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Original article

Analysis of the filed data of a sample of Egyptian children with bronchial asthma

Background: *Identification of the clinical profile of asthma in a community is crucial to the understanding of the growing disease burden. We sought to evaluate the clinical characteristics and management outcome of a sample of asthmatic children from Cairo city and its suburbs.*
Methods: *This retrospective study analyzed the data of 422 consecutively numbered files of asthmatic children from the Pediatric Allergy and Immunology Unit of Ain Shams University Children's Hospital. Data collected included the age at onset, duration of follow up, precipitating factors, feeding history, clinical severity, presence of other allergic diseases and outcome and course of the disease. This is besides the available results of laboratory and imaging studies and the treatment received including the routes and types of therapy.*
Results: *The results revealed that 197 children (46.7%) had bronchial asthma only while 225 (53.3%) had concomitant allergic disorders. Males outnumbered females and urban residents outnumbered suburban and rural residents and all cases belonged to the low and middle social and economic community sectors. A positive family history of allergy in general was evident in about 40% of cases. Viral infection was the most common precipitating factor for exacerbations. Mild and moderate persistent asthma were more frequent than the severe variety (15.10%, 10.20%, and 1.50%). Serum total IgE and peripheral blood eosinophil counts were elevated and atopy was evident in most cases. Inhaled corticosteroid therapy was the most commonly prescribed treatment in the current study but compliance was generally poor.*
Conclusion: *Wider scale multi-center studies in Cairo and other localities of Egypt are needed to outline the profile of childhood asthma in the whole country using a population rather than a referral center-based approach.*

Keywords: Pediatric asthma, risk factors, asthma grade, asthma triggers, smoking, residence.

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INTRODUCTION

Asthma is a highly prevalent chronic respiratory disease affecting 300 million people world-wide [1]. The burden of this disease to governments, health care systems, families, and patients is increasing worldwide.

The rate of asthma increases as communities adopt western lifestyles and become urbanized. With the projected increase in the proportion of the world's urban population from 45% to 59% in 2005, there will likely be a marked increase in the number of asthmatics worldwide over the next two decades. It is estimated that there may be an additional 100 million persons with asthma by 2025 [2].

Asthma is by far the commonest of all chronic diseases of childhood and estimates from developed countries suggest that it affects between 11 and 20% of all school age children[3]. The prevalence of asthma among Egyptian children aged 3 - 15 years was estimated to be 8.2%. Of major concern is the annual increase in mortality[4]. Asthma is a common cause of emergency room visits and hospital admissions. The burden of asthma is higher than generally recognized, particularly in children. For example, in Egypt up to one in four children with asthma is unable to attend school regularly because of poor asthma control[5].

It is estimated that asthma accounts for about one in every 250 deaths worldwide. Many of the deaths are preventable, being due to suboptimal long-term medical care and delay in obtaining help during acute exacerbation. Barriers to reducing the burden of asthma include generic barriers like

poverty, poor disease education, and poor health services infrastructure and environmental barriers like indoor and outdoor air pollution, tobacco smoking, and occupational exposure. Moreover symptom-based rather than disease-based approaches to the management of asthma and tendency of care to be "acute" rather than "regular" are significant barriers. Patient barriers include; lack of information, under-use of self management, over-reliance on acute care and cultural attitudes towards drugs and drug delivery systems like for example steroids and inhalers[2] .

The study aims at evaluation of the profile and management outcome of asthmatic children at the Pediatric Allergy and Immunology Unit of Ain Shams University, Children's Hospital. This is sought for through assessment of the demographic data of the patients, course and sequelae of illness, and efficacy of the various therapeutic strategies adopted. We were also trying to establish a proper database for the patients in the Pediatric Allergy and Immunology Clinic.

METHODS

This retrospective data analysis comprised revision of the files of 422 asthmatic children (286 males and 136 females), 197 children (46.7%) had bronchial asthma only and the other 225 children (53.3%) had bronchial asthma with other allergic diseases (atopic dermatitis, allergic rhinitis or food allergy). They presented to the Pediatric Allergy and Immunology Clinic, Children's Hospital, Ain Shams University in the period from February 1988 to October 2005.

The age at onset defined as the age of the first physical symptom or sign consistent with the diagnosis of bronchial asthma ranged from the neonatal period to 8.6 years with a mean of 0.97 ± 1.33 years, and the duration of follow up from 0.6 to 13 with a mean of 4.31 ± 2.93 years.

The status at last visit was categorized as:

- Uncontrolled disease on enrollment: persistent symptoms despite compliance on treatment.
- Controlled disease on enrollment: defined as complete absence of asthma symptoms in subjects not taking any asthma medication prior to the evaluation[6].

Study Methods:

Medical records were retrospectively examined and the following data were collected (whenever available) in a computer data base till analysis was undertaken:

I. Clinical and epidemiological data:

- Personal and demographic data, e.g. sex and residence.
- Age at onset, and duration of follow-up.
- Precipitating factors for acute exacerbation including: environmental factors, foods, viral infections, endocrinal factors, psychological factors, irritants such as cold air and parental smoking and noxious fumes and drugs such as aspirin and sulfonamide.
- Clinical findings during acute exacerbation including cough, dyspnea, cyanosis, low grade fever and profuse sweating.
- Symptoms of other atopic diseases in the child such as atopic dermatitis, allergic rhinitis and food allergy.
- History of absolute breast feeding or artificial feeding.
- Asthma grading at diagnosis.
- Outcome and course of the disease.

II. Available laboratory data:

a) Complete blood count on the first visit (Coulter Counter, Beckman Inc, Florida, USA).
b) ESR by Westergren method on the first visit.
c) Serum total IgE on the first visit by ELISA.

III. Available imaging data:

Plain X-ray of the chest on the first visit for infiltrations, hyperinflation or effusions.

IV. Treatment data:

Medication received: type, route of administration and compliance.

Statistical analysis:

First, simple frequency, mean, standard deviation and range were calculated. Thereafter, comparison between active and remission cases with bronchial asthma was done using the student's t-test for continuous variables and Pearson's Chi square test for categorical variables.

All statistical analyses were performed using the statistical package for social science (SPSS) version 11.0 (SPSS Inc. Head quarters. Chicago, Illinois USA), level of significance was set at $p \leq 0.05$.

RESULTS

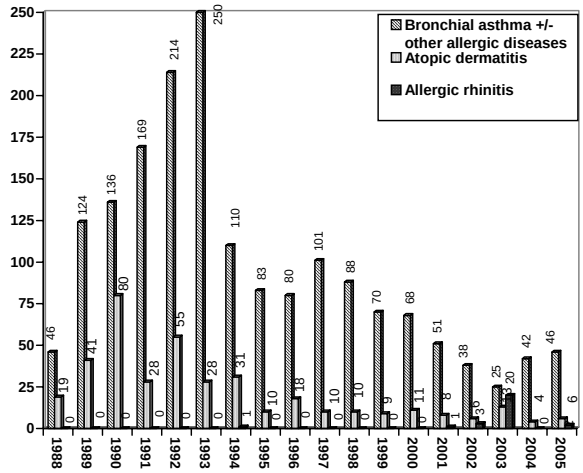


Figure 1. The number of newly diagnosed cases/year during the period from 1988 to 2005

More than half of the cases had an associated allergic disease as shown in (Fig. 2).

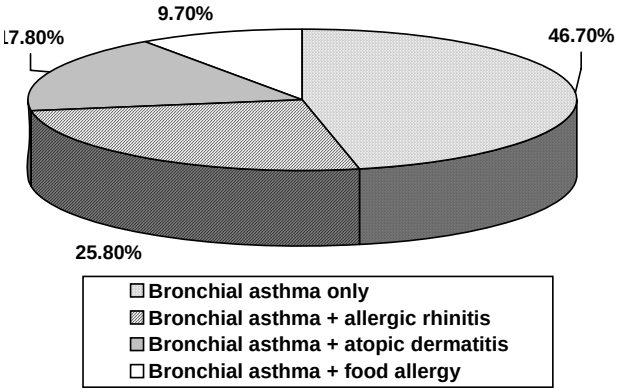
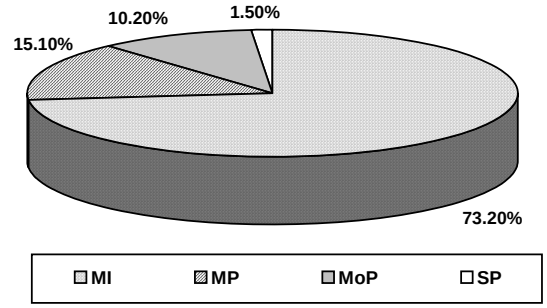


Figure 2. Form of allergic diseases among the studied children

Table 1. Factors precipitating exacerbations of bronchial asthma in this series.

Precipitating factors	Number of cases (N=422)
Viral infections	163 (38.6%)
Cold air	155 (36.7%)
Indoor allergens	148 (35.1%)
Fumes	142 (33.6%)
Foods	136 (32.2%)
Psychological	67 (15.9%)
Sulfonamides	34 (8.1%)
Aspirin	22 (5.2%)
Menstruation	2 (0.5%)

As regards asthma grading, data were available in 403 files, of which mild intermittent bronchial asthma was the most common presentation [295 cases, (73.2%)], followed by mild persistent, [61 cases, (15.1%)], moderate persistent [41 cases, (10.2%)], and only [6 cases, (1.5%)] had severe persistent asthma (Fig. 3).



MI: mild intermittent; MP: mild persistent; MoP: moderate persistent; SP: severe persistent.

Figure 3. Grading of bronchial asthma at diagnosis

Demographic data analysis revealed that bronchial asthma was more common in males (286 cases) than in females (136 cases) in a ratio of 2.1:1. The number of cases coming from urban areas were higher than those coming from suburban and rural areas [288 (68.2%) versus 116 (27.5%) and 11 (2.6%) respectively]. The mean age at onset was 0.97 ± 1.33 years and the mean duration of follow-up was 4.3 ± 2.93 years.

Family history of bronchial asthma was positive in 134 cases (31.8%) of our studied patients and 38 (9%) had family history of other atopic diseases in 1st, 2nd, or 3rd degree relatives.

Viral infections were the commonest precipitating factor of bronchial asthma exacerbation in our patients [163 cases (38.6%)]. This was followed by exposure to cold [155 cases (36.7%)]. Other precipitating factors are shown in Table 1.

Dyspnea, cough and cyanosis were the most frequent symptoms of bronchial asthma exacerbation in our patients (Table 2).

Regarding infant feeding, 182 infants (43.1%) were absolutely breast fed and 28 cases (6.6%) were artificially fed.

At the onset of the disease, the Hb concentration at onset varied from marked anemia to normal Hb (mean ± SD = 10.9 ± 1.54 gm/dl), platelet counts ranged from $160x10^3$ to $973x10^3$/cmm with a mean counts of 361.51 ± $152.23x10^3$/cmm, the total leucocytic count also varied considerably from $3.7x10^3$ to $19.7x10^3$/cmm, and the eosinophilic counts ranged from zero to

12% with a mean of 10.54 ± 15.65. The mean ESR at onset was 17.37 ± 12.68 mm/hr. Serum total IgE level was high for age in 133 cases (31.5%) and normal in 54 cases (12.79%) with no data available for the remaining patients.

Table 2. Frequency of clinical symptoms during acute exacerbations of bronchial asthma in our patients.

Symptoms	Bronchial asthma cases (N=422)	
	Frequency	Percent
Dyspnea	209	49.5%
Cough	207	49.1%
Cyanosis	207	49.1%
Low grade fever	62	14.7%
Vomiting	37	8.8%
Profuse sweating	13	3.1%

Inhaled corticosteroids (Budesonide or Fluticasone) were used by all patients of persistent asthma, long acting theophylline was used by 56 of them (51.9%), long acting B_2-agonist (salmeterol) by 5 cases (4.6%) and oral steroids by 5 (4.6%) (Table 3).

Table 3. Overview of medications used by patients with persistent bronchial asthma.

Drugs	Bronchial asthma cases (N=108)	
	Frequency	Percent
Budesonide	69	63.9%
Fluticasone	39	36.1%
Salmeterol	5	4.6%
Long acting theophylline	56	51.9%
Prednisolone	5	4.6%

Concerning the status of the patients followed up at the time of data analysis (144), 49 patients were showing manifestations of uncontrolled asthma and 95 cases had controlled disease. Gender difference, family history of atopy, age of onset, nature of precipitating factor, type of feeding, presence of other atopic disease, or any laboratory parameter had no influence on the course of the disease whether controlled or not.

The number of patients with uncontrolled disease was significantly higher in the moderate persistent grade compared to the mild intermittent, mild persistent and severe persistent asthma grades ($P<0.05$).

DISCUSSION

The development and phenotypic expression of allergic diseases depends on a complex interaction between genetic factors, environmental exposure to allergens, and non-specific adjuvant factors, such as tobacco smoke, air pollution and infections. Identification of these factors is the most crucial problem in the epidemiology of allergic diseases[7], and preventive measures should be targeted to reduce exposure to allergens and to adjuvant risk factors. The objective for this study was to identify the possible associations of importance in disease course and outcome in our unit.

In our study, we revised the files of 422 children who were diagnosed as having bronchial asthma; alone or in association with other allergic diseases. The number of newly diagnosed cases per year as shown in figure (1), bronchial asthma was the most common, followed by atopic dermatitis and then allergic rhinitis. Different findings were reported by Kalyoncu et al[8], who reported that the prevalence rates of asthma, wheezing, rhinitis and AD were 16.8%, 22.5%, 18.7%, 6.5% and 9.8%, 13.3%, 14.1%, 4.3% in 358 boys and 380 girls from Turkey respectively.

The risk of developing bronchial asthma was higher for boys than for girls, as shown from the current data. This result comes in accordance with the data of Redline and Gold [9] and by Kalyoncu and coworkers[8], who stated that male gender was a significant risk factor for asthma and wheezing. This observation may reflect a sex-linked influence or may be due to different environmental exposure patterns [7].

We observed that allergic diseases were more prevalent in urban residents followed by suburban residents with few cases coming from rural areas. These differences can be partially explained by differences in environment exposures, such as air pollution, and exposure to allergens, such as pollens, cockroaches, and house dust mites. Several studies from Europe, Canada, and Australia have suggested that agricultural exposures may protect children from developing asthma and atopy[10,11].

The mean age of onset among the studied group was one year. This highlights the role of viral infections as inducers of wheezing in infancy. In the study of Hsu et al[12] , 30% of their patients had their onset of symptoms before the age of 14 years.

Despite numerous studies on possible associations between environmental exposure and allergic disorders, any conclusions made remain a matter of controversy. Because almost all the studies were performed in Western countries, the application of these findings to people in other countries including Egypt may not be appropriate.

In our series, factors precipitating acute exacerbations of bronchial asthma were viral upper respiratory tract infection, cold air, environmental

factors (such as tobacco smoke), fumes, food allergy, puberty, psychological stress, drugs, and menstruation in this order of frequency. Our data are close to those reported by Noble et al.[13]and Zhao et al.[14] who reported that respiratory viral infections precipitated acute exacerbations of asthma and were the most common reason for hospital admissions. A study by El-Gamal et al.[15] revealed that 71% of asthmatic episodes in children were attributed to viral infections.

The association of diet with respiratory symptoms and asthma in school children was studied in Taiwan by Tsai and Tsai[16] who concluded that consumption of sweetened beverages and eggs were associated with increased risk of respiratory symptoms and asthma whereas consumption of soy products and fruits were associated with reduced risk of respiratory symptoms. In another study[17], peanut and milk allergies were both associated with increased number of hospitalizations and milk allergy was associated with increased use of systemic steroids. On the other hand, Beausoeil et al[18] concluded that asthma alone as a manifestation of food allergy was rare and avoidance of specific foods or additives had not been shown to improve asthma.

Grass pollen had an increasing effect on asthma hospital admissions as reported by Erbas and coworkers[19].

El-Gamal and associates[20] reported that cockroach sensitivity is quite prevalent in Cairo and it should be expected in moderate and severe bronchial asthma. The cockroach induced asthma in their study did not vary with the family history of allergy or the presence of other allergies in the individual. The latter observation suggests that cockroach allergy is mainly a respiratory one.

Chilmonczyk and co-workers[21] reported an association between exposure to environmental tobacco smoke and pulmonary morbidity in children with asthma. These data and ours emphasize the need for systemic, persistent efforts to stop the exposure of children with asthma to environmental tobacco smoke.

Allergic diseases usually cluster in the same family, and this was evident in our series, also atopic family history was the most prominent risk factor for all types of allergic disorders in children in the study of Kalyoncu et al[8].

In our study, dyspnea was the most frequent symptom of bronchial asthma exacerbation. This was in agreement with Roesner and Virchow[22], who found that acute attacks of shortness of breath, dry cough and symptoms of concomitant rhinoconjunctivitis were the main clinical symptoms of asthma.

Breast feeding in our limited series did not seem to confer protection against the development of bronchial asthma. Also Mihrshahi et al[23] stated that longer duration of breast feeding and later introduction of solid foods did not prevent the onset of asthma, eczema or atopy by age 5 years. On the other hand, the results of Kull and co-workers [24] suggested that breast feeding during four months or more exhibited a reduced risk of asthma and wheezing.

The Hb concentration varied from marked anemia to normal Hb. In a study by Shuttari[25], Hb concentration was mildly reduced during asthma exacerbation. Other study reported changes in platelet behaviour and function during or after allergen exposure in patients suffering from asthma, allergic rhinitis and atopic dermatitis[26].

Serum total IgE level was high in 31.5% of our patients and normal in 12.79%. Another study found total serum IgE levels significantly higher for the children with asthma between ages 6 and 8 years. Male gender was significantly associated with higher IgE levels when infants were 6 months of age in the same study [27].

Inhaled corticosteroids remain the mainstay of treatment in persistent asthma as shown in our results. Similarly, Lipworth and Jackson[28] stated that inhaled corticosteroids (ICSs) were first line drugs and most patients with mild to moderate asthma can be adequately controlled on low-to-medium dosage of ICSs alone. LABAs constitute an adjunctive therapy for patients not adequately controlled on low-medium dose ICSs[29]. The cost of LABAs and the concerns about side effects are the obstacles to its use on a wider scale in our community.

Before reaching conclusions based on the present study, it is wise to consider a number of potential objections to the methodology. A first question will be : to what extent would further follow-up alter the estimate of the association between a postulated risk factor and bronchial asthma? Another potential source of bias is the small sample size of the followed up cases.

In the current investigation, the only independent predictive risk factor for uncontrolled disease was the grade of bronchial asthma , and this is quite reasonable given the fact that persistent cases are less likely to remit. A longer follow up period would offer more reliable information. Perhaps the best study design to find out the natural course of asthma is a longitudinal prospective population-based cohort study.

In conclusion, these results pertain solely to our unit and should not be considered general; however, the methodology can be applied in relevant studies and in other centers.

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