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## Original article

# Epidemiological Pattern and Management of Pediatric Asthma Review of Ain Shams Pediatric Hospital Chest Clinic Data Cairo, Egypt 1995-2004

**Background:** Pediatric asthma is the leading cause of chronic illness in childhood and has an impact on child's quality of life.

**Objective:** To describe the epidemiological and clinical data of asthmatic children followed up in the Pediatric Chest Clinic Ain Shams University during a 10 year period.

**Methods:** Files of asthmatic children attending the Clinic in the period from 1995 to 2004 were selected. Relevant data were extracted and analyzed.

**Results:** Out of 1006 recorded cases, a total of 691 (68.7%) were asthmatic. The proportion of asthmatics among all chest patients attending the clinic was lowest in 2002 being 51.6% and highest in 1995, being 78.3%. Male to female ratio was 1.6:1, mean age was 5.27 yrs (SD  $\pm$ 3.65), mean age of onset of disease was 1.84 yrs (SD  $\pm$  2.78). Persistent asthma was significantly more prevalent in males  $p < 0.01$ . Severe asthma; using the American Thoracic Society Classification, was found in 151 (41.1%) of cases. From 2002, using GINA Guidelines Classification, severe persistent asthma accounted for 13.5%. Episodic attacks were reported by 270 (39%) of patients, nocturnal attacks by 302 of patients (43.7%) and exercise induced asthma in 97 (14%) of patients. Exacerbations occurred in 300 (43.4%) patients after respiratory infections, in 275 (39.8%) on exposure to smoke, in 139 (20%) with special food, in 91 (13.2%) following allergen exposure and 51 (7.4%) on exposure to inhaler sprays. Half of the patients were treated by combination of drugs (49.2%), corticosteroid inhalers in 32.1%, and  $\beta$  agonists (short acting) in 31.4%.

**Conclusion & recommendations:** Asthma constitutes a main problem in the Pediatric Chest Clinic. Respiratory infection and environmental factors are major exacerbating factors. Better documentation of patient's data and complete record in the files is needed.

**Key words:** pediatric asthma, epidemiology, pattern, chest clinic, hospital files.

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## INTRODUCTION

Bronchial asthma is a major worldwide health problem, which has received increased attention in recent years due to its rising trend and impact on the child's quality of life<sup>1,2</sup>. Moreover, it is the leading cause of chronic illness in childhood and the most common cause of childhood emergency department visits, hospitalization and missed school days<sup>3</sup>. The reasons for the rising trend may be related to a combination of poor access to health care and environmental factors such as smoke and perennial allergen exposure<sup>4</sup>.

In Egypt, 23.2% of wheezy infants were found to be real asthmatics<sup>5</sup>. According to GINA classification 2003, asthma ranges from mild intermittent asthma, to severe persistent asthma<sup>6</sup>.

Various asthma triggers have been identified such as common viral infections of respiratory tract, aeroallergens in sensitized asthmatics, air pollutants as particulate matter, cold and dry air, environmental tobacco smoke, strong fumes or noxious odors, exercise and others<sup>6</sup>. The rise of pediatric asthma prevalence necessitates continuous evaluation of the epidemiological factors and the medical services provided for these children.

The present study aimed to outline the pattern of pediatric asthma through reviewing the epidemiological and clinical data of asthmatic children visiting the Pediatric Chest Clinic during the period from 1995 to 2004.

**METHODS**

**Study Design:** A retrospective study was carried out retrieving and analyzing data from files of patients attending the outpatient chest clinic of pediatric hospital Ain Shams University during the past 10 years from 1995 till 2004.

**Subjects:**

All bronchial asthma patients diagnosed at the outpatient Pediatric Chest Clinic and have documented files during the study period from 1995-2004 were included.

**Methods:**

Patients' files kept in the hospital archive were sorted by the year of the patient's first clinic visit. Files of bronchial asthma patients were chosen from the 10 selected years of the study. Relevant data were extracted from the registered files.

The following data were recorded: personal data, diagnosis, main symptoms, associated conditions, family history, risk factors, investigations namely pulmonary function tests (PFT), chest X ray, Tuberculin test and treatment prescribed.

Grading of Asthma: Patients registered from 1995 till 2001 were graded based on the American Thoracic Society Classification, 1993<sup>7</sup>. Starting 2002, an updated filing system for grading asthma was followed based on the GINA guidelines 1997<sup>8</sup>.

**Ethical consideration:**

An approval from the ethics committee was taken to retrieve data from patients' files.

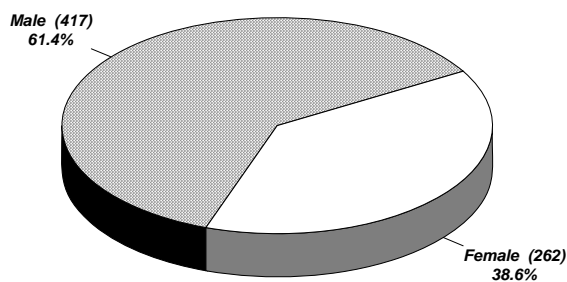
**Statistical analysis:**

Analysis using SPSS program software version 11 (Statistical Package for Social Sciences) using descriptive statistics, and qualitative test ( $\chi^2$ )

**RESULTS**

A total of 691 patients were diagnosed as bronchial asthma during the period 1995-2004 who attended the Pediatric Chest Clinic at Ain Shams University. These cases represent 68.7% of the total chest cases (n=1006) registered during that period.

The percentages of bronchial asthma cases to the total chest cases are seen in table (1)



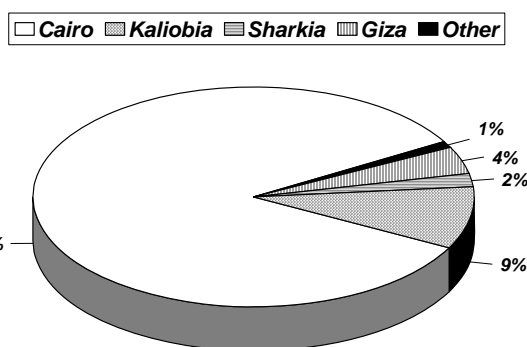
**Figure 1.** Gender distribution of bronchial asthma. Missing data on gender in 12 cases.

**Table 1.** Percentage of bronchial asthma patients among all registered chest patients.

Year	All registered patients		Bronchial asthma %
	n	n	
1995	148	116	78.3%
1996	134	95	70.8%
1997	110	80	72.7%
1998	85	65	76.4%
1999	76	52	68.4%
2000	90	65	72.2%
2001	79	50	63.3%
2002	124	64	51.6%
2003	76	48	63.2%
2004	84	56	66.7%
<b>Total</b>	<b>1006</b>	<b>691</b>	<b>68.7%</b>

The proportion of bronchial asthma cases from all chest cases attending the pediatric outpatient clinic along the studied years ranged from a lowest of 51.6% in 2002 to a highest of 78.3% in 1995.

Other chest diseases diagnosed were tuberculosis, bronchiectasis, cystic fibrosis, bronchopulmonary dysplasia and Loeffler syndrome (*non tabulated data*).



**Figure 2.** Distribution of bronchial asthma according to residence.

Missing data on residence in 69 cases.

Missing data on gender in 12 cases  
Missing data on residence in 69 cases

Cases of bronchial asthma showed greater proportions of male asthmatics than females as shown in fig.(1). In fig.(2), 84% of cases were coming from Cairo governorate mainly from Shobra, El-Marg, Hadayek el Koba, and Ain Shams districts. Few cases came from other governorates.

The age of pediatric asthma patients at presentation to the clinic ranged from 1 month up to 16 years with a mean age of 5.27 years (SD ± 3.65), while the age of onset of disease ranged from birth to 12.5 years, with a mean of 1.84 years (SD ± 2.78), the age categories of onset of disease are shown in table (2).

**Table 2.** Distribution of age of onset of disease among patients.

Age of onset (in years)	N	(%)
< 1 year	322	(51)
1 – < 4 years	197	(31.2)
4 - < 12 years	97	(15.4)
≥ 12 years	15	(2.4)
<b>Total</b>	<b>631*</b>	

\* There were 60 missing data

Age of onset of asthma was before 4 years of age in 82.2% of cases, and nearly half cases of pediatric asthma (51%) had the onset of disease before their first year.

**Table 3.** Severity of disease among asthmatic children.

Disease classification in files from 1995- 2001 (based on old filing system) <sup>1</sup>	Frequency	
	N	(%)
Mild disease	124	(33.6)
Moderate disease	93	(25.3)
Severe disease	151	(41.1)
<b>Total number*</b>	<b>368</b>	
Disease classification in files from 2002- 2004 (based on recent filing system) <sup>2</sup>	Frequency	
	N	(%)
Mild intermittent	65	(39.8)
Mild persistent	53	(32.5)
Moderate persistent	23	(14.1)
Severe persistent	22	(13.5)
<b>Total number*</b>	<b>163</b>	

\*There were 160 unclassified (missing data), 155 cases from old files, 5 cases from new files

<sup>1</sup>Classification of American Thoracic Society, 1993<sup>7</sup>

<sup>2</sup>Classification of GINA Guidelines, 1997, 2003<sup>8</sup>

Table (3) shows that nearly 1/3 of patients (33.6%) suffer severe asthma according to American Thoracic Society, 1993 disease classification, after using a recent filing system (GINA classification 1997) severe persistent asthma was diagnosed in 22 patients(13.5%) and the majority of cases were suffering from mild asthma.

**Table 4.** Pattern of disease symptoms among pediatric asthma patients.

Pattern of disease*	Frequency	
	N	(%)
Seasonal Exacerbation	132	(19.1)
Episodic (acute attacks)	270	(39)
Perennial	116	(16.8)
Exercise induced asthma	97	(14)
Nocturnal asthma	302	(43.7%)
<b>Total number</b>	<b>691</b>	

\* more than 1 pattern of symptoms occurred in some cases

Thirty nine percent of asthmatic patients suffered episodic attacks in asthma and almost half (43.7%) had nocturnal attacks. Seasonal exacerbation of asthma was more common in winter.

**Table 5.** Persistent and intermittent asthma in relation to gender.

Course of disease	Males		Females		Test of significance	
	N*	(%)	N*	(%)	χ <sup>2</sup>	P value
Persistent asthma	91	(21.9)	29	(11.4)		
Intermittent asthma	324	(78.07)	225	(88.6)	11.8	<0.001

\* some missing data

A significantly higher percentage of boys experienced persistent asthma than girls (p<0.001). Persistent asthma is an index of the severity of asthma.

The main presenting symptom of asthma was cough, observed in 95.2% of patients, wheezes in 89%, and dyspnea in 83.1% of patients. Other allergic conditions associated with asthma were observed in 189 (27.4%) of patients such as atopic dermatitis, allergic rhinitis and allergic conjunctivitis (non tabulated results).

Regarding the investigations performed for patients in the chest clinic, chest X ray was done for 341 (49.3%) of patients. Increased bronchovascular markings were revealed in 47.5% of them. Basic pulmonary function tests were done if possible for the child such as forced vital capacity manouver FVC, FEV1, SVC, ERV, and IC. Tuberculin test was done for 74 (10.7%) patient in whom 5 cases (6.8%) proved positive (non tabulated).

Asthma exacerbating factors as shown in fig(3) revealed that respiratory tract infection was the commonest triggering factor reported by 300 (43.4%) of patients, followed by environmental factors among 275 (39.8%), special type of food in 139 (20%), allergens in 91 (13.2%) and irritant chemical exposure as sprays in 51 (7.4%) of patients.

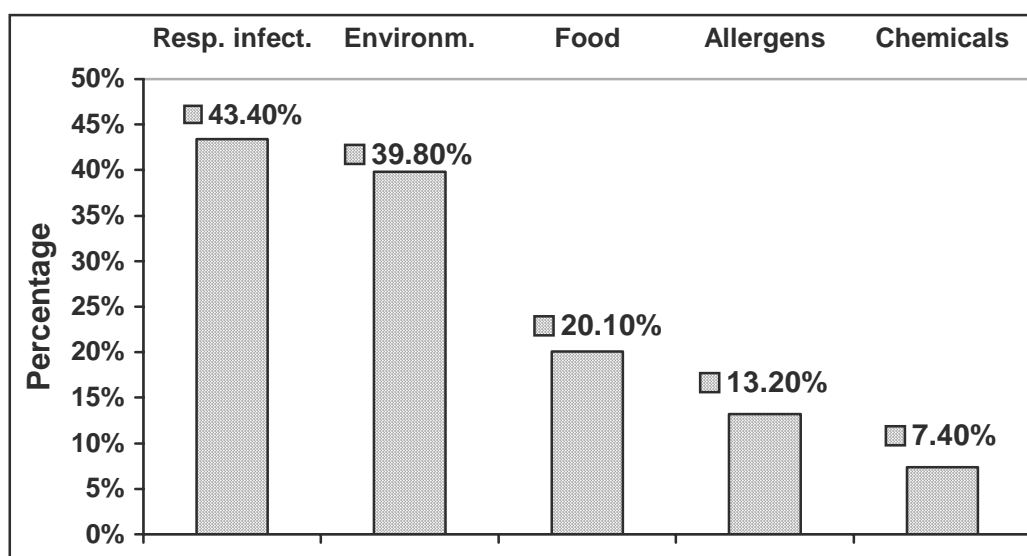
**Table 6.** Different treatment modalities in asthmatic children.

Treatment Category	Number	%
β agonists (short acting)	217	31.4%
Aminophylline	180	26%
Sodium cromoglycate	28	4.1%
Corticosteroid inhalers	222	32.1%
Oral corticosteroids	73	10.6%
Leukotriene modifiers	41	5.9%
Other drugs	41	5.9%
<b>Total</b>	<b>802*</b>	<b>116.1%</b>
Patients on combination of drugs	340	49.2%

\* some patients receive more than one drug

The majority of patients are managed by combination of rescue and controller drugs. Physicians prescribed more corticosteroid inhalers than oral corticosteroids.

Corticosteroid inhalers and β agonists were given in about 1/3 of patients.



**Figure 3.** Frequency of exacerbating factors of disease among patients.

Environmental factors: as dust, smoke, cold weather,  
 Food factors: as banana, chocolate, eggs, fish, mango and milk  
 Allergens: as animals, insects, fungi, moulds,  
 Chemicals: as perfumes , irritant household sprays and fumes,

## DISCUSSION

The epidemiological data of bronchial asthma patients who were managed in the Pediatric Chest Clinic of Ain Shams Hospital during a ten year period from 1995 to 2004 were analyzed. These data included age and gender distribution, frequency, triggering factors, course of the disease and the treatment modalities.

In the present study, approximately 2/3 of all chest cases admitted during this period were suffering from bronchial asthma which appears to be the commonest chronic chest disease in children. In a previous study at the same pediatric chest clinic during 1990 to 1999, asthma accounted for 70% of chest cases<sup>2</sup>. So, asthma remains as the major health problem among attendees of the Pediatric Chest Clinic. It is expected to see many cases of chronic chest problems especially asthma as it is a tertiary

referral center. Other studies also reported that asthma has increased in the last 30 years<sup>3,5,9,10</sup>. The variation observed in the proportion of asthmatic patients along the studied years is also revealed in most centers<sup>10,11</sup>. Reasons for such minor fluctuations are partially unexplained, however, the annual arousal of some environmental factors may be incriminated in such fluctuations.

Concerning disease classification, in the first seven years of the study the majority of cases suffered moderate or severe asthma based on the American Thoracic Society classification<sup>7</sup>, however, in the later years severe persistent asthma showed a decline. The proportion of severe cases may be an overestimate as this is a hospital based study to which moderate to severe cases are referred for better management and care. However, the relative decline in severe asthma cases observed

recently may be explained by the availability of different modalities of specific treatment in the chest clinic that were not present formerly.

The age of onset of asthma in the present study that was before the age of 4 years in most patients was in agreement with other studies as nearly 80 % of asthmatics suffer before the age of five or six years<sup>3,4,12,13</sup>. The male predominance as revealed by the present study was in accordance with other studies<sup>2,14,15,16,17</sup>. Reasons behind that maybe due to male-female difference in patterns of lung growth and maturity; susceptibility to infection among boys and sex differences in exposure to environmental risk factors<sup>18</sup>.

Exercise induced asthma (EIA) was reported to be 14% in the present study, this was lower than that reported in other studies<sup>19</sup>. A previous study showed lower prevalence among school children being 8.7%<sup>20</sup>, while it was higher being 25% in another study<sup>21</sup>. EIA may be under diagnosed or under reported in patients' files. EIA probably affects the lifestyle of children as it interferes with their play time and activities. Exercise induced asthma appears to be an indirect index of severity of airway inflammation<sup>19</sup>.

Some patients experienced seasonal variation in asthma. Seasonal variation is related to change in atmospheric temperature and quality of air as humidity, allergen and irritant content. This pattern is revealed in other studies as well<sup>6,22</sup>.

In the present study, upper respiratory tract infection represented one of the major triggering factors of asthma accounting for nearly half of cases. Studies previously reported that viral respiratory infection may reach up to 63% in children with an acute wheezing episode<sup>23,24</sup>. Preventive measures for respiratory infections in children may control such exacerbations. Food was identified as a triggering factor in asthma as reported elsewhere in asthmatic children<sup>25</sup>. The effect of indoor pollutants in increasing asthma prevalence morbidity cited in other studies<sup>1,26,27,28</sup> was detected in the present study. Indoor allergens were inducing asthma attacks among 13% of cases. Indoor allergens may be pets, insects, cockroaches and others. Allergen avoidance may include several measures as removal of pets, cockroach extermination, smoking cessation, and measures to control mold growth in the home<sup>29</sup>.

The management protocol of asthmatics followed in the pediatric clinic is satisfactory and updated according to recent guidelines<sup>6</sup>. The majority of pediatric cases received  $\beta$  agonists which are first line relievers for managing acute asthma. Oral corticosteroids, known for their side

effects, were used but with limited frequency compared to other drugs.

In conclusion, asthma is a major disease diagnosed in the pediatric population. Acute attacks are expected to occur as children are exposed to a variety of asthma triggers in their surrounding environment. Data registered in the chest clinic files were satisfactory in some aspects as the use of recent bronchial asthma classification<sup>6</sup> in the filing system of patients reflecting updating of data base. Appropriate standards of asthma care were followed by staff physicians. Besides, triggers of asthma were well documented. On the other hand, the present study revealed several missing data in patients' files on relevant variables as age, sex, age of onset of disease and classification, which should be improved.

Better recording of detailed patient's data in the pediatric chest clinic is recommended. Patients and parents' education on how to avoid the environmental exposure of allergens is highly recommended for better control of pediatric asthma.

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