

EVALUATION OF MEAN PEAK EXPIRATORY FLOW RATE (PEFR) OF HEALTHY CHILDREN BELONGING TO URBAN AREAS OF HYDERABAD

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ABSTRACT

Introduction: Peak Expiratory flow rate (PEFR) is an important measure of lung function in obstructive airway diseases. The values of PEFR vary with ethnicity and geographical areas as well as age, sex and height. Bronchial asthma is a common entity in childhood respiratory illness but unlike adults regional data regarding PEFR is missing with very few studies done in Hyderabad. Thus this study was designed to determine PEFR in urban children of Hyderabad and correlate it with their age, sex and height. **Materials and methods:** 2200 children of age 8-18 months were subjected to PEFR measurement and their anthropometry was recorded. PEFR measurement was done using wright's peak flow meter for three times and best of this was recorded. This was correlated with age, weight and height in both sexes. **Results:** PEFR increased with age, weight and height in both sexes. It was higher in boys when compared to girls. Correlation was best with height and so nomograms for PEFR based on the height were designed. **Conclusion:** Regional PEFR standard values need to be determined area wise. Larger studies needed to check the accuracy of PEFR –height nomogram design.

Key words: PEFR Hyderabad urban children, age, weight, height, PEFR height nomograms

INTRODUCTION

Respiratory diseases are the most common cause of death in both developed and developing countries.

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Bronchial asthma during childhood is a common chronic airway disease. PEFR recording is one among the many lung function tests helpful in evaluation, monitoring, management and follow up of patients with bronchial asthma. There is enough evidence to suggest that the prevalence of this disease is increasing, consequently morbidity and mortality of bronchial asthma is also increasing.

PEFR is easily measured using peak expiratory flow meter and can be recorded by the patients at home by themselves and at the clinic to reflect the severity of the

out flow obstruction and was shown to anticipate early deterioration of patients conditions before it actual happens[1].

Bronchial asthma is a common respiratory disease of childhood which is associated with fluctuation in airway caliber and one of the earliest sign of impending attack is fall in PEFr[2].

PEFR is an accepted index of pulmonary function. Personal best PEFr is a useful concept for asthma self-management plan. Serial PEFr monitoring is a convenient method for investigation and diagnosis of asthma. A variation of greater than 20% of baseline may indicate airway hyper reactivity.

Predictive normal values are essential for clinical interpretation of lung function test. Nomograms predicting PEFr from anthropometric measurements are available for various population groups.

While using lung function test in epidemiology is an important to ensure that the population from which the regression equation was derived is an appropriate one as predicted normal values are affected by many factors including ethnicity, regional and environmental influences[3].

As hardly any studies are done to determine PEFr in our area (Hyderabad). This study was designed to determine a normal range reference for children.

AIMS AND OBJECTIVES

- 1) To determine the PEFr values in healthy school children from 8-18 years of age of Hyderabad city.
- 2) To study the effect of factors like age, sex, height and weight on PEFr.

MATERIALS AND METHOD

2200 children of age group 8-18 years of both sexes (1100 boys and 1100 girls) were selected from various schools of Hyderabad city. These children constitute a representative cross section of normal children of Hyderabad. Schools were selected by systemic random sampling technique.

Proper consent was taken from the parents, children and school authorities before starting the study.

These children were interviewed to rule out respiratory tract infections within preceding three weeks, chronic respiratory disease, asthma, skeletal deformities of thorax, cardiac and neurological disease and smoking in adolescents.

Age was taken as completed years as on the school/college records. The children were subjected to full clinical assessment. The anthropometric measurements taken were height and weight. Weight was measured in kilograms using standard weighing machine with accuracy of ± 50 grams. Standing height was measured by making the child to stand against a fixed calibrated rod with adjustable headrest. Children who were found as malnourished as per IAP criteria were excluded from the study.

PEFR was measured by mini wright's peak flow meter. Graduation starts with 50L/min to 800L/min with accuracy of 10L/min indicators of PEFr remains in place of reading unless brought back manually by the operator. All the measurements of PEFr were taken in standing position.

The purpose of the test and procedure was explained to the children.

Each child was told to take a deep breath and then flow into peak flow meter as hard and as fast as possible through mouth piece and was closely watched to ensure that he/she maintains an air tight seal between lungs and mouth piece of instrument. Disposable mouth piece were used for recording PEFr. The procedure was repeated thrice, highest value of these three readings was taken as observed PEFr.

Effect of factors like age, sex, weight and height on PEFr was studied. Regression analysis was used to calculate the predicted normal values of PEFr and also to assess its relation to age, sex, weight and height.

Data analysis: Was done by SPSS using univariate and multivariate regression analysis and Pearson's correlation coefficient was determined for each parameter.

RESULTS

The data of 2200 children (8-18 years) obtained by peak flow meter were analyzed with respect to age sex height and weight.

When PEFr was correlated with age it was seen that PEFr increased as the age increased as shown in Figure 1 boys had higher level of mean PEFr than girls except 8 years of age were both have a same mean PEFr. It is also seen that difference in mean PEFr of boys and girls was found to be increased more widely as age increased from 14 years. In girls there is not much increased in PEFr as age increased from 14 years.

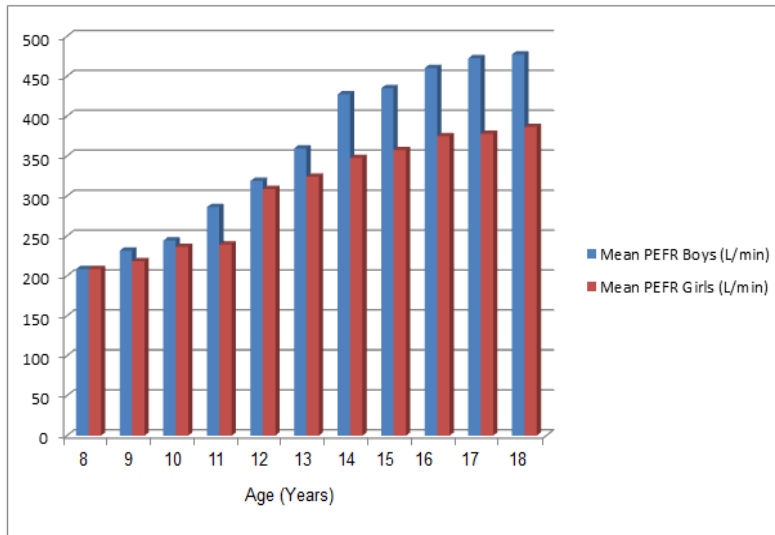


Figure1: Mean PEFR of boys and girls with respect to their Age (yrs)

When PEFR was correlated with weight it was seen that mean PEFR is increased as the weight increased in both

boys and girls. Boys had a higher value of mean PEFR than girls at the given weight shown in (Figure2).

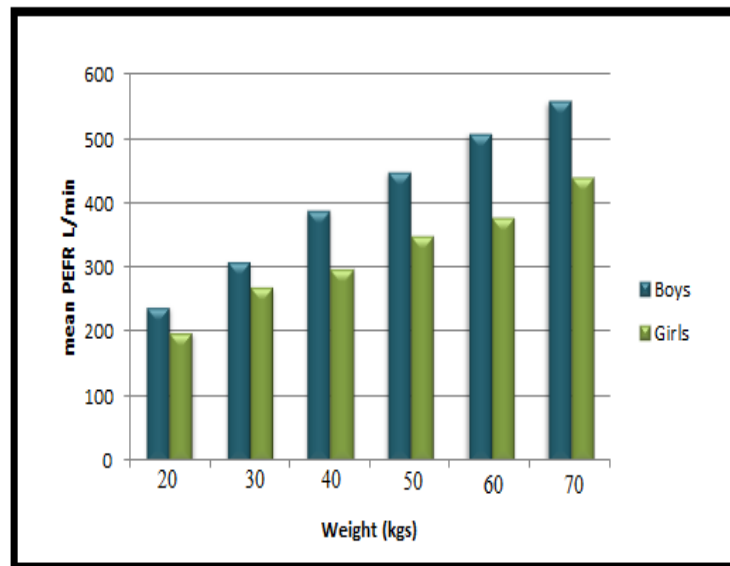


Figure2 Mean PEFR of boys and girls with respect to their Weight (kgs)

When PEFR was correlated with height mean PEFR is increased as the height increased in both boys and girls.

Boys had a higher value of mean PEFR than girls at the given height.

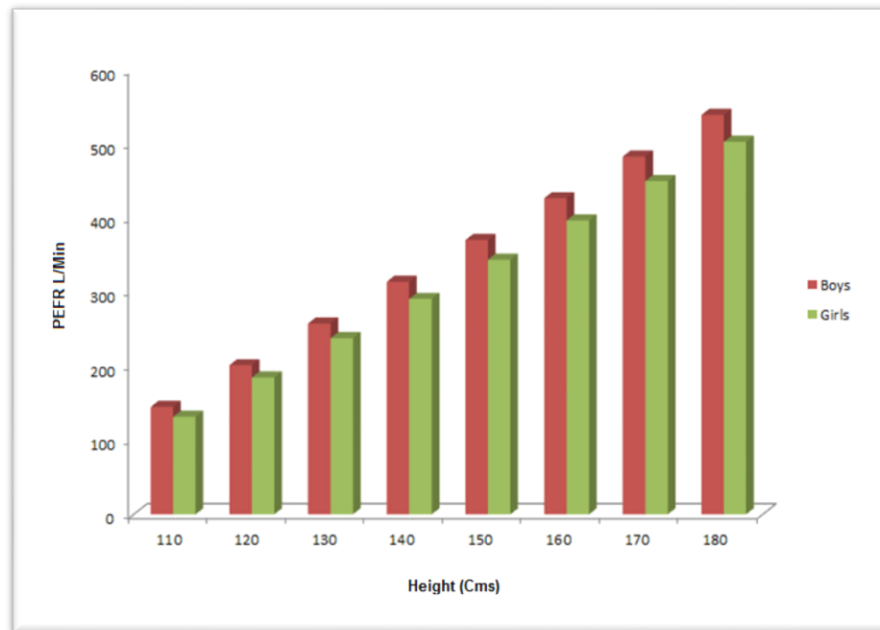


Figure3: Mean PEFR of boys and girls with respect to their heights

Univariate regression analysis was done using individual parameter (age, sex, weight and height). Regression equation and r values (pearsons correlation coefficient) was determined for each parameters.

The regression equation for PEFR in boys, girls and entire (boys + girls) sample using weight, height and age as independent variables. Thus table 1 shows correlation of PEFR is highest with the height. The pearson correlation coefficient is denoted by r[4].

Table1: Regression equations of PEFR in various groups

Variables	Regression equation for PEFR.	r values
Age (Boys)	$71.5 + 18.8 (\text{age})$	0.861
Age (Girls)	$70.3 + 18.21 (\text{age})$	0.859
Age (Entire)	$71.8 + 19.2 (\text{age})$	0.850
Weight (Boys)	$7.47 + 83.5 (\text{wt})$	0.859
Weight (Girls)	$123 + 5.11 (\text{wt})$	0.797
Weight (Entire)	$100 + 6.38 (\text{wt})$	0.800
Height (Boys)	$-474 + 5.63 (\text{ht})$	0.902
Height (Girls)	$-451 + 5.30 (\text{ht})$	0.876
Height (Entire)	$-489 + 5.65 (\text{ht})$	0.892

As PEFR correlated best with height nomogram were derived taking height as independent parameter. Which shows the PEFR nomogram from various heights

for boys in Figure4, for girls in Figure5 and for both children ranged from 8-18 years of age.

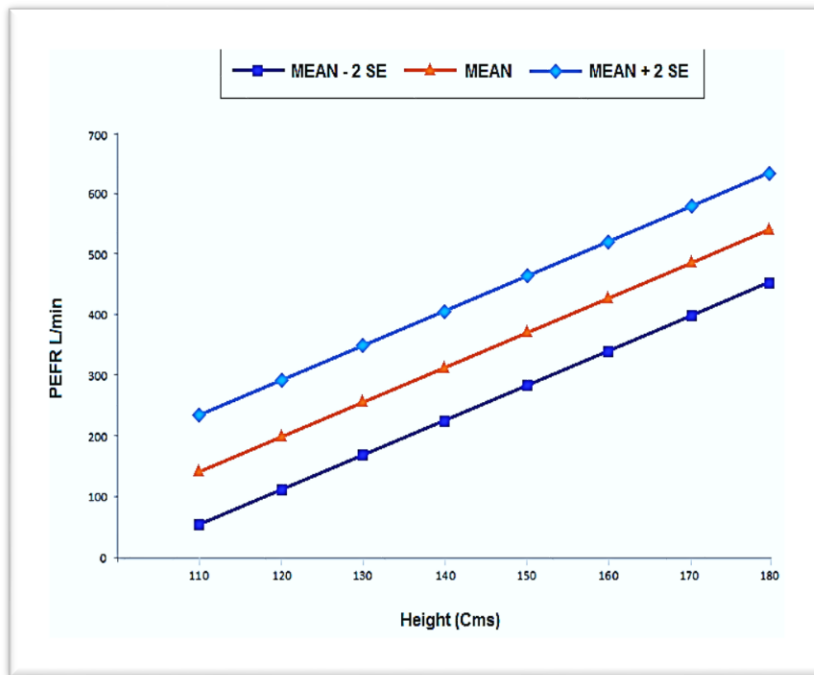


Figure4: shows the PEFR nomogram for boys (8-18 years)

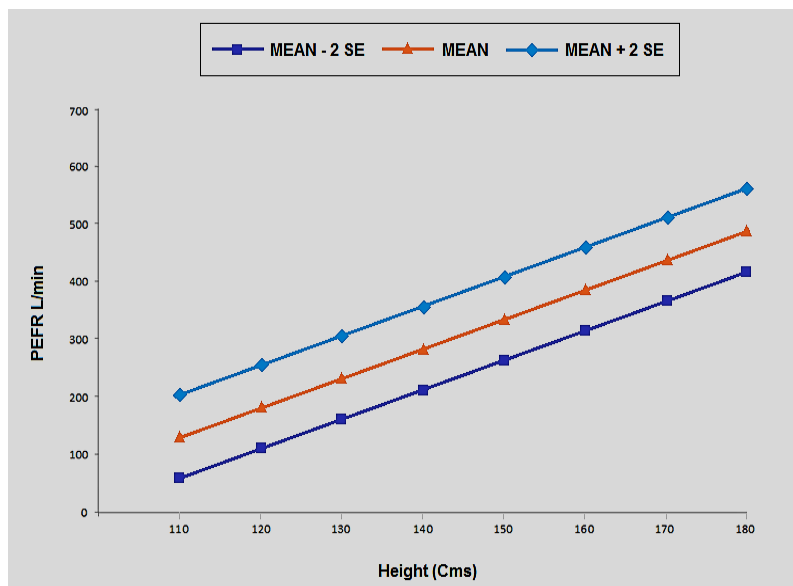


Figure5: shows the PEFR nomogram for girls (8-18 years)

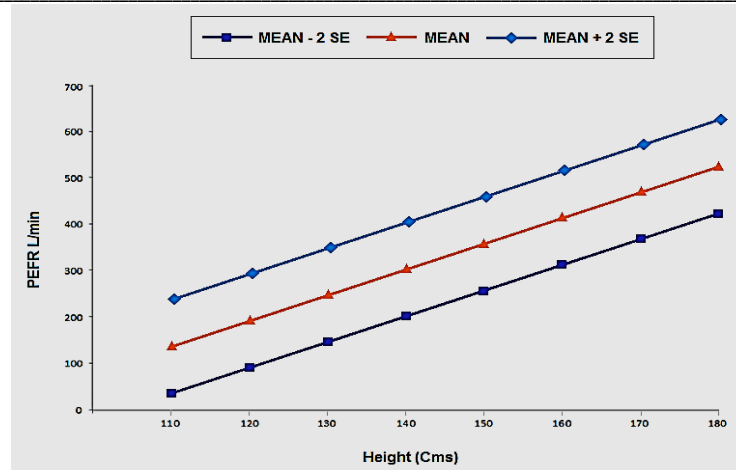


Figure6: shows the PEFR nomogram for children (8-18 years) of Hyderabad city

The upper and lower levels donate the +2 SE (+95%) and -2 SE (-95%) around the mean respectively. Middle line donates the mean PEFR. These values will serve as norms of PEFR levels as the reference range for the children of hyderabad.

In order to know the combine effect of all these independent variables (age, height, and weight) multivariate analysis was performed and PEFR was estimated.

Multiple regression equation was found to be

For boys : PEFR = 20.7 (AGE) + 1.43 (HEIGHT) + 0.95 (WEIGHT)-158

For girls : PEFR = 11.6 (AGE) + 2.34 (HEIGHT) + 0.13 (WEIGHT) – 189

Discussion

In our study in boys the mean PEFR increased with age

Table 2: Comparison of PEFR/min from our study with those of previous studies with respect to height

Source of data	Height					
	120 cm		140 cm		160 cm	
	Boys	Girls	Boys	Girls	Boys	Girls
Swaminathan[2] (Tamil nadu)	205	193	286	272	368	350
Amar Taksande[6] (Maharashtra)	217.4	178.9	311.4	251.7	405.4	324.5
Malik[12] (Punjab)	222	216	320	314	418	412
Carson[8] (Dublin)	250	244	344	332	469	457
Present study	202	185	314	291	427	397

and boys had higher value of PEFR than girls at any given age. A study conducted in children of Mysore district Veeranna *et al* and that conducted in south Indian school children by Swami Nathan S *et al* showed positive correlation between age and PEFR. As age increased PEFR levels increased. At a given age boys had higher level of PEFR than girls[5,2].

In our study PEFR increased with increased in weight of both boys and girls similar to the studies done in the past by Carson JWK *et al* and GharagozloM *et al*[8,9].

In our study it was noticed that PEFR increases with increased in height. Correlation was obtained between PEFR and height. (r=+0.902 for boys, r=+0.876 for girls). Similar to the studies done by Sharma R *et al*, and study done by Kashyap S *et al*, showed PEFR has significant correlation with height. (r=+0.893 for boys, r=+0.883 for girls) [10,11].

PEFR values from Dublin (western) school children in study by Taskande A et al were at higher levels compare to present study. North Indian school children and western children have higher values of PEFR whereas the children from tamilnadu, study conducted by Swaminathan S et al have lower levels of PEFR when compared to present study[6,2]. Inter individual variability may be due to variety of [host factors, including size, weight, height, age, race, past and present health, geographical pollution and socio economic status may also influence the inter individual variation. Therefore it would be more appropriate for each region to have its own value[7]. Comparison of PEFR (L/min) from present study with those of previous studies with respect to height shown in Table 2.

In our study PEFR levels were higher in boys than girls and this was more significant during puberty. Difference in PEFR increased between two sexes after the age of 11 years due to faster increase of height in boys similar to the studies done by et al. Thus, the findings of this study correlates well with other studies and gives prediction of PEFR using age, weight and height individually.

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Conflict of Interest: None

relation being more for height as well as correlation with all three parameters combined for all urban children of Hyderabad.

CONCLUSION

- PEFR increases progressively with age, weight, height and more so with height in both sexes.
- For a given age, weight, height of boys have higher PEFR than girls.
- It is important to have reference standards for detecting abnormal values. Reference values are affected by regional and environmental factors. Therefore it is necessary to have regional values for children.
- Since are children in dynamic process of variable growth, further studies of this nature are required. Usually larger sample sizes in each age group needed to establish reference standard and represent them as percentile charts for that region.