

Original Article

Evaluation of Correlation of Peak Expiratory Flow Rate with Age, Height and Weight in Children

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ABSTRACT:

Background: Peak Expiratory Flow Rate is a convenient and reliable measurement in diagnosing and monitoring the progress of airflow limitation and evaluating the response to treatment. The present study was conducted to correlate age, height and weight with PEFR in study population. **Materials & Methods:** This study was conducted on 254 subjects of 10- 14 years of age. Height and weight were measured according to a standardized protocol. All the parents filled a self-administered questionnaire to obtain general information and disease history of the participant. PEFR was measured in all subjects. **Results:** It included 152 boys and 102 girls. There was significant difference in height, weight and PEFR in all age groups. All parameters were higher in boys as compared to girls. The difference was significant (P- 0.05). Tanner pubertal staging and the mean age, height and PEFR for pubertal stage in boys showed at each stage 1, 2, 3, 4 and 5. Tanner pubertal staging and the mean age, height and PEFR for pubertal stage in girls showed at each stage 1, 2, 3, 4 and 5. Girls achieved earlier pubic hairs and breast development than males. **Conclusion:** PEFR is indicator for respiratory diseases commonly seen in children. It is positively correlated with age, height and weight of subjects.

Key words: Age, Height, Tanner.

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INTRODUCTION

Peak Expiratory Flow Rate (PEFR) is a convenient and reliable measurement in diagnosing and monitoring the progress of airflow limitation and evaluating the response to treatment. The peak expiratory flow (PEF), also called peak expiratory flow rate (PEFR) is a person's maximum speed of expiration, as measured with a peak flow meter, a small, hand-held device used to monitor a person's ability to breathe out air. It measures the airflow through the bronchi and thus the degree of obstruction in the airways.¹

Age, sex, height, weight, diurnal variation and race are factors affecting PEFR. PEFR in infants, children and adults differ between different ethnic groups. Since the growth and development are affected by pubertal hormones, pubertal stage also is likely to affect PEFR. PEFR readings are higher when patients are well and lower when the airways are constricted. From changes in recorded values, patients and doctors may determine lung functionality, the severity of asthma symptoms, and treatment.²

Chronic respiratory diseases are among various diseases common in children. Asthma is the most common obstructive disease in children. It has been seen that respiratory diseases leads 4 million deaths annually; and 250,000 people die of asthma. Due to the wide range of

'normal' values and the high degree of variability, peak flow is not the recommended test to identify asthma. However, it can be useful in some circumstances. A small portion of people with asthma may benefit from regular peak flow monitoring.³ The present study was conducted to correlate anthropometric measurements with PEFR in study population.

MATERIALS & METHODS

This study was conducted in the department of Physiology. It included 254 subjects of 10- 14 years of age. All were informed regarding the study and written consent was obtained from the parents. Ethical clearance was obtained from institutional ethical committee.

General information such as name, age, gender etc. was recorded. Height and weight were measured according to a standardized protocol. All the parents filled a self-administered questionnaire to obtain general information and disease history of the participant.

PEFR was measured with mini-Wright compatible 'asthma plan peak flow meter' which had a range of 50- 800 L/min and readable to the nearest 10 L/min. The measurement was made while the subject was in erect position and instructed to take maximum inspiration and to blow as hard as possible

without any delay while keeping a tight seal around the mouth-piece. Results were tabulated and subjected to statistical analysis. P value <0.05 was considered significant.

RESULTS

Table I Height, weight and PEFR

Age (Yrs)	Boys (mean)			Girls (mean)			P value
	Ht (cm)	Wt (Gm)	PEFR L/min	Ht (cm)	Wt (Gm)	PEFR L/min	
10	124.2	30.0	186	132.6	27.2	180	0.01
11	130.2	31.4	204	140.4	28.6	198	0.05
12	144.4	32.4	228	142.2	32.0	221	0.02
13	150.8	35.6	260	148.4	34.6	250	0.01
14	156.2	40.4	276	150.6	39.4	274	0.05

There was significant difference in height, weight and PEFR in all age groups. All parameters were higher in boys as compared to girls. The difference was significant (P- 0.05).

Table II Age, Height and PEFR in boys in accordance to Tanner staging

Stage	Boys Pubic hair			Boys Penile development		
	Age	Height	PEFR	Age	Height	PEFR
	Stage 1	10	140.2	222	10.2	138.8
Stage 2	12.2	148.4	262	11.8	146.2	258
Stage 3	13.1	152.2	304	12.8	152.6	288
Stage 4	15.4	160.4	368	15.6	166.6	358
Stage 5	16.0	168.2	386	16.2	162.4	376

Tanner pubertal staging and the mean age, height and PEFR for pubertal stage in boys showed at each stage 1, 2, 3, 4 and 5.

Table III Age, Height and PEFR in girls in accordance to Tanner staging

Stage	Girls Pubic hair			Girls Breast development		
	Age	Height	PEFR	Age	Height	PEFR
	Stage 1	9.4	134.0	189	9.4	131.6
Stage 2	11.2	146.6	194	11.8	142.4	196
Stage 3	12.2	152.6	248	12.4	154.2	242
Stage 4	14.8	164.2	256	14.8	162.4	258
Stage 5	15	162.1	274	15.2	164.6	276

Tanner pubertal staging and the mean age, height and PEFR for pubertal stage in boys showed at each stage 1, 2, 3, 4 and 5. Girls achieved earlier pubic hairs and breast development.

DISCUSSION

Peak expiratory flow rate (PEFR) is a convenient and reliable measurement in diagnosing and monitoring the progress of airflow limitation and evaluating the response to treatment.

To interpret the significance of peak expiratory flow measurements, a comparison is made to reference values based on measurements taken from the general population. Various reference values have been published in the

literature and vary by population, ethnic group, age, sex, height and weight of the patient. For this reason, tables or charts are used to determine the normal value for a particular individual. There are a number of non-equivalent scales used in the interpretation of peak expiratory flow such as EU scale, Wright, NHANES III etc. The present study was conducted to correlate anthropometric measurements with PEFR.

Shobijah et al⁴ found that Pearson's correlation of PEFR in boys with age was 0.863, height was 0.870 and weight was 0.808. In girls it was 0.797, 0.813 and 0.761 respectively. Girls achieved maximum PEFR at 16 years but in boys PEFR was increasing up to 18 years. The PEFR of boys was higher than girls after the age of 14 years.

We found that there was significant difference in height, weight and PEFR in all age groups with all parameters higher in boys as compared to girls. This is in accordance to Fernandez.⁵

We found that Tanner pubertal staging and the mean age, height and PEFR for each pubertal stage in boys and girls. Girls achieved pubertal changes at younger age when compared to boys. When the difference of PEFR between the stages of the same sex was analyzed, the increase at each stage was statistically significant in boys and girls. Peak expiratory flow rate (PEFR) is the maximum flow rate generated during a forceful exhalation, starting from full lung inflation. PEFR primarily reflects large airway flow and depends on the voluntary effort and muscular strength of the patient.⁶

The pubertal staging correlated well with height and therefore it may indirectly be represented through height. Sharat et al⁷ reported that the girls' lung development is completed at menarche. The present study did not record the age at menarche because we considered that the menarche is incidental depending on the cyclical hormonal secretions resulting in significant development and disintegration of endometrium and it can occur at any time during puberty. Peak flow readings are often classified into 3 zones of measurement according to the American Lung Association; green, yellow, and red. Doctors and health practitioners can develop an asthma management plan based on the green-yellow-red zones.⁸

The measurement of peak expiratory flow was pioneered by Martin Wright⁹, who produced the first meter specifically designed to measure this index of lung function. Since the original design of instrument was introduced in the late 1950s, and the subsequent development of a more portable, lower cost version, other designs and copies have become available across the world.

CONCLUSION

Girls acquired pubertal changes at younger age as compared to boys. Age, height and weight can be considered for estimation of PEFR in children.

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