Original Research Article

Study on peak expiratory flow rate and its influencing factors in healthy school children in Kancheepuram district of Tamil Nadu, India

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ABSTRACT

Background: The Peak Expiratory Flow Rate (PEFR) is useful to screen and monitor the severity of asthma in children. Many studies have documented that age, height and weight are some of the main factors that affect the PEFR. Thus, the present study was done to find the PEFR values among the school children and to find the factors that influences the PEFR values in our geographical area.

Methods: It was a cross sectional study conducted in school children belong the rural area of Kancheepuram district, Tamil Nadu, India. A total of 378 students of both the gender at the age group of 5-10 years were selected for the study. The PEFR was measured by making the participant seated comfortably. One peak flow meter was used for 25 children and mouthpiece was changed for each student.

Results: The PEFR value among and male and female participants was analyzed statistically (Table 2). The mean value of male and female study population was 169.53±37.38 and 146.24±33.01 respectively. The difference in the mean values were statistically significant (p=0.001) and found to be high in male participants. The Pearson correlation r between PEFR with height is 0.463, thus showing a positive correlation with the p<0.001 which is statistically significant. The Pearson correlation r between PEFR and chest circumference is 0.335 thus indicating a positive correlation between PEFR and chest circumference.

Conclusions: From the present study, the normal values of PEFR has been deduced for the healthy school children in our geographical area. Further, it was found that the height and chest circumference are influencing factors for PEFR. Further regression equation has been derived that can help us to find the approximate PEFR values with the help of height and chest circumference of the children.

Keywords: Chest circumference, Height, Peak expiratory flow rate, Pearson correlation, Weight

INTRODUCTION

Peak expiratory flow rate is the maximum expiratory flow that is produced following after deep inspiration this is the suitable easy way method to diagnose obstructive air way disease.[1] In India, the important cause of childhood morbidity and mortality is the respiratory disorders.[2] The obstructive airway diseases are caused in children due to environmental pollution and other causes like infection.[3] The Peak Expiratory Flow Rate (PEFR) is a test done to measure how fast a person can exhale. The PEFR test is also called peak flow test.[4] The lung function test is further useful to screen and monitor the severity of asthma in children.[5] Many studies have documented that age, height and weight are some of the main factors that affect the PEFR.[6] PEFR can be easily measured by a peak flow meter and is a convenient tool to measure the lung functions in field survey.[7] It is simple

to measure as it does not require body temperature pressure saturated correction and is a good indicator of bronchial hyperresponsiveness.[8] In general, children from different geographical area may have different PEFR values that are influenced by their race and nutritional status.[9]

Thus, the present study was done to find the PEFR values among the school children and to find the factors that influences the PEFR values in our geographical area.

METHODS

It was a cross sectional study conducted in school children belong the rural area of Kancheepuram district, Tamil Nadu, India. A total of 378 students of both the gender at the age group of 5-10 years were selected for the study. The study was conducted between January 2019 to August 2019. Age was taken as completed years as on the school records. The anthropometric measurements like height and weight were recorded by standard instruments.

Inclusion criteria

- Age from 5 to 10 years
- Both male and female

Exclusion criteria

- The children with diagnosis of asthma and chronic lung disease.
- Children with other diseases which may interfere with PEFR measurement.
- Non-cooperative children

The PEFR was measured by making the participant seated comfortably. One peak flow meter was used for 25 children and mouthpiece was changed for each student. The methods of carrying out the test was demonstrated to the participants. Each participant was made 3 PEFR man oeuvres and the highest value was taken into the consideration. Descriptive statistics was done for the data collected. The regression analysis was done to find association of PEFR with height and chest circumference.

RESULTS

Total of 378 students were studied for various parameters like height, weight, chest circumference and waist circumference along with PEFR. The study included 192 male and 186 female students. The Table 1 gives the overall mean values of the various parameters studied. The children with the minimum height of 101 cm and maximum height of 154 cm with mean value of 121.62±8.743 cm was studied. Their mean weight was 25.76±14.057 kg.

The chest circumference and waist circumference were also measured, and the mean values were found to be 56.26±6.294 cm and 52.99±7.451 cm respectively.
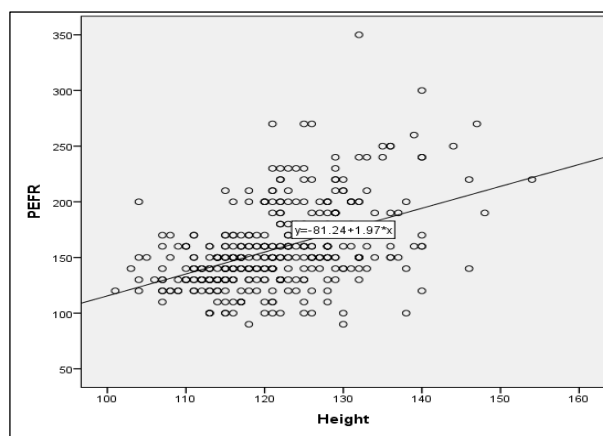
Table 1: Values of various parameters studied in children.

Parameters	Minimum	Maximum	Mean±SD
Height in cm	101	154	121.62±8.743
Weight in Kg	12	241	25.76±14.057
Chest circumference in cm	27	80	56.26±6.294
Waist circumference in cm	23	85	52.99±7.451
PEFR	90	350	158.07±37.128

The PEFR value among and male and female participants was analyzed statistically (Table 2). The mean value of male and female study population was 169.53±37.38 and 146.24±33.01 respectively. The difference in the mean values were statistically significant (p=0.001) and found to be high in male participants.

Table 2: PEFR value among male and female.

Gender	Total individual	PEFR value Mean±SD	p value
Male	192	169.53±37.38	0.001
Female	186	146.24±33.01	
Total	378	158.07±37.128	

Figure 1: Association of PEFR and height.

The Table 3 and 4 gives the values of various parameters studies in male and female participants respectively. The male and female students almost matched in all the parameters in terms of height, weight, chest circumference and waist circumference (Table 3).

Pearson correlation coefficient was measured to find the association between PEFR with height and chest circumference. The Figure 1 shows the correlation between the PEFR and height. The Pearson correlation r is 0.463, thus showing a positive correlation with the p<0.001 which is statistically significant. Thus, results suggest that PEFR values will be seen increased with the

increase in height. The figure 2 shows the association of PEFR with chest circumference. The Pearson correlation r is 0.335 thus indicating a positive correlation between PEFR and chest circumference. Thus, the result indicates that the chest circumference can determine the PEFR value. The correlation is highly significant with P<0.001.

Table 3: Values of various parameters studied in male and female children.

Parameters	Gender	Minimum	Maximum	Mean±SD	p value
Height in cm	Male	103	154	122.37±8.571	>0.05
	Female	101	148	120.85±8.873	
Weight in Kg	Male	12	241	25.82±18.282	>0.05
	Female	14	75	23.66±7.430	
Chest circumference in cm	Male	47	80	56.6±5.908	>0.05
	Female	27	78	55.9±6.667	
Waist circumference in cm	Male	23	85	52.91±7.078	>0.05
	Female	23	85	53.07±7.836	
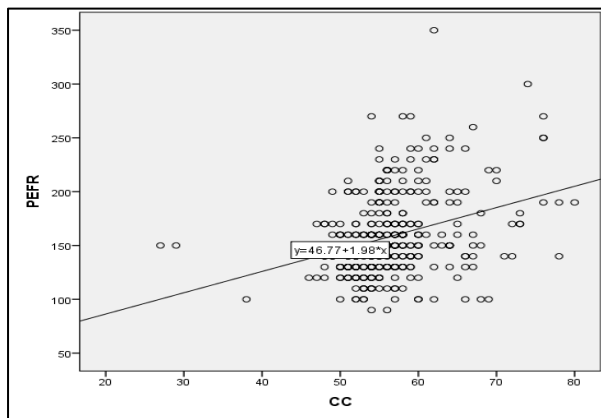
Figure 2: Association of PEFR and Chest Circumference (CC).

DISCUSSION

The present study was conducted to find the normal values of PEFR values among the rural area surrounding the city of Chennai, India. Further, the influencing factors of PEFR values like height and chest circumference were also studied. The assessment of lung functions is imperative in both healthy and unhealthy individuals in the field of respiratory medicine.

PEFR measurement is gaining importance in the day-to-day clinical practice to evaluate the patients with obstructive and restrictive airway diseases as the instrument used is simple and portable.[10]

The PEFR value may differ based on ethnicity and geographical area.[11] Hence, a study should be conducted in a particular geographical area to find the values in the normal health individuals. In the present study, an assessment of the normal values of PEFR were made in healthy school children in our geographical area. Further, the association of PEFR with height and chest circumference was also studied.

It was found that there is a positive linear relationship between PEFR with height and chest circumference. The findings are in accordance with previous studies which also showed a positive correlation of PEFR with height and chest circumference.[12-15] From the present study, it was also found that the PEFR value differs between gender. The normal values and the equation derived in the regression analysis will help to predict the normal PEFR value of normal healthy children with their height and chest circumference. These values can also be used as the reference values for this geographical area.

CONCLUSION

From the present study, the normal values of PEFR has been deduced for the healthy school children in our geographical area. Further, it was found that the height and chest circumference are influencing factors for PEFR. Further regression equation has been derived that can help us to find the approximate PEFR values with the help of height and chest circumference of the children.

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