. Twelve schools were selected randomly from different regions in Assiut city and two rural areas one to the North and the other to the South of Assiut city. The total coverage of the students included was 1048 (482 boys and 566 girls). Data were collected by self-administered questionnaire (in Arabic Language) which was filled by the participants .*
Results: *Of the 1048 positively responding subjects, 65 fitted the diagnosis of asthma with over all prevalence of 6.2%. No significant difference was found between urban and rural areas (P = 0.075). Using logistic regression analysis: a positive family history of allergy and the presence of other one or more allergic diseases were significantly associated risk factors for asthma. Exposure to dust, cigarette smoke, playing and physical activity, common cold attacks, and special food or drinks were the most common triggering factors for asthma exacerbations .* ***Conclusion:*** *Bronchial asthma is a significant health problem among children and adolescents in Assiut district and needs special medical care. Wider scale multi-center studies in upper Egypt and other localities of Egypt are needed to outline the profile of bronchial asthma among children and adolescents in the whole country.*

Keywords: prevalence of asthma, preparatory school children, Assiut district.

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INTRODUCTION

Asthma is a highly prevalent chronic respiratory disease affecting 300 million people world-wide[1]. Asthma is by far the most common of all chronic diseases of childhood and estimates from developed countries suggest that it affects between 11 and 20% of all school age children[2]. The prevalence of asthma and allergies is increasing in both western and developing countries. The prevalence of asthma among Egyptian children aged 3 - 15 years was estimated to be 8.2%[3]. Despite a large volume of clinical and epidemiological researches within affected populations, the etiology and risk factors of these conditions remains poorly understood[4].

The prevalence of atopic conditions is lower in rural and less-developed areas of the world than that in rapidly urbanizing or modernized. The reasons for these variations are yet to be fully understood. Some researchers have speculated that exposure to infections early in life may have a role in prevention of asthma and atopy in children[5]. History with interpretation of asthma symptoms is still considered the corner stone in asthma diagnosis. The other limb in diagnosis is through the reversibility and variability of pulmonary function tests (PFTs). However, PFTs require patients' cooperation that may be not fully feasible in children[6]. So far, there have been few studies of the epidemiology of asthma in Egypt .This study was planned to determine the prevalence and risk factors of bronchial asthma among preparatory school children in Assiut district.

METHODS

A cross sectional study was conducted in Assiut district among children in preparatory schools in Assiut city and two rural areas (Manquabad and Mosha, Assiut district) in Assiut governorate in Upper Egypt. Participants were selected from the second grade as a representative sample. Twelve schools were selected randomly as one boys' school and one girls' school (four rural and eight urban schools; the urban schools included two private and

six public schools).The randomly selected schools were from different regions in Assiut city to ensure the homogeneity of the total sample .The two rural areas were one to the North and the other to the South of Assiut city. Schools related to the inner city were classified as schools of low socioeconomic class, other schools in the city were classified as high socioeconomic class, schools in rural areas were classified as rural schools. Inner city was defined as the usually older, central part of a city, especially when characterized by crowded inhabitants[7].

In each school, total coverage of the students in the second grade was done to have a total of 1048 students (482 boys and 566 girls). Data were collected by self-administered questionnaire (in Arabic language) which was filled by the participants inside the classes and guided by the researchers and two well trained personnel. We have utilized Phase I International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire translated into validated Arabic language[8]. Translation of the original ISAAC questionnaire into Arabic was carried out by an independent professional translator with the help of a panel of asthma specialists. The questionnaire was then back translated by a second independent translator to English. We added questions dealing with risk factors of asthma as family history of allergy, presence of other types of allergy, housing condition including animal contact, and passive smoking.

The questionnaire included the following variables: (1) Sociodemographic characteristics including name, sex, age and residence of the school child, family size, number of rooms in the house, degree of parent's education, parent's occupation (working or not). (2) History related to asthma including whether the father or mother is a smoker, whether the child is suffering from asthma or not, whether the child is suffering from nasal allergy, dermal allergy, eye allergy or allergy to specific type of food, and the presence of allergic manifestations in any family member including; asthma, nasal allergy, dermal allergy, or conjunctival allergy.

If the child has physician-diagnosed asthma (documented clinical professional diagnosis, follow-up school clinic cards, health insurance cards) asthma subsequent questions were asked about: Symptoms that the child suffers from (cough, wheezing, dyspnea…….), frequency of symptoms during the day and night, if there is diurnal variation or not and if yes, when and what are the allergen or allergens that induce an attack of asthma (viral respiratory infection, house dust, smoking, exercise, laughing, crying, odours, foods, exposure to cold, exposure to cats, dogs, etc……), whether the child receives controlling medication or not and if yes; what are these drugs, their doses, and what are the drugs used during the attack and their doses. In addition to the questionnaire, all children were subjected to full clinical examination.

Statistical Analysis:
Data entry was done using the Excel program and statistical analysis was done with SPSS software (V. 16 SPSS Inc., Chicago, Il, USA). The categorical variables were summarized as percentages and the continuous ones as means and standard deviations. Chi square test was used to compare the qualitative data. P value < 0.05 was considered statistically significant. Logistic regression analysis was done to analyze the associated risk factors with asthma among studied asthmatic children. The variables entered in logistic regression analysis were: age, mother's and father's education, crowding index, school region, mother's work, father's smoking, family history of asthma, and presence of other allergies.

Ethical considerations: The study protocol was approved by the ethical committee, Faculty of Medicine, Assiut University, Egypt. The methodological process was approved by the authority in the ministry of education in Assiut governorate.

RESULTS

This study included 1048 students, 46% of them were males and 54% females with a mean age 14.1 + 0.7 years and range from 13 to 17 years. Students with urban residence were 83.6%. Students who had fathers with high education were 35.3%; 11.3 % had illiterate ones. As regards mother**'s** education, 20.4% had illiterate mothers and 30.7% had mothers with high education. Two thirds (65.5%) had non-working mothers. Nearly half of the students (51.8%) go to the inner city school (Table 1).

The prevalence of asthma among the studied students was 6.2% (Figure 1). Asthma was not significantly associated with age, gender or residence (rural or urban). There was no association of asthma with mother**'s** and father**'s** educational levels mother**'s** work, school level, crowding index and father**'s** smoking (Table 2).

Family history of asthma was significantly associated with asthma among the asthmatic

students ($p < 0.0001$). The presence of one or more allergic diseases (skin, nasal, eye and other allergies to food or drinks) was significantly associated with asthma ($p < 0.0001$) (Table 3).

Among asthmatic students males constituted 55.4% and females (44.6%). More than half of asthmatic students (52.3%) attended schools in low economic areas and 9.2 % of them attended schools in rural areas.

Using logistic regression analysis: a positive family history of allergy and the presence of other one or more allergic diseases were significantly associated risk factors for asthma. Presence of family history had high potential Odd's ratio (3.56) (Table 4). Most asthmatic students (63.1%) had asthma for 10 years and more. The prominent symptoms of asthma were dyspnea and cough (44.6% and 27.7% respectively). The common time of asthmatic attacks was at night in more than half of them (58.5%). They had commonly once a month attacks (43%), whereas once a week attacks were seen in 24.6%. Most of them (61.5%) complained of increase in the attack rate seasonally, of whom 65% confirmed that the attacks increased in winter. The triggering factors incriminated most for the attacks were dust (84.6%), cigarette smoke (81.5%), playing and physical activity (58.5%) and common cold attacks (56.9). Most of the asthmatic students (89.2%) took the treatment during the attack only (Table 5).

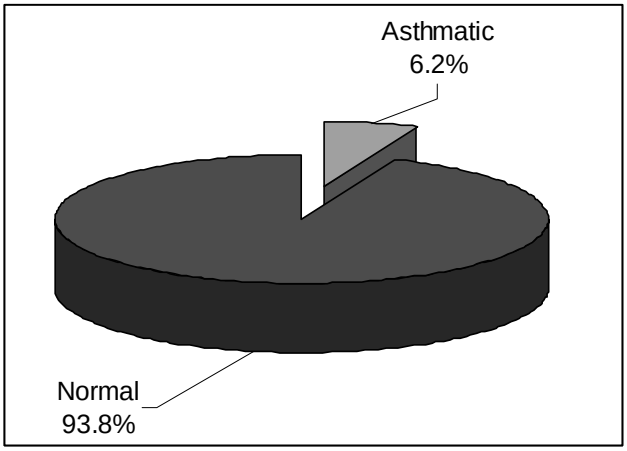

Figure 1. Prevalence of asthma among the studied preparatory school students in Assiut district (n=1048).

Table 1. Sociodemographic characteristics of the studied preparatory school students in Assiut district

Sociodemographic characteristics	Number. (n= 1048)	%
Age: (years)		
< 15	837	79.9
≥ 15	211	20.1
Mean ± SD (Range)	14.1 ± 0.7 (13 – 17)	
Gender:		
Male	482	46.0
Female	566	54.0
Residence:		
Rural	172	16.4
Urban	876	83.6
Father's education:		
Illiterate	118	11.3
Read & write/ basic education	317	30.2
Secondary	243	23.2
High education	370	35.3
Mother's education:		
Illiterate	214	20.4
Read & write/ basic education	276	26.3
Secondary	236	22.5
High education	322	30.7
Mother's work:		
Working	362	34.5
Not working	686	65.5
School region:		
Outer city	348	33.2
Inner city	543	51.8
Rural	157	15.0
Crowding index:		
One per room	367	35.0
Two per room	512	48.9
Three or more per room	169	16.1

Table 2. Sociodemographic characteristics and asthma among studied preparatory school students in Assiut district

	Normal (n= 983)		Asthmatic (n= 65)		Total (n=1048)		X^2 value	P value
	No.	%	No.	%	No.	%		
Age: (years)							0.085	0.771
< 15	786	93.9	51	6.1	837	100		
≥ 15	197	93.4	14	6.6	211	100		
Gender:							2.461	0.075
Male	464	92.5	36	7.5	482	100		
Female	537	94.9	29	5.1	566	100		
Residence:							0.333	0.729
Rural	163	94.8	9	5.2	172	100		
Urban	820	93.6	56	6.4	876	100		
Father's education:							2.279	0.517
Illiterate	112	94.9	6	5.1	118	100		
Read & write/ basic education	292	92.1	25	7.9	317	100		
Secondary	230	94.7	13	5.3	243	100		
High education	349	94.3	21	5.7	370	100		
Mother's education:							3.281	0.350
Illiterate	205	95.8	9	4.2	214	100		
Read & write/ basic education	257	93.1	19	6.9	276	100		
Secondary	217	91.9	19	8.1	236	100		
High education	304	94.4	18	5.6	322	100		
Mother's work:							0.153	0.696
Working	341	94.2	21	5.8	362	100		
Not working	642	93.6	44	6.4	686	100		
School region:							2.109	0.348
Outer city	323	92.8	25	7.2	348	100		
Inner city	509	93.7	34	6.3	543	100		
Rural	151	96.2	6	3.8	157	100		
Crowding index:							1.360	0.507
One per room	348	94.8	19	5.2	367	100		
Two per room	479	93.6	33	6.4	512	100		
Three or more per room	156	92.3	13	7.7	169	100		
Father smoking:							0.116	0.733
Yes	460	94.1	29	5.1	489	100		
No	523	93.6	36	6.4	559	100		

Table 3. Family history of asthma and presence of other allergic diseases of the studied preparatory school students in Assiut district

	Normal (n= 983)		**Asthmatic (n= 65)**		**Total (n=1048)**		**X^2 value**	**P value**
	No.	**%**	**No.**	**%**	**No.**	**%**		
Family history							36.339	0.000*
Yes	229	85.8	38	14.2	267	100		
No	754	96.3	27	3.7	781	100		
Other allergies							29.851	0.000*
One type only	205	87.2	30	12.8	235	100		
More than one	18	81.8	4	18.2	22	100		
No other allergies	759	96.1	31	3.9	791	100		

p-value is significant if ≤0.05*

Table 4. Logistic regression of significant risk factors of asthma among the studied asthmatic preparatory school students

	B	**Significance**	**Exp(B) (Potential Odd's)**
Family history	1.269	0.000	3.556
Presence of other allergies:			
One type only	-1.034	0.000	0.356
Presence of more than one	-1.253	0.042	0.286

significance is considered if ≤0.05

Table 5. Clinical history of asthma among the studied asthmatic preparatory school children in Assiut district

Clinical history	Asthmatic students (n= 65)	
	No.	**%**
Duration of asthma		
< 5 years	19	29.2
5-	5	7.7
10 years and more	41	63.1
Mean ± SD (range)	9.02 ± 5.04 (15.0-0.3 years)	
Asthmatic symptoms		
1- Dyspnea	29	44.6
2- Cough	18	27.7
3- Wheezes	2	3.1
4- Associated two symptoms	11	16.9
5- Associated more than two symptoms	5	7.7
Common time of asthmatic attack		
1- At night	38	58.5
2- Diurnal	16	24.6
3- Both	11	16.9
Asthmatic attack frequency		
1- Once per day	10	15.4
2- Once per week	16	24.6
3- Once per month	28	43
4- Seasonal	11	16.9
Seasonal variation		
Yes	40	61.5
No	25	38.5
Season of attack increase (n=40)		
1- Winter	26	65
2-Summer	14	35
Triggering factors		
1-Dust	37	84.6
2-Cigarette smoke	55	81.5
3-Playing and physical effort	53	58.5
4- Common cold	29	56.9
5- Special food or drink: eggs, fish, peanuts, chocolate and cola	38	49.2
6- Irritating odors	14	44.6
7- Crying	21	32.3
8- Contact with animal	16	24.6
9- Laughing	32	21.5
Course of therapy		
1- Regular treatment	7	10.8
2- During the attack only	58	89.2

DISCUSSION

Worldwide, the prevalence of asthma among children has increased steadily during the last two decades. Considerable evidence indicates that there is a significant regional variation in the prevalence of asthma and in the relative weight of risk factors[9]. Few studies evaluated asthma prevalence in Egypt. In a survey including 115 health centers in five governorates, Khallaf et al.[10] reported that asthma prevalence was 4.8% in Egypt. El-Hefny[3] found that asthma prevalence was 8.2%, using a questionnaire among 13028 children 3-15 years old. Georgy et al.[11] used translated and adapted version of the ISAAC questionnaire which was distributed to a sample of 2645, 11-15 years old school children in Cairo. They revealed that wheeze during the last year was 14.7% and physician diagnosed asthma was 9.4%.

In the present study, the prevalence of questionnaire-diagnosed asthma was 6.2% in Assiut district. This rate is less than what has been previously estimated in Cairo in 2006[11]. This may be due to the different geographical, social and environmental factors between these two localities. Cairo is mainly an urban district surrounded by multiple industrialized areas where air pollution by sulphur dioxide, nitrogen dioxide, carbon monoxide, ozone and particulate matter is one of the highest levels worldwide due to industrialization and heavy traffic, while Assiut is a semiurban area surrounded by rural societies, and has less industrial areas[12].

In the Middle east, asthma prevalence (ranges 5-23%) has previously been reported to be lower than in developed countries[11,13-17] and so these results agree with our results.

In the present study although most asthmatic children were males (55.4%), the prevalence of asthma among studied children was not significantly associated with gender. Barbee and Murphy[18] reported that asthma was more common and more severe in boys than girls while Landau et al.[19] found that gender difference regarding asthma prevalence were less evident after the age of 6 years. In our study whereas, 63.1% of asthmatic children had asthma for 10 years or more, the prevalence of asthma among studied children was not significantly associated with age variable. Mannino et al.[20] reported that approximately 25% of children with persistent asthma have begun wheezing before 6 months of age and 75% by the age of 3 years. Also, Hsu et al.[21] found that 30% of their patients had their onset of symptoms before the age of 14 years.

In this study there was no significant difference between the prevalence of childhood asthma in urban and rural areas that may be explained by the similarity in environmental conditions in both areas due to their close proximity to each other and relatively low levels of air pollutions in Assiut as it is a semiurban area surrounded by rural societies with few numbers of factories and industries. Downs et al.[22] also did not find a protective effect of farming among children living in a primary crop farming region. In contrast, a cross sectional survey of children in Austria, Germany, and Switzerland, revealed a decrease in prevalence of asthma, hay fever, and atopic sensitization among children living in farms[23].

In our study no significant association was found between asthma and parental educational level, mother**'s** work, school level, crowding index and father**'s** smoking. Zedan et al.[24] reported no significant association between asthma and passive smoking whereas, they reported that bad housing was significantly associated with asthma.

A positive family history of asthma was significantly associated with asthma in the studied children. Our results are in agreement with those of previous studies[24, 25]. This can be explained by the fact that asthma is a syndrome influenced by genetic and environmental factors; the hereditary component has been demonstrated by familial studies[26].

This study revealed that the presence of one type or more of other allergic disease (skin, nasal, eye and allergies to food or drinks) was significantly associated with asthma. Atopy, particularly atopic dermatitis is a significant risk factor for development and persistence of asthma in children[27, 28]. In another study in Egypt, Hossny et al.[29] found that 53.3% of studied asthmatic children had associated allergic disease (atopic dermatitis, allergic rhinitis or food allergy).

The prominent symptoms of asthma among the studied children were dyspnea and cough (44.6% and 27.7% respectively), similar to previous studies[29,30]. Besides, 58.5% of the asthmatic children had their asthma attack at night (nocturnal asthma). The mechanisms accounting for the worsening of asthma at night are not fully understood but may be driven by circadian rhythm of circulating hormones such as epinephrine, cortisol and melatonin and neural mechanisms such as cholinergic tone. An increase in airway inflammation at night has been reported. This might reflect a reduction in endogenous anti-inflammatory mechanisms[31].

The most common triggering factors for asthma attacks among studied students were: exposure to house dust (84.6%), exposure to cigarette smoke (81.5%), playing and physical activity (58.5%). Ernst et al.[32] and Surdu et al.[33] stated that exposure to allergens , particularly house dust mites is a risk factor of asthma development and exacerbation. Hence, measures to reduce exposure to house dust mites such as using mattress and pillow covers with mites impermeable characteristics are recommended. Also, bedding should be washed regularly at temperature greater than 60°C, rooms should be well ventilated and carpets should be removed from the living areas and especially the bedrooms[34]. It has been reported that tobacco smoke is the most important indoor irritant and a major precipitant of asthma symptoms in children and adults[29,33]. These data and ours emphasize the need for systemic, persistent efforts to stop the exposure of children with asthma to environmental tobacco smoke.

Exercise induced asthma occurred in 58.5% of the studied children in this study and has been reported in 70 % to 90 % of patients with persistent asthma and in about 10 % of the general population[35].

Upper respiratory tract infections were the precipitating factor in more than half of the studied children. Respiratory viral infections precipitated acute exacerbations of asthma and were the most common reason for hospital admissions in other studies[29,36]. How viruses provoke asthma is not clear, a study using a human B-cell culture system found that rhino virus-induced double-stranded RNA activates an antiviral protein kinase that can induce Ig class switching to IgE, suggesting a mechanism for viral provocation of allergy and asthma[37]. Jacoby[38] suggested that the mechanism of virus-induced airway responsiveness is likely to be multifactorial including, impairment in the inactivation of tachykinins, virus effects on nitric oxide production, and virus-induced changes in neural control of the airway.

Food allergy was noticed in 49.2% of the studied children. Tsai and Tsai[39] concluded that consumption of sweetened beverages and eggs were associated with increased risk of respiratory symptoms and asthma.

In conclusion, bronchial asthma is a significant health problem among children and adolescents in Assiut district in upper Egypt occurring in 6.2% of preparatory school children. A positive family history of allergy and the presence of one or more type of other allergic disease were significantly associated risk factors for asthma development whereas, exposure to dust, cigarette smoke, playing and physical activity, and common cold attacks were the most common triggering factors for asthma exacerbations followed by other factors as special food or drinks (eggs, fish, peanuts, chocolate and cola). Wider scale multi-center studies in upper Egypt and other localities of Egypt are needed to outline the profile of bronchial asthma among children and adolescents in the whole country.

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