

Asthma in Children: A Clinical Spectrum

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Citation

S Shah, A Khemka. *Asthma in Children: A Clinical Spectrum*. The Internet Journal of Pediatrics and Neonatology. 2007 Volume 9 Number 1.

Abstract

Objective: It is a study to evaluate the asthmatic patients admitted for an exacerbation as regards to their clinical features, severity of the attack and then mean hospital stay. This is a retrospective analysis of the medical records of these admitted asthmatic children.

Methods: The patients were in the age group of 1 month to 12 years. The case records of patients admitted were reviewed by a set proforma filled for each patient.

From the records details about the respiratory rate, use of accessory muscle and wheezing was found out. This was used to assess the severity of the attack by determining the pulmonary score (2). The Pulmonary Index (3) score is an aggregate of respiratory rate, wheezing, Inspiratory / Expiratory Ratio, accessory muscle use.

Each assessed on a 3 point scale. A recent scoring system that has undergone validation trials is the pulmonary score(2) which is a modification of the pulmonary index(3) scoring by excluding the inspiratory / expiratory ratio and instead using respiratory rate dependent on age. The P.S. was used as an excellent correlation with PEFr in children for varying severity of asthma. The daily hospital score was assessed and the days taken to reach a score of ≤ 3 (mild asthma) and no symptoms, was calculated. The mean hospital stay of these patients was also determined and compared with their pulmonary score (2), age and number of exacerbations. The relationship between these, if any, was tested for significance.

Results: We found that 36 males and 39 females admitted for acute exacerbation: the male/female ratio was 0.92:1. There were 28 children <2 years of age. In the 2-5 years age group 28 patients were present, where as only 19 patients were in the age group of 5-12 years. In 17 cases the attack of breathlessness was the first episode in life. Out of the remaining 58 patients of repetitive cough, breathlessness and wheeze; 41 (70.7%) patients were treated in the OPD and managed. Pulmonary score (2) of the patients were measured on admission and daily till discharge. On admission the mean pulmonary score (2) was 6.08 (range being 3-8). Hence majority of these patient admitted were in moderate attack 23 patients (30.6%) of the patient had severe attack of asthma on admission.

We also calculated the number of days that the patient was hospitalised and found that these children stayed on an average of 2-4 days with median stay of 3 days. 19 patients were admitted for less than or equal to 2 days while 36 patients were admitted for more than 2 days but less than 5 days.

Conclusion: 58.4% of admitted patients' pulmonary score(2) became mild i.e. ≤ 3 by 3.02 days (mean) and 3 days (median) but some of them were in the hospital for more than the actual number of days required there by increasing the hospital stay and expenses.

INTRODUCTION

Asthma is one of the most common chronic diseases of the childhood. It has afflicted mankind since ages. It affects around 5–10 % of the children during their lifetime and prevalence is forever increasing⁽¹⁾.

“It is chronic inflammatory disorder characterised by episodic airway obstruction due to hyper-responsiveness of the airways to various endogenous and exogenous

provocative stimuli reversed either by treatment or spontaneously”⁽¹⁾.

The basic defect in asthma is the allergic constitution and a hyper reactivity of airways to various stimuli including allergens, infections, drugs, weather, exercise & pollution.

Because of its chronicity, asthma is the main cause for significant proportion of school days lost, psychosocial

issues, multiple emergency visits and paediatric ward hospitalisations. Morbidity surpasses mortality due to its chronicity.

Newer technology is responsible for reduction in morbidity of asthma. Anti-asthma medications with the help of newer devices in the inhaled form have aided in smoother long term control of bronchial asthma. Currently therapy consisting of inhaled steroids with or without long acting ?2 agonists is in vogue. The initial therapy is vital, as early treatment can decrease morbidity significantly.

The patient can have an exacerbation in his condition of a varying severity, which is managed by salbutamol either in the nebulised form or by means of spacer and metered dose inhaler. The attack of asthma requires at least a bi hourly nebulisation with salbutamol and steroids to control the inflammation but with optimal therapy, control is way faster.

Further management consists of an ambulatory oral treatment. We know that any hospitalisation implies family problems as well as strain on the health care cost. Can the treatment of asthma be made more ambulatory?

In the present study we have evaluated the asthmatic patients admitted for an exacerbation as regards their clinical features, severity of the attack and then mean hospital stay. This is a retrospective analysis of the medical records of these admitted asthmatic children.

AIMS AND OBJECTIVES

The aims and objectives of the study were as follows:

- To study most common symptoms.
- To find out the factors causing increased hospitalisation.
- How to decrease the hospital admission.
- To control patients symptoms on Outpatient basis.
- Decrease hospital stay by proper Outpatient management.

MATERIALS AND METHODS

This is a retrospective analysis of the medical records of the asthmatic patients admitted in a tertiary care centre for exacerbation of their asthma. The patients were in the age group of 1 month to 12 years. Breathlessness and wheezes were the main complaints of these patients. They also had an

upper respiratory tract involvement, with fever. The case records of patients admitted were reviewed and the following proforma filled for each patient.

PROFORMA

?. SR. NO.

II. NAME:

III. AGE:

IV. SEX:

V. ADDRESS:

VI. Date of Admission:

Date of Discharge:

VII. Chief Complaints: Cough Days Cold Days

Breathlessness Days

Similar complaints in the past: Hospitalisation: times

Emergency visit: times

Seasonal variation: Yes/No

No. of school days/ play days missed:

Sleep disturbed due to cough, breathlessness: Yes/No

Severity: Increasing/Decreasing/Steady

Precipitating factors: Rain/ Dust/ Exposure to cold weather/ Cold water/

Exercise/ Strong odours/ Smoke/ Emotions/

Aerated drinks

Food

Any other:

Nature of attack: After exercise/ Cough/ Cold/ Associated with fever.

Associated conditions: Rhinitis/ Conjunctivitis/Sinusitis/ Otitis Media/ Food.

Intolerance/ Urticaria/ Eczema/ Contact dermatitis/

Drug allergy/ any other.

Past History of Worms: Yes/ No

TB: Yes/ No Details: Mantoux test:

X-Ray chest

Any other illness

IX. For past attack treatment taken at: Urban Health Centre/
General practitioner/

Paediatrician/ Tertiary care centre

X. Any other major illness in the past:

XI. For present illness: Treatment taken:

XII. Birth history:

Perinatal problems

Duration of breastfeeding

Weaning started at age

XIII. Immunisation History

XIV. Family history:

Asthma

Tuberculosis

Smoking Bidi/ Cigarette/ Tobacco chewing

Father's occupation

Mother's occupation

XV. Socio economic condition:

Type of house

Urban/ Rural Area

XVI. EXAMINATION

GENERAL EXAMINATION

Height

Weight

Anthropometry

Temperature

Respiratory system

Inspection: Chest deformity

Pulmonary index: ⁽³⁾

Figure 1

Clinical asthma score	Respiratory rate	Wheezing	Inspiratory/ Expiratory ratio	Use of accessory muscle
0	< 30	None	5:2	0
1	31 – 45	Terminal expiration with stethoscope	5:3 – 5:4	±
2	46 - 60	Entire expiration with stethoscope	1:1	++
3	> 60	Inspiration and expiration without stethoscope	< 1:1	+++

Palpation findings:

Percussion findings:

Auscultation findings:

CARDIOVASCULAR SYSTEM

CENTRAL NERVOUS SYSTEM

PER ABDOMINAL

XVII. Investigations:

Haemoglobin

Total lymphocyte count

Differential WBC count

Mantoux test

X – Ray chest

Stool examination

Others:

XVIII. TREATMENT ON ADMISSION

Figure 2

Drugs	Inhaled	Oral	IV/ SC	Frequency	Dose	Days
Salbutamol/ Ipratropium Bromide						
Terbutaline						
Hydrocortisone						
Methyl Prednisone						
Aminophylline						
Prednisolone						

Other treatment:

XIX. COURSE IN WARD

Figure 3

Days	Respiratory rate	Wheeze	Crepitations	Use of Accessory muscles
D 1				
D2				
D3				
D4				
D5				

On Discharge

Based on this the mean age of the hospitalized patient was evaluated. Their age and sex distribution was determined. Their clinical features were documented. From the records details about the respiratory rate, use of accessory muscle and wheezing was found out. This was used to assess the severity of the attack by determining the pulmonary score ⁽²⁾.

Pulmonary Scoring:

Because pulmonary expiratory flow rates cannot be obtained in younger children other objective methods to assess the severity of asthma have been used by us. Two such scoring systems are the Pulmonary Index ⁽³⁾ score and Wood-Down score ⁽⁴⁾. The Pulmonary Index ⁽³⁾ score is an aggregate of

Respiratory rate

Wheezing

Inspiratory / Expiratory Ratio

Accessory muscle use.

Each assessed on a 3 point scale.

A recent scoring system that has undergone validation trials is the pulmonary score ⁽²⁾ which is a modification of the pulmonary index ⁽³⁾ scoring by excluding the inspiratory / expiratory ratio and instead using respiratory rate dependent on age. The P.S. is an excellent correlation with PEFR in children for varying severity of asthma, calculated as per the table shown below.

Figure 4

Score	< 6 years	≥6 years	Wheezing	Accessory muscle use (sternocleidomastoid activity)
0	< 30	< 20	None	No apparent activity
1	31 – 45	21 – 35	Terminal expiration with stethoscope	Questionable increase
2	46 - 60	36 - 50	Entire expiration with stethoscope	Increase apparent
3	> 60	> 50	Inspiration and expiration without stethoscope	Maximal activity

* If no wheezing due to minimal air exchange: score 3

The daily hospital score was assessed and the days taken to reach a score of

≤3 (mild asthma) and no symptoms, was calculated. The mean hospital stay of these patients was also determined and compared with their pulmonary score ⁽²⁾, age and number of exacerbations. The relationship between these, if any, was tested for significance.

RESULTS

The retrospective analysis was carried out in the department of paediatrics in a tertiary training hospital in Mumbai. The medical records of 75 patients of Asthma who were hospitalised for an acute exacerbation were studied.

We found that 36 males and 39 females admitted for acute exacerbation: the male/female ratio was 0.92:1. The age distribution of these patients is as given in Table No. 1. There were 28 children <2 years of age. In the 2-5 years age group 28 patients were present, where as only 19 patients were in the age group of

5-12 years. Hence the majority of the children (74.7%) were less than 5 years of age.

Majority of the patients had presented with cough, cold, breathlessness. Fever was present in 45 patients, but it was of mild type. In 17 cases the attack of breathlessness was the first episode in life. Out of the remaining 58 patients of repetitive cough, breathlessness and wheeze; 41 (70.7%) patients were treated in the OPD and managed. For present illness 32 patients had first consulted their family physician or private paediatrician. 57.3% of the patients had come directly to our tertiary centre for the acute attacks.

Two of our patients who presented with exacerbations had coexisting Tuberculosis and were presently on Anti-Koch's

therapy along with asthma medication. Family history of asthma could be elicited in 10 of these patients who were admitted. History of passive smoking was seen in majority of the cases. 78.7% of the patients admitted for an acute attack had a history of being exposed to tobacco smoke in the family. Majority of these 75 asthmatic children were averagely nourished. 14 of these children had normal nutrition while 58% of these cases were in grade I or grade II of IAP classification of protein energy malnutrition.

Pulmonary score ⁽²⁾ of the patients were measured on admission and daily till discharge. On admission the mean pulmonary score ⁽²⁾ was 6.08 (range being 3-8). Hence majority of these patient admitted were in moderate attack 23 patients (30.6%) of the patient had severe attack of asthma on admission. These patients were out on Salbutamol/ Ipratropium Bromide nebulisation with parental steroids. These medicines were switched to oral prior to discharge.

We also calculated the number of days that the patient was hospitalised and found that these children stayed on an average of 2-4 days with median stay of 3 days. 19 patients were admitted for less than or equal to 2 days while 36 patients were admitted for more than 2 days but less than 5 days. Majority of these patients were less than 2 years of age or had severe type of asthma.

When we compared the relationship between age and mean hospital stay, we realised that children less than 2 years had a mean hospital stay of 5-23 days whereas children who were 2 years and above but less than 5 years required hospitalisation for their acute attack of asthma for a mean of 3.37 days. Children older than 5 years similarly required on an average of 3.25 days of hospital stay. (Table 2)

Pulmonary score ⁽²⁾ of these patients was daily asessed and found to be decreased to less than or equal to 3 on day 3.02 (mean). 44 patients (58.4%) were found to reach a pulmonary score ⁽²⁾ of less than or equal to 3 (mild asthma). On day 2 itself 29 patients were diagnosed only when their mean pulmonary score ⁽²⁾ was 0. Their mean hospital stay was 4.9 days.

Only one patient deteriorated in spite of the emergency management given and had to be transferred to the Paediatric Intensive Care unit.

Figure 5

Table 1: Age And Sex Distribution

AGE	MALE	FEMALE	TOTAL	PERCENTAGE
< 2 YEARS	18	10	28	37.33%
2 – 5 YEARS	14	14	28	37.33%
5 –12 YEARS	04	15	19	25.33%
TOTAL	36	39	75	

P > 0.5 NOT SIGNIFICANT

Figure 6

Table 2: Signs And Symptoms Of The Patients

SIGNS & SYMPTOMS	NUMBER	PERCENTAGE
FEVER	45	60.00%
COUGH & COLD	60	79.80%
BREATHLESSNESS	73	97.00%
NUTRITIONAL STATUS		
I	25	33.33%
II	15	20.00%
III	11	14.68%
IV	03	04.44%
V	14	18.67%

*NUTRITIONAL STATUS as per the Indian Academy of Paediatrics (IAP) Classification

Figure 7

table 3:most probable diagnosis of the patient

AGE GROUP	ASTHMA	BRONCHIOLITIS	R.A.D	WALRI	TB & WHEEZE	OTHERS
<2 YEARS	2	14	6	2	1	1
≥ 2 - <5 YEARS	10	2	10	7	1	1
> 5 – 12 YEARS	4	2	4	0	1	6
TOTAL	16	18	21	9	3	8
PERCENTAGE	21%	24%	28%	12%	4%	10.6%

R.A.D Reactive Airway Disease
WALRI Wheezing Associated Lower Respiratory Tract Infections
TB Tuberculosis

Figure 8

table 4: family history of asthma / tb / rad

FAMILY HISTORY	NO. OF PATIENTS	PERCENTAGE
ASTHMA	07	9.3%
TUBERCULOSIS	04	5.32%
RAD	02	2.67%

Figure 9

table 5: pulmonary score on admission

	MILD : P.S. ≤ 3	MODERATE : P.S. 4 – 6	SEVERE : > 6
PATIENTS	1	51	23
PERCENTAGE	1.3%	68%	30.7%

Figure 10

table 6: number of days required for the attack to become mild

PULMONARY SCORE	MEAN HOSPITAL DAYS
P.S. ≥ 6	1
P.S. ≤ 3	3.02
P.S. = 0	4.9

Figure 11

Table 7: relationship between number of attacks of asthma and mean hospital stay

EPISODES	AGE	NUMBER	MEAN P.S.	MEAN HOSPITAL STAY
1st EPISODE	< 2 YEARS	14	5.78	4 DAYS
	>2 YEARS	03	5.67	1.67 DAYS
≥ 3 EPISODES		32	6.46	3.97 DAYS

*P < 0.01
P > 0.1

Figure 12

Table 8: relationship between age of the asthamatic child and mean hospital stay

AGE	MEAN HOSPITAL STAY
< 2 YEARS	5.23 DAYS
2 - < 5 YEARS	3.37 DAYS
≥ 5 YEARS	3.25 DAYS

P > 0.1

Figure 13

Table 9: relationship between the severity of the attack and mean hospital stay

SCORE	MEAN HOSPITAL STAY
≤ 3	3
> 3 - ≤ 6	1.71
> 6	5.30

P < 0.01

Figure 14

table 10: number of days for hostipal stay

DAYS	NUMBER OF DAYS	PERCENTAGE
≤ 2	19	25.3%
> 2 - < 5	48	48%
≥ 5	20	26.7%

DISCUSSION

Bronchial asthma is one of the most common diseases of childhood. It affects 5 – 10% of children. The hospital admission rates have increased in all the countries of the world. The present study is the retrospectively analyze of the medical data of asthmatic patients who required admission, in an effort to minimize the admission rates and utilize the same the same health care cost for other diseases. The recent asthma guidelines emphasize an early and prompt treatment for the attack by the Inhaled route with steroids. Also stressed on home treatment and self-management plan is made. This if carried out properly could aid in ambulatory treatment for asthma attacks and early relief for outpatient.

In our study we found that there were 75 cases of exacerbation of asthma in the year in which the study was undertaken. Total number of ward admissions during the staid period was totally 3455. Hence 2.2% of our hospital

admissions were of acute attack of asthma. In the study of Meurer J.R. et al ^(5,6,7,8,9) it was seen that 13.21% of their admissions of children were of asthma. L. Stromber from department of pediatrics country hospital, Sweden found that 11% of the admissions in the hospital in 1973 were for asthma but in 1993 there was a significant drop in the percentage of asthmatic admissions to 5%. ^(10,11,12,13,14)

In our study children of less than 2 years of age were found to be 37.33% of the total asthmatic children admitted where as in the age group of 2 – 4 years and

5 – 12 years the figures were 37.33% and 25.33% respectively (Table 1).

Meurer J.R. et al in his study ^(5,6,7,8,9) during 1990 to 1992 and 1993 to 1994 found that persons aged 0 to 4 , 47% were asthmatics :18% in ages group of 5 to 14 years. L. Strombery his study has shown that number of children per 10,000 admitted in 0 to 4 and 5 to 16 years was <100 and <10 respectively in 1993. In our study the Male: Female ratio was found to be 0.92:1. The prevalence of asthma in males is twice as in females in early childhood but equalizes by adolescence after which a female preponderance is seen. 100% of our patients had come with cough and cold as the major symptoms at the time of presentation. Breathlessness was seen in 97% of the cases, mild grade fever noticeable only in 60% of the cases (Table 2). Similar results were seen in Y. Thakker, T.A. Sheldon, R. Long and R. Macfauls study. They found otitis media with asthma in 1.5% cases URTI with asthma in 10.2% cases, viral infection 8.7% cases, gastroenteritis 4.9%, breathing difficulties 3.3% bronchiolitis 5.4% pneumonia 4.4% urinary tract infection 1.2% and others presenting as asthma in 28.1% cases., ^(16,17,18,19,20,21)

Wheeze associated lower respiratory tract infection (WALRI) was seen in 9 cases. A majority of cases were diagnosed of having asthma. Bronchiolitis was commonly seen in children below 2 years of age. In P. G. J. Burney, S. Chinn,

R. J. Rona studies ^(22, 23, 24, 25, and 26) they found that asthma causing wheeze increase from 6.9% to 90% from 1073 to 1986 in boys and from 12.8% to 250 % in girls. Bronchitis causing wheeze decreased over a period from 1973 to 1986, persistent wheeze, no asthma or bronchitis found in 90% cases in boys and in 76.3% of the girls. In L. Stromberg's studies asthma diagnosed on wheeze, cough, chest tightness and dyspnoea wherever possible. ^(10, 11, 12, 13, 14, 15)

In Mayol P.M. and et. al's study in San Pablo hospital, in January – December

1990. They found 29% of asthmatic patient admission in which 65% were males and 45% were females. Males/females ratio was 1.6 to 1 in x-ray of above patients 29% had positive findings of which 6% revealed atelectasis and 20% bronchopneumonia infiltrates. Hospital stay over 4 days only 21% were less than 4 years of age and 12% were less than 1 year of age.

39 of our patients had come directly to the hospital for treatment of their attack. 29 patients (out of 75) sought help from private doctors, before they were referred to the hospital for treatment. Hence majority of our patients still seek local general practitioner advice. Hence training of these regarding aggressive and prompt treatment of attack of asthma with inhaled β_2 agonist and oral steroids could help in early control of the attack of asthma and avoidance of hospitalization.

When we evaluated pulmonary score⁽²⁾ of our patients, around 30.7% of the cases had a score of more than 6 i.e. they were in a severe attack on admission. 68% of the cases had a pulmonary score⁽²⁾ of 4 – 6 when admitted (i.e. moderate attack). Only 1.3% of the patients admitted with a mild score (Table 5). Meurer et al in his study found that 76.6% to 79.4% of the patients had mild asthma where as 16.9% to 19% of the patients were of moderate severity.⁽⁵⁾

The average pulmonary score⁽²⁾ of out hospital patients was 6.08 with a median of 6. Most of our patients stayed for less than 5 days in the hospital for their acute attack. 25.3% of the patients had required 2 or fewer days for control of their attack of asthma. The mean hospital stay was found to be 4.02 days with a median of 3 days. Within about 3.02 days the pulmonary score⁽²⁾ reached the mild category and the patient could be discharged. 58.4% of these patients had a pulmonary score⁽²⁾ of less than 3 by day 2 itself. Meurer et al⁽⁵⁾ found that the median length of stay of his patients of mild, moderate and severe category was 2, 2.7 and 5 days respectively. This has not changed over the years. We did not have the details of the grades of asthma in the medical record and hence could not analyze our patients in a similar manner, but in our study children less than 2 years of age were found to have a higher mean hospital stay of 5.23 days. Also children with severe attack of asthma required a significant longer duration of hospital stay i.e. 5.3 days. (Table 8)

Children with first episode of breathlessness and those who were less than 2 years of age required significantly more hospital stay. Hence in children less than 2 years with a severe attack and in children with a first episode of breathlessness a longer duration of hospital stay were seen. Also in the age group of children less than 2 years a higher probability of bronchiolitis is known which could probably explain their longer hospital stay. Bronchiolitis is known to be a self limiting viral disease which responds poorly to inhaled or nebulised bronchodilators and steroids. Hence the average duration of hospitalization in our study was around 3 days, majority of the cases required only 2 days to control their symptoms.

Each day of hospitalization cost Rs.710/- per patient (INR), which is considerable along with the loss of school days and working days for the parents is significant. In USA, K.B. Weiss^(27,28,29,30) have found that around 6.2 billion dollars are spent annually on asthma treatment, out of which 1.6 billion dollars per year is spent on direct inpatient hospital services, hence minimizing the hospital rates and switching over to ambulatory treatment for asthma would definitely aid in reduction of our health care cost for asthma.

Hence as maximum number of our patients took medical advice and treatment from local, private doctors, training these doctors in acute management of these patients during their attack would curtail the hospitalization rates, also protocol kept in emergency rooms and training of the doctor and paramedical employees at their places would cause a considerable reduction in the hospitalization for an acute attack. This type of services in asthma would go a long way in bringing down the health care cost for a poor country like India.

CONCLUSIONS

This study was carried out at a pediatric department, in a tertiary care hospital. 75 patients were admitted in a period of one year in which the study was carried out. The following conclusions were drawn:

The ration of male: female was 0.92: 1.

The asthma started before the age of 5 years in 75% of the children.

The asthma started after the age of 5 years in 25.3% of the children.

Asthma was mild in 11.3%, moderate in 58% and severe in 30.7% of the patients.

Bronchiolitis found in 24% cases, Reactive Airway Disease in 28% cases, Wheeze Associated with Lower Respiratory tract Infection in 12% cases, T.B. and wheeze in 4% cases and others 10.6%. True asthmatics were 21%.

Family history of asthma, TB, R.A.D, was found to be 9.3%, 5.32% and 2.67% of the cases respectively.

Fever with attack was found in 60% of cases.

Cough and cold in 79.8% of cases.

Breathlessness in 97% of cases.

33.33% patients were in grade I PEM (IAP-Classification of PEM); 20% Grade II, 14.66% Grade III, 4% Grade IV and 18.67% were in Grade V.

52% of the patients did not take treatment before coming to the hospital. 34.64% patients took treatment from a local doctor, 4% took treatment from a pediatrician, 2.64% from peripheral area and 5.32 from a tertiary hospital.

58.4% of admitted patients' pulmonary score⁽²⁾ became mild i.e. 3 by 3.02 days (mean) and 3 days (median) But some of them were in the hospital for more than the actual number of days required thereby increasing unnecessarily the cost.

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