

## Prevalence of childhood asthma and its immediate outcome - At tertiary care rural hospital

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### ABSTRACT

**Introduction:** Asthma is a chronic inflammatory disorder of the airways resulting in episodic airway obstruction. Globally, childhood asthma is increasing in the prevalence, despite improvements in investigation and treatment. Childhood asthma seemed more prevalent in urban population and now even in rural areas of India. **Objectives:** To know the prevalence, assess the risk factors, severity, and immediate outcome of the treatment offered to asthmatic children in a tertiary rural hospital. **Materials and Methods:** All the diagnosed asthmatic children up to 18 years were enrolled in the study. All the patients of pulmonary Koch's, congenital heart disease and chronic lung disease were excluded from the study. Clinical profile was noted in recruited patients. **Results:** The prevalence of childhood asthma among children visiting to our department was 3.93%. 58 (48.33%) had age of onset before the age of 6 years. Asthma was more prevalent in boys. 116 (96.66%) children presented with complain of cough, and 118 (98.33%) children had associated breathlessness. Common precipitating factors were change in season (71.66%), pollen allergy (58.33%), air pollution (45.00%), and passive smoking (23.33%). Exercise-induced asthma was seen in 55% cases, diurnal variation in 60% and 28.33% children had family history of atopic disease. Majority of the patient was undernourished. The average duration of stay in persistent asthma is 1.8 times more than in intermittent asthma. **Conclusion:** Significant number of patient becomes symptomatic before the 6 years of age. Prevention of child from exposure to passive smoking, environmental improvement, and allergen avoidance are major aspects for prevention of asthma exacerbations.

**Key words:** Asthma, Outcome, Pediatric, Prevalence, Trigger factors

Asthma is a chronic inflammatory disorder of the airways resulting in episodic airway obstruction, which may be completely or partially reversed with or without specific therapy. Childhood asthma and other allergic conditions are more prevalent in urban population [1]. Literature search for data sources found 15 studies from 300 articles which suggested that the prevalence of bronchial asthma in Indian children is higher than was understood [2]. Mortality in asthmatic children has reduced due to increased awareness about investigation and management of asthma in long-term with the use of various medications available for asthma but still, it is a major cause of long-term morbidity. The prevalence is increasing yearly due to several genetic and environmental factors [3]. Asthma is more common in males during pre-pubertal age whereas in females, it is more common in adulthood and it persists longer in females as compared to males [4].

Response to asthma treatment is variable in different children and so to acquire the goals of therapy, regular follow-up should be made and treatment should be adjusted accordingly. Studies have identified asthma among Indian children. Still, there is paucity of information on the overall prevalence of childhood asthma in India. Therefore, this study was done in our hospital

to know the prevalence, assess the risk factors, and severity and immediate outcome of the treatment offered to asthmatic children in a tertiary rural hospital.

### MATERIALS AND METHODS

This prospective observational study was carried out in the Department of Pediatrics of a rural medical college of Vadodara. All consecutive children below 18 years and above 1 year attending the outpatient/inpatients department with clinical symptoms and signs suggestive of asthma such as wheezing, cough, breathlessness, chest pain, or tightness were eligible for enrolment in the study. Patients' detailed history and examination were carried out and recorded in pre-structured pro forma.

All the enrolled patients were investigated for complete blood count, pulmonary function tests (for above 6 years), peak expiratory flow rate (PEFR), erythrocyte sedimentation rate, absolute eosinophil count (AEC), Montoux test, and chest X-ray using the standardized methodology to ensure the proper diagnosis. Emphasis was given regarding age of first episode, total number of episodes, and number of hospitalization till date of visit. Any diurnal variation, seasonal variation, precipitating

factors such as upper respiratory tract infections, exercise, house dust, food, emotional disturbances, air pollutants such as dust or smoke, passive smoking. Personal and family history of atopy such as allergic rhinitis, atopic dermatitis, was enquired in detail. Those with recurrent (2 or more episodes of pneumonia in 1 year or 3 or more episodes ever with radiographic clearing in between)/persistent pneumonia (radiographic evidence of pneumonia persisting 30 days or more despite minimum 10 days antibiotics), other appropriate diagnostic workup was done to find out the exact cause of the problem to rule out asthma mimickers such as foreign body in airways and congenital heart diseases.

Patients who were admitted in acute episodes, severity was assessed by pulmonary scoring system and treatment was started as per standard protocol guidelines and response to treatment was assessed. All the known patients of wheeze associated lower respiratory tract infections, pulmonary Koch's, congenital heart disease, and chronic lung disease were excluded from the study.

## RESULTS

Out of total outpatient department (OPD) visit, childhood asthma cases accounted for 3.93% (n=140) were eligible for enrolment in the study. Similarly, out of total pediatric admissions in a year (7.30%, n=120) were due to bronchial asthma. Mean age of enrolled children was  $8.62 \pm 1.4$  years with male preponderance (74, 61.66%). The majority of the children belonged low socioeconomic class (75%). 61.66% were residing in overcrowded environment and family history of atopy was seen in 28.33% cases. 25% patients born by lower segment cesarean section (LSCS). Out of 84 patients, 8.2% were stunted, 21.7% were wasted, and 48.3% were wasted as well as stunted. Majority of the patient whose growth was affected belonged to category of severe asthma. The most common presenting symptoms were breathlessness and cough (96.66%, n=116) whereas 3.33% presented only with cough. 84 (80%) children had wheeze.

All the enrolled patients were classified according to severity of the disease with most common being moderate asthma (43.33%) (Table 1). Common precipitating factors acting as trigger for asthma attack were change in season (71.66%), allergy to pollens (58.33%), and exercise (55.00%) as shown in Table 2. 80% (n=84) patients had abnormal AEC (Table 3).

All 12 patients of mild intermittent asthma, salbutamol was prescribed on requirement basis and they all (100%) got total control of symptoms at the time of discharge after mean hospital stay of  $1.2 \pm 0.7$  days. Out of 52 patients of moderate asthma, 42 patients (80.76%) got total control and 10 patients (19.23%) got partial control. Out of 6 patients of severe asthma, 4 (66.66%) got total control and 2 (33.33%) got partial control. Average duration of stay in mild intermittent asthma was 3 days as compared to 3.5 days in mild persistent asthma, 5 days in moderate and 6 days in severe persistent asthma and 5.5 days in cough variant asthma. Many of the patients of mild intermittent and mild persistent asthma were admitted due to social purpose as they belonged to remote rural area and insisted to stay for the response to the treatment.

**Table 1: Classification of asthma according to severity**

Classification of asthma at diagnosis	Number of patients (n=120) (%)
Mild intermittent asthma	12 (10.00)
Mild persistent asthma	46 (38.33)
Moderate persistent asthma	52 (43.3)
Severe persistent asthma	6 (05)
Cough variant asthma	4 (3.33)

**Table 2: Trigger factors associated with asthma exacerbation**

Trigger factors	Number of patients (n=120) (%)
Seasonal variation	86 (71.66)
Diurnal variation	72 (60.00)
Allergy to grass pollen	70 (58.33)
Exercise	66 (55.00)
Food allergy	60 (50.00)
Air pollutants	54 (45.00)
Passive smoking	28 (23.33)
Contact with pet	12 (10.00)
Emotional disturbances	2 (1.67)

## DISCUSSION

The prevalence of asthma among children visiting department was 3.93% while out of total admission, 7.30% were diagnosed as of bronchial asthma. The International Study of Asthma and Allergies in Childhood (ISAAC) study in 2009 showed that the distribution of childhood bronchial asthma varied from less than <2% to approximately 33% across the globe which is consistent with our study [5]. A meta-analysis in 2002 on 20,000 children under the age of 18 years showed a prevalence of 9, 10.5, 18.5, 24.5, and 29.5% in year 1979, 1984, 1989, 1994, and 1999, respectively [6]. As per the ISAAC criteria, the overall cumulative 12 months prevalence of wheezing was 12% in our study [5]. Out of the total 120 children, 60 (50%) children were diagnosed and labeled asthma during school age period, 40 (33.33%) children during pre-school years and 18 (15.00%) children in their toddler age, 2 (1.67%) during adolescent. Overall, 58 (48.33%) had age at onset before the age of 6 years; while 62 (51.66%) had age at onset after 6 years.

In Global Initiative for Asthma (GINA) Dissemination Committee report 2004, it was observed that most of asthma starts in early childhood. About 95% of asthma patients have their first episode before the age of 6 years [7]. Lam et al. in 2007 analyze data from 942 children. The median age of onset of asthma was 3 years of age, with the peak between 1 and 3 years of age. The majority of children had their first symptoms before 6 years of age [8]. In our study, findings were not matching with Lam et al. and GINA report as it is a rural hospital so probably reporting was late as they came after multiple OPD visits to local hospital and ignorance about the condition or lack of proper diagnosis.

In our study, overall male: Female ratio was 1.61:1 and it was 0.33 at 4-5 years and 6.0 at 10-11 years, which is similar to the results of other studies showing that asthma is more prevalent in

**Table 3: Treatment regimens and response**

Classification of asthma diagnosis	Number of patients (n=120)	Treatment given	Total control of symptoms (%)	Partial control of symptoms (%)
Mild intermittent	12	No daily Rx	12 (100)	0 (0)
Mild asthma	46	Low dose ICS	40 (86.95)	6 (13.04)
Moderate asthma	52	Low dose ICS+LABA/medium dose ICS	42 (80.76)	10 (19.23)
Severe asthma	6	Medium to high dose ICS+LABA	4 (66.66)	2 (33.33)
Cough variant asthma	4	ICS	4 (100)	0 (0)

ICS: Inhaled corticosteroid, LABA: Long-acting bronchodilator

boys than girls. Yao et al. assessed 5351 Taiwanese children aged 4-18 years using ISSAC questionnaire and found that the male-to-female prevalence ratios of current wheeze increased with age from <1 at 4-5 years, peaked at 10-11 years (2.24), then reversed to 0.57 at 16-18 years [9]. A previous study stated that in early life, prevalence of asthma is higher in boys. However at puberty, the ratio shifts and asthma appears predominantly in girls as seen in our study [8]. As shown in previous studies, we also reported strong association of family history of atopy and birth by LSCS with asthma [10]. 116 children (96.66%) had both cough and dyspnea; 4 (3.33%) children had only cough as a chief complain without breathlessness; 84 (80%) children had wheeze; and 50 (41.66%) children had cold as presenting symptom. In study done by Elmoneim et al. in 2011 [11], 68.5% of 178 children with asthma presented with both cough and dyspnea, in 29.2%, it was cough only and in 2.3%, it was dyspnea only. This difference may be due to the reason that majority of patients are from community with long-term mismanagement and so most of them came to us in the state of acute exacerbation.

Significant association of precipitation of asthmatic episode was observed with change in season in 71.66%. Allergy to grass pollen was precipitator in 58.33% cases; exercise in 55%, food in 50%, air pollution in 45%, and passive smoking in 23.33% cases. In 6 (10.00%) children, contact with pet as a trigger was observed. Diurnal variation was observed in 60% cases as a trigger which was similar to the findings of other studies [6-9,12]. Growth of most of the children with asthma was affected; only 26.66% children had normal growth parameters. In a study of 405 children, overall prevalence of underweight was 15.1%, stunting was 25.2%, and thinness/wasting was 8.9% [13]. In comparison to previous studies, children in our study were more malnourished which contraindicates the well-known statement about asthma that it is more prevalent in obese. In fact, it can be seen that with the changing lifestyle, rural population is exposing children to variety of allergens and disease is now also prevalent in low socio-economic status (SES) as well as malnourished children.

In our study, 104 (86.67%) children showed improvement in PEFr consistent with the clinical improvement and 16 (13.33) children showed PEFr to be static/decreased even if, there is clinical improvement. The actions reported in response to children's symptoms and peak flow results similarly varied and concluded that peak flow readings tended to correspond to asthma disease activity. The relative usefulness of peak flow measurements as monitoring tools can be individualized based on the patient's age (decreased utility in pre-school children [14,15].

Out of 12 patients of mild intermittent asthma put on salbutamol therapy as and when required, 100% got complete control at the time of discharge. Out of 46 patients of mild persistent asthma given corticosteroids, 40 (86.95%) got total control on discharge and 6 (13.04%) patients got partial control. Out of 52 patients of moderate persistent asthma given corticosteroids, 42 patients (80.76%) got total control, and 10 patients (19.23%) got partial control. Out of 6 patients of severe persistent asthma given steroids, 4 (66.66%) got total control and 2 (33.33%) got partial control and out of 4 with cough variant asthma, all 4 (100%) got total control. This study supplements the well-known fact and generates strong evidence that corticosteroids are important in the treatment of childhood asthma. In our study, most of children got improved on using corticosteroids which matches to above study.

## CONCLUSION

Low SES, malnutrition, and overcrowding at home are strongly associated factors with asthma. Study also revealed that asthma is now not only disease of urban population but also with changing living standards, it is equally affecting rural population. Environmental changes were the most common cause for precipitation of acute exacerbation of asthma. Goal of an asthma management should be to establish positive relationship with the family, to reduce the number of exacerbations and to ensure adherence to controller medications.

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