

**Original article:**

## Study the variation of peak expiratory flow rate with height, weight, age and sex among pediatric age group

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### Abstract:

**Introduction:** Peak expiratory flow rate provides an objective assessment of airflow limitation. Regular use of peak flow meter helps in improving the control of asthma and reduction of overall morbidity and mortality. It can be used for short term monitoring.

**Material and methods:** The present study was conducted on children between the age group of 6-12 years of age. A total of 200 children were subjected to peak expiratory flow rate estimation.. Cases were selected from patients attending Out Patient Department {OPD} of Paediatrics , Patna Medical College &Hospital ,Patna .This shall include patients with as well as without symptoms of asthma.

**Results :** Study shows mean and range of physical parameters (age, height & weight) and peak expiratory flow rate (L.min.) in group II, both in boys and girls. It showing Mean peak expiratory flow rate values and its standard deviations in boys and girls both in relation to age in group II.The correlation between age &PEFR was statistically significant( $P<.05$ ).

**Conclusion:** As peak expiratory flow rate values are quite variable in relation to age, sex, height, weight as well as racial and ethnic differences. Therefore, it has been tried to establish reference standards of PEFR values based especially on height for normal as well as children with symptoms/signs suggestive of asthma.

**Keywords:** Peak expiratory flow rate , diabetes mellitus.

### Introduction:

Peak expiratory flow rate provides an objective assessment of airflow limitation. Regular use of peak flow meter helps in improving the control of asthma and reduction of overall morbidity and mortality. It can be used for short term monitoring. Peak expiratory flow rate is defined as the maximum expiratory flow rate sustained for at least 20 milliseconds during the forced expiratory maneuver. It is measured with the help of specially designed instrument like Wright's peak flow meter. Peak flow meter is handy, portable and inexpensive instrument. It gives reading of the peak flow rate on a dial or linear scale and expressed in wright-mckerrow unit since a long time before 2004, when it is replaced by European scale which is relatively more accurate. <sup>1,2</sup>

Peak flow rate variation also depends upon physical activity and educational levels. Its low value has already related with smoking and children whose parents smoked specially mothers. Study of peak expiratory flow rate of school going rural children are lower as compared to Caucasian and urban children of same height. It has been observed that racial and ethnic variation also alter pulmonary function test specially lung volume. Similar reports are obtained among various Indian ethnic groups.<sup>3</sup>

Since, there is marked variations in peak expiratory flow rate among general population. "Personal best peak expiratory flow rate" is a better index for self-assessment during health and illness.

**Material and methods:**

The present study was conducted on children between the age group of 6-12 years of age. A total of 200 children were subjected to peak expiratory flow rate estimation.. Cases were selected from patients attending Out Patient Department {OPD} of Paediatrics , Patna Medical College &Hospital ,Patna .This shall include patients with as well as without symptoms of asthma.

**Inclusion Criteria:-**

- All children between age group of 6-12 years were included as study subjects who could perform this test freely on individual basis after proper demonstration.
- Those who were interested to participate in this study voluntarily.
- It included asthmatics as well as children with normal respiratory symptoms

**Exclusion Criteria:-**

- Children below 6 years and above 12 years.
- Those who were extremely sick and not able to perform the test properly.
- Those who did not participated voluntarily.

**Children were divided into two groups:-**

Group I : Consisted of healthy children with no symptoms of respiratory diseases.

Group II: Consisted of children with respiratory symptoms/signs suggestive of asthma .

The purpose and objectives of this study were explained to subjects, parents and their verbal consent were obtained. Recording of peak expiratory flow rate was done with the help of low range Wright's peak flow meter (clement Clarke).

**Results:**

**Table 1) Showing Mean PEFR values in relation to age in Group II**

Boys			Girls		
Age (in years)	Mean PEFR (L/min.)	S.D.	Age (in years)	Mean PEFR (L/min.)	S.D.
6 (n=1)	100	-	6 (n=0)	-	-
7 (n=1)	130	-	7 (n=1)	130	-
8 (n=2)	142.5	17.5	8 (n=2)	142.5	7.5
9 (n=5)	175	7.07	9 (n=3)	180	8,16
10 (n=1)	190	-	10 (n=1)	200	-
11 (n=1)	215	-	11 (n=1)	200	-
12 (n=1)	225	-	12 (n=0)	-	-

The correlation between PEFR and age ( $r=0.89$  for male and  $r=0.82$  for female) was statistically significant ( $P<0.05$ ).

**Table 2) Showing Mean PEFR values in relation to Height in Group II**

Boys			Girls		
Height (in c.m.)	Mean PEFR (L/min.)	S.D.	height (in c.m)	Mean PEFR (L/min.)	S.D.
106-110 (n=1)	100	-	106-110 (n=0)	0	0
111-115 (n=1)	125	-	111-115 (n=1)	115	-
116-120 (n=1)	130	-	116-120 (n=2)	142.5	7.5
121-125 (n=2)	162.5	2.5	121-125 (n=1)	170	-
126-130 (n=4)	177.5	5.59	126-130 (n=3)	180	16.32
131-135 (n=1)	190	-	131-135 (n=1)	190	-
136-140 (n=1)	215	-	136-140 (n=0)	0	0
141-145(n=1) (n= 1 )	225	-	141-145 (n= 0 )	0	0

The correlation between PEFR and height ( $r=0.94$  for male and  $r=0.85$  for female) was statistically significant ( $P<0.05$ ).

**Table 3) Showing Mean PEFR values in relation to Weight in Group II**

Boys			Girls		
Weight (in kg)	Mean PEFR (L/min.)	S.D.	Age (in years)	Mean PEFR (L/min.)	S.D.
11-20 (n=4)	128.75[100-160]	21.32	11-20 (n=2)	132.5[130-135 ]	2.5
21-30 (n=6)	177.5[165-190]	8.5	21-30 (n=5)	170[150-190]	14.14
31-40 (n=2)	220 [215-225]	5	31-40 (n=1)	200	-

The correlation between PEFR and weight ( $r=0.92$  for male and  $r=0.83$  for female) was statistically significant ( $P<0.001$ ).

**Table 4) Showing comparison of mean PEFR in Group I and Group II**

	<b>Boys</b>	<b>Girls</b>
Group I	240.74 (145-345)	219.24 (130-310)
Group II	168.33 (100-225)	164.37 (130-200)

The correlation between PEFR and respiratory symptoms was statistically significant ( $p < .05$ ). Group II consisted of children with low PEFR values. They were subjected to further pulmonary function test to establish the diagnosis of asthma and other obstructive airway diseases.

#### **Discussion:**

It was found that peak expiratory flow rate increases in linear relationship with height both in boys and girls. The coefficient of correlation between peak expiratory flow rate and height ( $r=0.95$  for boys and  $0.87$  for girls) was highly significant ( $P < .001$ ). Sharma et al. (2002) observed similar correlation between PEFR and height ( $r=0.85$  for boys and  $0.87$  for girls,  $P < .001$ ), which was highest among age, height and weight, Swaminathan<sup>4</sup>(1993) also observed similar correlation ( $r=0.84$ ,  $P < .001$ ). Raju et al.<sup>5</sup> (2003) in boys ( $r=0.89$ ), Malik et al. (1981 & 1982), Singh & Peri<sup>6</sup> (1978) ( $r=0.90$  for boys and  $r=0.89$  for girls) and Parmar et al.<sup>7</sup> (1997) showed similar result in their studies with highest relationship of peak expiratory flow rate and height. These findings similar to finding of present study

Table VIII highlights mean peak expiratory flow rate in both boys and girls in relation to weight in group I children. It was observed that peak expiratory flow rate increases in linear fashion with weight, both in boys and girls. The coefficient of correlation between PEFR and weight ( $r=0.93$  for boys and  $r=0.84$  for girls) was significant ( $P < .001$ ). Swaminathan<sup>10</sup> (1993) also observed that correlation of PEFR with weight ( $r=0.81$ ,  $P < .001$ ) was significant. Singh and Peri<sup>26</sup>(1978) confirmed the fact ( $r=0.88$  for boys and  $r=0.87$  for girls) with significant ( $P < .001$ ) results. It indicates the comparison of Peak expiratory flow rate values of present study with those of previous five studies for two different heights in Caucasian and Indian children. The study also shows that boys performed better than girls of similar height which was comparable to other studies in past.

Study shows mean and range of physical parameters (age, height & weight) and peak expiratory flow rate (L.min.) in group II, both in boys and girls. It showing Mean peak expiratory flow rate values and its standard deviations in boys and girls both in relation to age in group II. The correlation between age & PEFR was statistically significant ( $P < .05$ ). It shows mean expiratory flow rate in both boys and girls and its standard deviation in relation to height in group II. The correlation between PEFR & height was statistically significant ( $P < .05$ ).

### Conclusion:

As peak expiratory flow rate values are quite variable in relation to age, sex, height, weight as well as racial and ethnic differences. Therefore, it has been tried to establish reference standards of PEFV values based especially on height for normal as well as children with symptoms/signs suggestive of asthma. Based on these reference values screening of reactive airway diseases particularly asthma can be made .

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