

CORRELATION OF PEAK EXPIRATORY FLOW RATE WITH PULMONARY FUNCTION TEST IN CHILDHOOD ASTHMA

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ABSTRACT: **AIM:** To ascertain whether the severity of childhood asthma as assessed by peak expiratory flow rate correlated with assessment by spirometry. **MATERIALS AND METHODS:** All patient between 6-18 years of age attending the asthma clinic during the non-exacerbation phase were included, those in whom PFT, PEFR could not be performed and those with diagnosis other than asthma were excluded. A total of 102 patients were enrolled in the study. **CONCLUSION:** The present study demonstrated that PEFR measurement alone had poor predictive value for abnormal spirometry. In the absence of PFTs, PEFR often overestimated how well a patient's asthma was controlled.

KEYWORDS: Asthma, Children, pulmonary function test (PFT), Peak expiratory flow rate (PEFR).

INTRODUCTION: To assess the pulmonary function of children with asthma at the time of follow up in the asthma clinic. To ascertain whether the severity of childhood asthma as assessed by peak expiratory flow rate correlated with assessment by spirometry.

MATERIALS AND METHODS: This study was conducted in Asthma clinic of the pediatric OPD, at Sri Ramachandra Medical College and Research Institute, Chennai. All patient between 6-18 years of age attending the asthma clinic during the non-exacerbation phase were included, those in whom PFT, PEFR could not be performed and those with diagnosis other than asthma were excluded. A total of 102 patients were enrolled in the study.

RESULTS: Of the 102 patient enrolled 39 (38.2%) were in the 6-10 yrs. age group, 36 (35.3%) were in 11-14 yrs. and 27 (26.5%) were in 15-18 yrs. Average patient mean age was 11.81. Of the 102 patients enrolled, no patient with mild intermittent asthma or mild persistent asthma had abnormal PEFR and 53.8% with moderate persistent asthma had abnormal PEFR. The difference in the severity of asthma with PEFR results was statistically significant ($p = .00$).

TABLE 1: RELATIONSHIP BETWEEN ASTHMA SEVERITY AND PEFR RESULTS:

PEFR * CLINICAL SEVERITY OF ASTHMA Crosstabulation						
			CLINICAL SEVERITY OF ASTHMA			Total
			MILD INTERMITTENT	MILD PERSISTENT	MOD PERSISTENT	
PEFR 60 - 80 %	Count	0	0	7	7	
	% of Total	.0%	.0%	6.9%	6.9%	
> 80 %	Count	38	51	6	95	
	% of Total	37.3%	50.0%	5.9%	93.1%	
Total	Count	38	51	13	102	
	% of Total	37.3%	50.0%	12.7%	100.0%	

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Of the 102 patients enrolled, spirometry result were normal is 24(23.5%) of the visits and abnormal 78(76.5%). The likelihood of abnormal Spirometry did not increase with worsening of asthma severity, Abnormal PFTs were found in 78.9% of patients with mild intermittent asthma, 76.4% with mild persistent asthma, and 69.2% with moderate persistent asthma. The difference in the severity of asthma as assessed by clinical grading and as assessed by spirometry results was statistically significant ($p = .003$).

TABLE 2: SHOWING RELATIONSHIP BETWEEN ASTHMA SEVERITY AND SPIROMETRY RESULTS

Spirometry results vs Diagnosis Cross tabulation				
Spirometry results	Clinical severity of asthma			total
	Mild intermittent	Mild persistent	Moderate persistent	
Severe obstruction % of total count	0	3(2.9%)	0	3(2.9%)
Moderate obstruction % of total count		7(6.9%)	1(1%)	27(26.5%)
Mild obstruction % of total count		13(12.7%)	6(5.9%)	24(23.5%)
Mild Restriction % of total count		16(15.7%)	2(2.0%)	24(23.5%)
Normal % of total count	8(7.8%)	12(11.8%)	4(3.9%)	24(23.5%)
Total	38(37.3%)	51 (50.0%)	13(12.7%)	102(100.0%)

Of the 102 patients enrolled, Spirometry result were normal for 24(23.5%) of the visits and abnormal for 78(76.5%). PEFr results were normal for 95(93.1%) and abnormal for 7(6.9%) of the visits. Among these 4(3.9%) with abnormal PEFr shows abnormal spirometry whereas 3(2.9%) with abnormal PEFr shows normal spirometry, also 74(72.5%) with normal PEFr shows abnormal spirometry and with 21(20.6%) with normal PEFr shows normal spirometry. The difference in the PEFr results with spirometry results is not statistically significant ($p = .212$).

TABLE 3: SHOWING RELATIONSHIP BETWEEN PEFr AND SPIROMETRY:

SPIROMETRYRESULTS * PEFr Crosstabulation					
			PEFr		Total
			60 - 80 %	> 80 %	
SPIROMETRYRESULTS	ABNORMAL	Count	4	74	78
		% of Total	3.9%	72.5%	76.5%
	NORMAL	Count	3	21	24
		% of Total	2.9%	20.6%	23.5%
Total		Count	7	95	102
		% of Total	6.9%	93.1%	100.0%

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A PEFr <80% had a strong positive likelihood value; however it is low sensitivity made it a poor parameter for diagnosing abnormal lung function. No PEFr level had a sufficiently strong negative likelihood ratio to make it useful in ruling out abnormal lung function in the absence of a less than indicated PEF. PEFr was moderately accurate in distinguishing between normal and abnormal lung function. A PEFr <80% had a strong positive likelihood value; however it is low sensitivity made it a poor value for diagnosing abnormal lung function. No PEFr level had a sufficiently strong negative likelihood ratio to make it useful in ruling out abnormal lung function in the absence of a less than indicated PEF. Though PEFr correlate well with FEV1, it is not a substitute for spirometry.

DISCUSSION: In children older than 5 years, three major features are recommended in determining level of severity: frequency of asthma symptoms during the day and night, and measures of pulmonary function.¹ Although the use of spirometry has been recommended by the NAEPP, this recommendation is based on expert opinion and not on evidence based. Most cases of asthma in our country are managed by primary care physician and PFTs and PEFr are not performed routinely, however spirometric measurements should be considered important vital signs.²

In an attempt to understand the relationship between pulmonary function and level of asthma severity as judged by clinical symptoms, we examined lung function measures in 102 children seeking care in our asthma clinic. The rationale for this recommendation comes from the finding that many children with asthma are poor perceivers of airway caliber.

Children with long-standing airways obstruction are less likely to report dyspnea than children with acute onset of airway obstruction.³ Peak expiratory flow (PEF) is the most commonly used method to check lung function in asthma because it can be measured easily by simple, cheap, portable devices. It is therefore, very popular in primary care. It is commonly applied as a quick screening method of assessing lung function in the clinic or at the bedside.

AD Mitra et al determined the relationship between (FEV1), peak expiratory flow and asthma symptoms score and concluded that pulmonary function test is a helpful tool for physicians in the assessment of childhood asthma.⁴ In our study PEFr was abnormal only in 7 children overall and all 7 clinically had moderate persistent asthma.

When compared to the spirometry result only 4 out of the 78(5.1 %) of those with abnormal spirometry had reduced PEFr. While a PEFr <80% had a strong positive likelihood value, no PEFr level had a significant strong negative likelihood ratio to make it useful in ruling out abnormal lung function in the absence of a less than indicated PEFr.⁵ Nemr Eid et al compared the PEFr in relation to the spirometry results and concluded that it might be possible to identify children for whom the PEF is likely to give false-negative results. As air trapping increases, it causes the PEF to give misleading reassurance of normal pulmonary function.

Furthermore, poor predictiveness of PEF is obtained when values 80% of predicted for age are considered normal.⁶ In our study 37.3% had mild intermittent asthma, 50% had mild persistent asthma and 13.7% had moderate persistent asthma. No patient had severe persistent asthma. This is in contrast to other studies in which 18-20% had severe persistent asthma.⁷ The FEV1/FVC ratio has been used to express the degree of airflow obstruction present in asthma and has been shown to be increasingly abnormal with increasing severity of asthma. FEV1/FVC is considered gold standard in measuring airway obstruction.⁸

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CONCLUSION: The present study demonstrated that PEFR measurement alone had poor predictive value for abnormal spirometry. In the absence of PFTs, PEFR often overestimated how well a patient's asthma was controlled.

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