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To Study the Clinical Profile and Peak Expiratory Flow Rate in Bronchial Asthma in Children Aged 6 to 12 Years

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Abstract

Asthma is one of the most common chronic diseases world-wide imposing a substantial social burden on both children and adults alike. Worldwide childhood asthma appears to be increasing in prevalence, despite considerable improvement in management of the disease . In India prevalence of asthma has been found to be around 6% in majority of survey, but it has been reported to vary from 2-17% in different study population, affecting on average about 3-11% of adults, 3-5% of paediatric population. The symptoms of the disease can start at any age, but in majority it starts before 10 years of age. *Aims and Objectives:* To study the clinical features of bronchial asthma and the peak expiratory flow rate(PEFR)in patients with acute exacerbation of bronchial asthma and to assess objective response of PEFR to bronchodilator therapy in group of 40 children visiting the department of pediatrics in a city hospital. *Material and Methods:* Data was collected by using pre-tested proforma meeting the objectives of the study. The purpose and technique of the study was carefully explained to the subjects and informed consent was taken.Age and sex matched control group of 100 was taken from the same population as the lung function tests are affected by certain variables like age, sex, stature and environmental conditions Detailed clinical history, thorough clinical examination was taken. Relevant investigations were done. Instrument used to measure PEFR was "The miniature Wright's peak flow meter". *Results*: There was significant reduction in PEFR in all the age groups of the study group as compared to the control group which was easily measured using the miniature Wright's peak flow meter in both outdoor and admitted patients.

Keywords: Asthma; Children; Peak Expiratory Flow.

Introduction

Asthma is a syndrome characterized by chronic airway inflammation and increased airway hyper-responsiveness leading to symptoms of wheeze, cough, chest tightness and dyspnoea. It is characterized functionally by the presence of airflow obstruction which is variable over short periods of time, or is reversible with treatment. There are several inflammatory mediators that contribute the characteristic patho-physiological changes that lead to symptoms of asthma.

Asthma is one of the most common chronic diseases world-wide imposing a substantial social burden on both children and adults alike. Asthma occurs in all countries regardless of the level of development but varies greatly between populations, even within countries. There is evidence that over the last 20 years its prevalence has considerably increased, especially among children.

The prevalence of asthma symptoms in children has been described as ranging from from 0 to 30 percent in different study populations. Worldwide childhood asthma appears to be increasing in prevalence, despite considerable improvement in management of the disease [2]. In India prevalence of asthma has been found to be around 6% in majority

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of survey, but it has been reported to vary from 2-17% in different study population, affecting on average about 3-11% of adults, 3-5% of paediatric population [3].

The symptoms of the disease can start at any age, but in majority it starts before 10 years of age. Although many patients have mild disease, any person with asthma can develop a severe exacerbation [4] The childhood asthma is responsible for significant proportion of school days lost. A wide range of different methods to assess the level of airflow limitation exists. But two methods have found wide spread acceptance in patients over 5 years of age. These are the measurement of forced expiratory volume in 1 sec (FEV1) and its accompanying forced vital capacity and the measurement of peak expiratory flow [5].

Aims and Objectives

1. To study the clinical features of bronchial asthma in children visiting the department of pediatrics, in a city hospital .
2. To study the peak expiratory flow rate(PEFR)in patients with acute exacerbation of bronchial asthma and to assess objective response of PEFR to bronchodilator therapy.

Material and Methods

A group of 40 children with symptomatic bronchial asthma attending the Department of pediatrics, Government Hospital, Gandhi Nagar, Jammu.

Inclusion Criteria

The children between age group of 6 to 12 years with exacerbation of asthma.

Exclusion Criteria

The children with following conditions were excluded from the study

- The children with abnormal chest radiography and patient with history of heart failure.
- Children with life threatening asthma as defined by British guidelines on management of asthma.
- The patient with history of any systemic disease which is known to involve respiratory system.
- History of surgery involving cardiovascular or respiratory system.
- And finally the children with history of contact with patients of tuberculosis or past history of having been treated for the same disease;

Collection of Data

Data was collected by using pre-tested proforma meeting the objectives of the study. The purpose and technique of the study was carefully explained to the subjects and informed consent was taken. Detailed clinical history, thorough clinical examination was taken. Relevant investigations were done. Instrument used to measure PEFR was "The miniature Wright's peak flow meter". Control group was selected from children attending OPD of hospital for minor ailments and without any systemic diseases. Their height, weight and age; detailed history, clinical examination and PEFR findings were recorded in details .

Techniques of Performing PEFR

The patients were selected according to the criteria laid down earlier. The purpose and technique of the study was carefully explained to the subjects and informed consent was taken from the parents . PEFR was measured before giving nebulization with salbutamol. Post bronchodilator PEFR was recorded 10 min after nebulization with 0.5% solution of salbutamol. The patients were advised to take maximum inspiration and then to exhale forcibly into the flow meter with nose closed after satisfactory trial blows and then recordings were taken. Care was also taken to maintain airtight seal between lips and mouth piece of the instrument. For analysis the maximum of 3 recordings were taken.

Results

The 40 children in the age group between 8 -12 years with symptomatic bronchial asthma visiting OPD or admitted to hospital were randomly selected for the study. Age and sex matched control group of 100 was taken from the same population as the lung function tests are affected by certain variables like age, sex, stature and environmental conditions. Age wise distribution of children was as follows-there were 11 children (6 boys and 5 girls)in age group of 8-9 years, 7 (4 boys and 3girls) patients in age group 9-10 years,11children (8 boys and 3 girls) in the age group 10-11 years and 11 children in age group 11-12 years (5 males and 6 females)

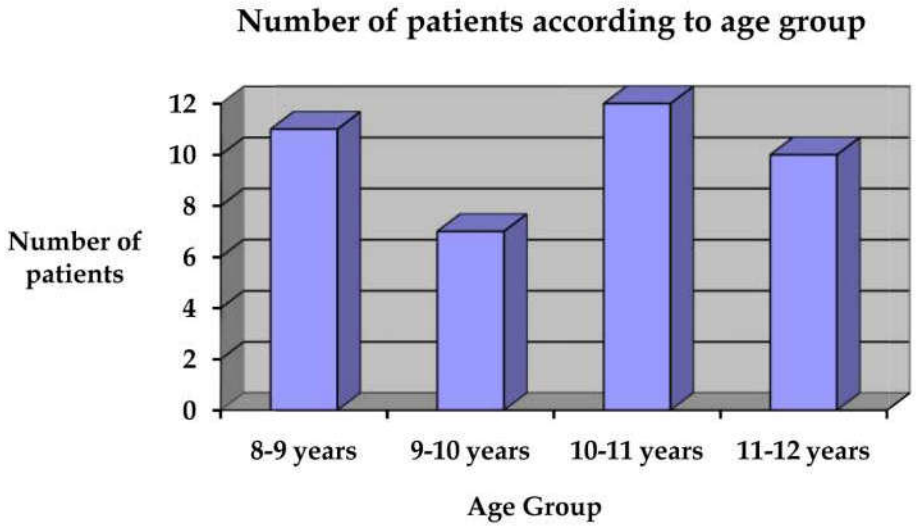
Family history of asthma was present in 21 cases. History of food allergy was present in 16 cases.

Absolute Eosinophilic count (AEC) was >400/mm3 in 17 cases. Abnormal Chest X ray (hyperinflated lung fields) was found in 24 cases.

In this study as per the history given by attendants, the cold air was the most frequent precipitating factor in 17 cases followed by URTI in 15 cases, dust in 5 cases and cold food in 5 cases and no precipitating cause could be found in the remaining 8 cases.

In the study group cough and wheeze was present in all cases (100%), chest retraction in 25 cases, fever in 15 cases, nocturnal cough was present in 12 cases. The mean respiratory rate was significantly higher in study group as compared to control group .

Fig. 1:



There was significant reduction in PEFR in all the age groups of the study group as compared to the control group.

Discussion

40 children with symptomatic bronchial asthma, between age group of 8 and 12 years were selected by using simple random sampling technique and peak expiratory flow rate was measured before and after bronchodilator therapy with the help of mini Wright peak flow meter.

The study group was divided into 4 groups based on age. Age and sex matched control group with normal health status was taken from the same population visiting the hospital for unrelated condition . It is known that peak expiratory flow rate varies with age, sex, height and weight. Therefore important consideration in study of PEFR was to ensure matching of these variables between study group and control group.

Results in this study show that in the both groups (study group and control group), sex, height, weight and age were nearly equally distributed among cases and controls with nearly equal mean SD. Since cases and controls were sampled from the same population, they have same socioeconomic background. Thus this ensures adequate matching for comparability between cases and controls.

In present sex -wise distribution of cases in all four groups revealed slightly male predominance in all groups as there were 6 boys and 5 girls in age group of 8-9 years, 4 boys and 3girls in age group 9-10 years, 8 boys and 3 girls in 10-11 years and 5 males and 5 females in the age group of 11-12 years . Several studies have shown that asthma is more common and more severe in boys than in girls [6-9].

In present study 40 (80%) children were from urban area and 10 (20%) children were from rural area. This shows that in our study there is urban predominance. This is in concordance with study by Aligne et al [10], which found out that children in urban area are at increased risk for asthma. The high incidence of asthma in urban populations compared with a significantly lower incidence in rural populations suggests that environmental risk factors have key role [11]. Chakvarthy et el [12] studied prevalence of asthma in urban and rural children in Tamil Nadu and found that 22% of urban and 9% of rural children (6-12 yrs of age) reported breathing difficulty and concluded that the prevalence of asthma, breathing difficulty and nocturnal cough was significantly higher among urban children. In another study, authors found that asthma prevalence was more among urban children (1m6.6%) as compared to rural (5.7%) children [13].

The clinical course of asthma encompasses acute exacerbation of cough, wheeze and chest retraction. In this study, all children had cough and wheeze (100%) as the predominant symptoms on presentation in hospital and chest retraction was seen in 22 children (44%) on clinical examination. This shows that during the attack, there is increased work of breathing and respiratory rate increases to maintain normal pa02 and Pco2 in blood (P < .000).

In present study, cold air was the most frequent precipitating factors for asthma constituting 48%, followed by URI (30%), dust (16%) and cold food (06%). Ratageri et al [14] studied precipitating factors for mild and severe asthma. They identified cold air in 61.7%, URI in 50%, smoke in 30%, dust in 46.6%, cold food in 63.3% of cases as precipitating factors associated with mild asthma and cold air in 83.3%, URI in 70%, smoke in 56.6%, dust in 46.6%, cold food in 8.3% as precipitating factor in children with severe asthma. Tomac et al [15] studied prevalence and risk factors for childhood asthma and concluded that family history of allergy, symptoms or diagnosis of allergic rhinitis and bronchitis and male gender were found to be significant predictors for asthma symptoms .

Asthma is an atopic disease, some studies [16] have showed strong genetic component in atopic disease including asthma. In this study, family history of Asthma was present in 20 (40%) children. In a study involving genetic and environmental factors associated with asthma in school children it was reported that , the family history of asthma contributed more to childhood asthma than indoor and outdoor environmental factors [16]. Blair et al [17] found that 73% of those asthmatics having a first-degree relative with an atopic condition , had chronic recurrent asthma at follow up. In this study we found that grandparents were the predominant category affected among family members and food allergy was found

Table 1:

Peak expiratory flow (pre-bronchodialator)	Peak expiratory flow(post bronchodilator)	P-value
207.22 ± 37.65	237.87 ± 36.80	0.001 (H.S.)

Table 2: Showing Mean Pefr in Four Age Groups

Peak expiratory flow(post bronchodilator)in patients	Controls(Healthy children)	P-value
237.87±36.80	258.60±36.82	0.001 (H.S.)

Table 3:

Age group(years)	Pre-bronchodilator	Post-bronchodilator	Control
8-9	169.18	200	212.36
9-10	201.42	233.28	255.57
10-11	239	268.75	285.75
11-12	215	245.20	279

in 2 (4%) cases. PenerdMornad C [18] et al studied prevalence of food allergy and its relationship to asthma and allergic rhinitis in school children and found that about 2.1% of children reported symptoms of food allergy Since Asthma is an atopic disease, it is usually associated with an increase in eosinophil count. The PEFR was studied in 4 groups based on age. The mean PEFR with SD before giving bronchodilator was 207.22 ±37.65 1/min and after bronchodilator was 237.87±36.80 1/min in our study. Applying paired 't' test. the mean value of PEFR before and after bronchodilator therapy in study group was highly significant (P < 0.001). The mean PEFR in study group was then compared with mean PEFR in control group in all 4 groups. There was significant reduction in PEFR (l/min) in study group (237.87±36.80)as compared with control group (258.60±36.82). The percentage of improvement was again statistically significant (P<0.001) after bronchodilator therapy. Statistical analysis shows significant reduction of PEFR in asthmatic patients. Thus to summerise , there was significant reduction in PEFR (l/min) in study group as compared with control group across all age groups .

Conclusion

Thus in a study involving 40 children with symptomatic bronchial asthma, between age group

Table 4: Showing the basic data of cases and controls who participated in the study

S. No.	Age	Sex	Height (centimetres)	Peak expiratory flow (pre-bronchodialtor)	Peak expiratory flow(post-bronchodilator)	PEP in controls(of same age and sex)
1.	8 years	Male	122	130	165	172
2.	8 years 3 months	Male	131	150	195	212
3.	8 years 6 months	Female	128	135	180	192
4.	8 years 6 months	Female	129	142	190	192
5.	8 years 9 months	Female	132	170	210	212
6.	8 years 9 months	Female	130	176	195	212
7.	8 years 9 months	Male	134	190	235	212
8.	8 years 9 months	Male	136	186	220	233
9.	8 years 9 months	Male	139	200	240	233
10.	9 years	Female	135	182	232	233
11.	9 years	Male	139	200	142	233
12.	9 years 3 months	Male	138	190	240	233
13.	9 years 3 months	Male	142	210	245	266
14.	9 years 6 months	Male	140	190	235	266
15	9 years 6 months	Female	136	180	220	233
16.	9 years 6 months	Female	138	180	195	233
17.	9 years 9 months	Male	146	220	246	279
18.	9 years 9 months	Female	141	240	252	279
19.	10 years 3 months	Male	140	214	252	266
20.	10 years 3 months	Male	139	190	242	266
21.	10 years 6 months	Male	145	240	262	279
22.	10 years 6 months	Female	142	240	256	266
23.	10 years 9 months	Female	144	220	240	279
24.	10 years 9 months	Male	146	190	240	279
25.	10 years 9 months	Male	149	260	294	303
26.	10 years 9 months	Male	150	272	286	303
27.	10 years 9 months	Female	149	238	260	303
28	10 years 9 months	Male	152	280	310	303
29.	10 years 9 months	Male	150	272	305	303
30.	11 years	Male	148	252	278	279
31.	11 years 3 months	Female	142	240	252	266
32.	11 years 3 months	Female	139	200	212	233
33.	11 years 6 months	Male	146	210	238	279
34.	11 years 6 months	Male	149	216	246	303
35.	11 years 6 months	Male	150	270	292	329
36.	11 years 6 months	Female	142	190	230	266
37.	11 years 9 months	Female	139	180	210	266
38.	11 years 9 months	Female	140	194	238	266
39.	12 years	Male	149	230	284	303
40.	12 years	Female	146	220	250	279

of 8 and 12 years ,the peak expiratory flow rate was measured before and after bronchodilator therapy with the help of mini Wright peak flow meter. There was significant reduction in PEFR (l/min) in study group as compared with control group across all age groups, and he percentage of improvement was again statistically significant ($P<0.001$) after bronchodilator therapy.

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