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Original Article

Correlation Between PEFR and Pulmonary Score in Assessing Mild to Moderate Exacerbation of Bronchial Asthma in Children Aged 6-13 Years Treated at Government Medical College Ernakulam

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ABSTRACT

Introduction: Asthma is a chronic inflammatory disorder characterized by cough, wheeze and breathlessness which is partly reversible. PEFR monitoring is a simpler tool to measure airflow obstruction. Pulmonary score is a useful scoring system to assess the asthma severity. As not much studies are available regarding the use of Pulmonary Score in grading the asthma exacerbations, we conducted a study on the correlation of PEFR values and Pulmonary score among children with mild and moderate exacerbation of bronchial asthma.

Methods: A descriptive diagnostic test evaluation was conducted in 50 children with acute exacerbation of asthma aged 6-13 years attending the Paediatric emergency room, Government Medical College Ernakulam over a period of 1 year. Children were classified according to PEFR and Pulmonary Score as mild and moderate exacerbation. Treatment was started according to standard protocol of asthma management. PEFR and pulmonary scoring were done again 20 minutes after bronchodilator therapy and improvement in both were statistically calculated and compared.

Conclusion: In our study there was a significant negative correlation between pre-treatment and post- treatment PEFR & PS with a pre-treatment correlation coefficient of -0.657 (P value 0.0001) and post-treatment coefficient of -0.543 (P value 0.0001). As pulmonary score correlates well with PEFR, it can be used as an easy tool to measure the severity of bronchial asthma especially in peripheral centres where a peak flow meter may not be available. This helps in early referral.

Key Words: *Bronchial asthma, Peak expiratory flow rate, Pulmonary score*

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INTRODUCTION

Asthma is a chronic airway inflammatory disease, defined by history of respiratory symptomssuch as cough, wheeze, shortness of breath and chest tightness that vary over time and in intensity, along with variable expiratory airflow limitation. In developed countries, 1-5% of adults and 3-5% of children are suffering from asthma[1]. The incidence of asthma among children in developing countries including India is around 6% in the age group 6- 20 years [2].

Asthma is now regarded as a complex cluster of disease phenotypes linked to specific endotypes. Unravelling the heterogeneity of asthma is instrumental in understanding the pathogenic mechanisms of the disease which helps to develop new treatment strategies. Due to the non- specific nature of asthma symptoms, currently, there is no gold-standard method to diagnose asthma. Careful evaluation of respiratory symptoms and airflow limitation should be done to establish a causal relationship with the disease. Corticosteroids and bronchodilators still form the keystone of pharmacological therapy in childhood as well as adult asthma. Novel biologic therapies which target type 2 immunity have been proven effective in severe childhood and adultasthma and will likely lead to improved disease outcomes.

According to the GINA guidelines bronchial asthma can be diagnosed by the following criteria[3]

- Typical symptoms like cough, breathlessness and wheeze which exacerbate during earlymorning or night.
- Exacerbation on exposure with risk factors.
- Evidence of variable expiratory airflow limitation which can be done by doing PEFR. PEFR variability should be more than 13% in bronchial asthma. Reversibility with bronchodilators is also a characteristic feature.

METHODS

This is a retrospective study done in the Department of Pediatrics, Government Medical College,Ernakulam over a period of 12 months from 01/12/2018 to 30/11/2019. Institutional Ethical Committee clearance was obtained prior to starting the study. The study included children with bronchial asthma in the age group of 6-13 years presenting with mild and moderate exacerbationof asthma to the paediatric department whose parents gave consent to perform PEFR. Children requiring PICU admission were considered to have severe exacerbation and were excluded fromthe study. Children with musculoskeletal disease of the chest wall, abnormal shape of chest wall and neurologic disease were also excluded from the study. The relevant data was entered in a pretested Performa.

STUDY PROCEDURE

Children with bronchial asthma in the age group of 6-13 years presenting with mild and moderate exacerbation of asthma to the Paediatric department, whose parents gave consent to perform PEFR were included in the study. On arrival to the emergency room or asthma clinic, children were assessed twice by measuring peak expiratory flow rate and pulmonary score, firstprior to starting treatment and next 20 minutes later after treatment initiation. PEFR was expressed as a percentage score. Pulmonary score is a combined score obtained by adding individual scores for Respiratory rate, use of accessory muscles, inspiration expiration ratio andwheezing.

PEFR was measured using mini Wright Peak Flow Meter. The meter was reset by sliding the marker to zero on the scale before starting to measure. The child was asked to take in a full, deepbreath while sitting or standing up straight. The mouthpiece was then placed in the patient's mouth followed by a single, fast, forceful expiration. The marker slides outward on the numbered scale, indicating the peak expiratory flow rate for that attempt. The best reading from 3 repeated attempts were taken. Observed PEFR was expressed as the percentage of expected forage, sex and height of the child. Children were classified according to PEFR as Mild (PEFR>70%) and Moderate (PEFR 40 to 69%). Based on Pulmonary Score, children were classified as having mild exacerbation when score was < 4 and moderate exacerbation when score was between 4-7. Initial bronchodilator therapy was started according to standard protocol of asthma management. Patients were reassessed using PEFR and Pulmonary Score 20 minutes later, after initial bronchodilator therapy. Improvement in PEFR values were compared with thatof pulmonary score. The correlation between PEFR & Pulmonary scores were calculated statistically.

DEFENITIONS OF RELEVANT VARIABLES

PEFR - Peak expiratory flow rate measurement (peak flow) is a simple measure of the maximalflow rate that can be achieved during forceful expiration following full inspiration. It is expressed in litres per minute.

Modified Pulmonary Index score:

Variables		Score			
		0	1	2	3
Oxygen saturation (%)		>95	93 - 95	90 - 92	<90
Accessory muscle use		None	Mild	Moderate	Severe
Inspiratory to expiratory flow ratio		2:1	1:1	1:2	1:3
Wheezing		None	End expiratory	Inspiratory and expiratory wheeze, goodaeration	Inspiratory and expiratory wheeze, decreased aeration
Heart rate (per/minute)	<3 years	<120	120 - 140	141 - 160	>160
	>3 years	<100	100 - 120	121 - 140	>140
Respiratory rate (perminute)	<6 years	30 or less	31 - 45	46 - 60	>60
	>6 years	20 or less	21 - 35	36 - 50	>50

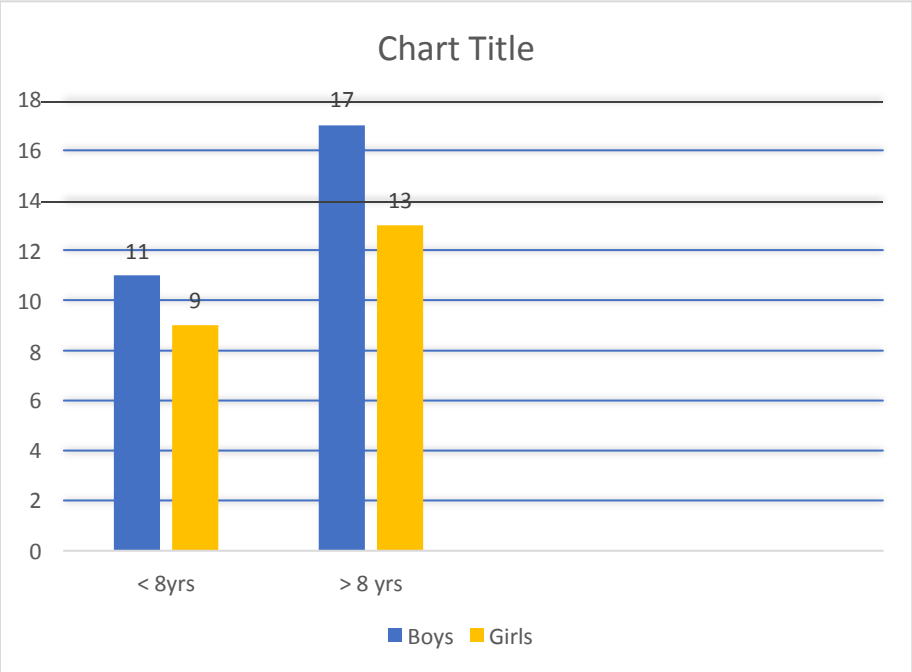
STATISTICAL ANALYSIS:

The data and results were recorded in the proforma, numerically coded and entered in Microsoft Excel spreadsheet. Statistical data analysis was done using SPSS software. Results were expressed in proportion and frequency. Qualitative data was expressed as frequency and percentage. Quantitative variables were expressed as mean & standard deviation. Correlation between PEFR score and pulmonary score were assessed using Spearman correlation coefficient. Association between qualitative variables were tested using chi square test and association between quantitative variables were tested using Mannwhitney U test, independent sample t test and paired t test. Non parametric test such as Mann whitney U test & wilcoxon signed rank test were used whenever necessary. Significance level was fixed at a P value <0.05.

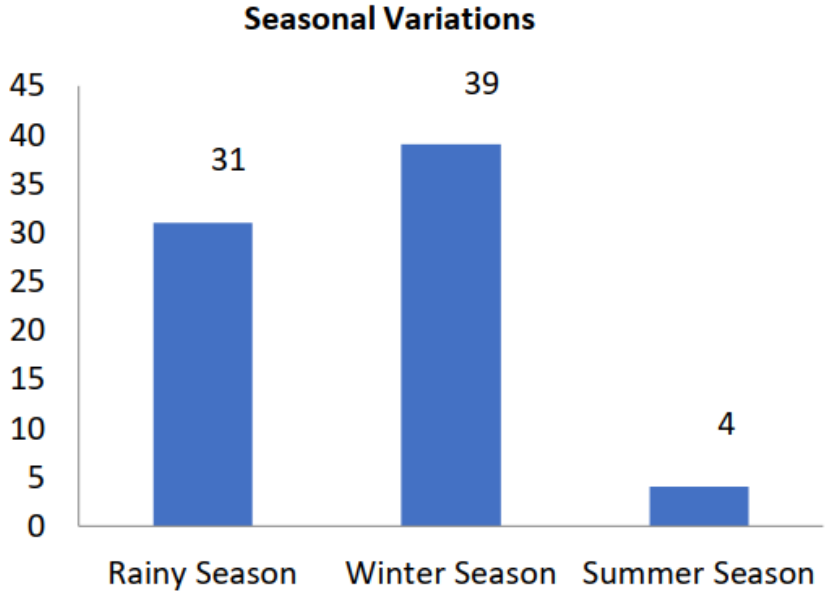
RESULTS & DISCUSSION

1. DISTRIBUTION OF AGE & SEX

Of the 50 children who were included in the study, 56 % of the study population were boys and 44 % were girls. Mean age of the study population was found to be 9 years with a standard deviation of 2.33. 30 children were above 8 years of age.



2. SEASONAL VARIATIONS IN ASTHMA

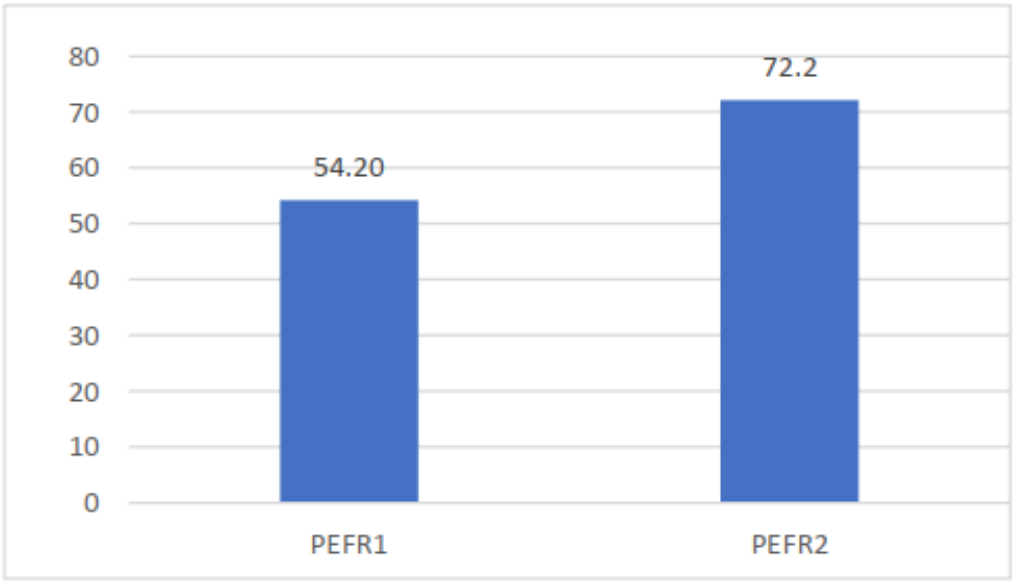


39 children experienced most of the exacerbations during winter season. 31 children had exacerbations during rainy season.

3. TRIGERRING FACTORS IN ASTHMA

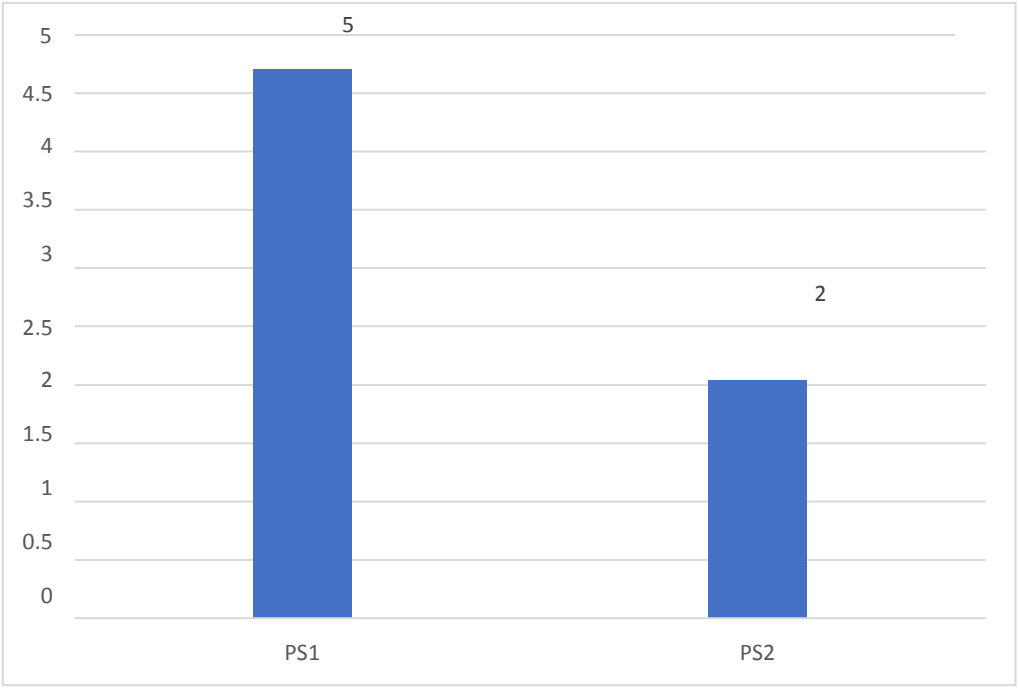
In our study, we found that the most important trigger factor was exposure to cold 68 %(n-34) followed by exposure to dust 64 % (n-32).

4. CORRELATION BETWEEN PEFR 1 & 2



PEFR 1 had a mean of 54.27 with Standard deviation 7.13 and PEFR 2 had a mean of 72.2 and Standard deviation of 2.36.

5. CORRELATION BETWEEN PSI 1 & 2



The mean of Pulmonary Score 1 was 4.7 and Pulmonary score 2 was 2.04

6. CORRELATION BETWEEN PULMONARY SCORE & PEFR

Correlation	Spearman correlation co-efficient	P Value
PEFR 1 and Pulmonaryscore 1	-0.657	0.0001
PEFR 2 and Pulmonaryscore 2	-0.543	0.0001

DISCUSSION

Asthma is a very common chronic childhood illness leading to considerable morbidity, increasing emergency room visits and school absenteeism.

Mean age of children in our study was found to be 9 years and majority of the children affectedwere under 10 years. A similar observation was found in a study by Ranabir Pal et al where children in the age group 6-12 years were more affected than above 12 years[4]. A study conducted by A Jain et al also showed inverse relation of asthma with increasing age[5]. The findings may be due to the fact that the younger children are more exposed to multiple environmental risk factors including cooking fuels and prone for viral infections compared to older ones [4,6].

Studies have shown that male sex, atopy and parental atopy are risk factors for wheeze. In our study, boys were found to be more affected. Similar observations were made in the study done by Raghavan et al. and Ranabir et al. According to studies done on gender difference in asthma,males were prone to have increased risk of asthma because of increased bronchial lability[4,7] .

In this study, we observed that most of the exacerbation occurred during winter (78 %) season followed by rainy season (62 %). Similar observations were made by Salvi et al in 2015. They also found that majority of cases showed seasonal variation with maximum exacerbations occurring during rainy (66%, n=33) and winter season (62%, n=31)[6].

In our study there is a significant negative correlation between Pre-treatment PEFR & Pulmonary score with a correlation coefficient of -0.657 P value 0.0001. Similarly, there was significant negative correlation between Post-treatment PEFR & Pulmonary score with a correlation coefficient of -0.543 with a P value 0.0001. In a similar study done by Chaitra B Rao Etal among50 children aged between 5- 18 years, they found Pulmonary score had a significant negative correlation with the PEFR; i.e., as the PEFR increased, the Pulmonary score decreased. The correlation of pre-treatment PEFR and Pulmonary score was r = -0.497 (p = 0.001) and at 20 minutes is r = - 0.589 (p = 0.001).

CONCLUSION

The Pulmonary Score is a convenient simple method of assessing airway obstruction. PS has higher post-treatment correlations, which makes it a good tool to assess the response to treatment. As pulmonary score correlates with PEFR, it can be used as an easy tool to measure the severity of Bronchial Asthma especially in Peripheral centres where a Peak flow meter maynot be available. This helps in early referral.

LIMITATIONS

Children may not be able to accurately use the tools for assessment of asthma because of lack ofunderstanding and inability to use the machine. This may alter our results.

RECOMMENDATIONS

The authors highly recommend to popularise the use of Pulmonary score calculation in allchildren presenting with acute exacerbation of Bronchial asthma.

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CONFLICTS OF INTEST: Nil

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