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RESEARCH ARTICLE

Peak expiratory flow rate in healthy school children

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ABSTRACT

Background: Peak expiratory flow rate (PEFR) assesses the overall functional status of the respiratory system. **Aims and Objectives:** The aim of this study was to observe the PEFR in school going healthy children, in a town located in the southern part of India. To illustrate the relation among the age, height, weight, and PEFR in the school going children. **Materials and Methods:** 119 school going healthy boys were selected randomly, aged between 5 and 16 years. Anthropometric parameters, namely, height and weight of the subjects were measured to the nearest reading with minimal clothes on and without footwear using stadiometer and weighing machine, respectively. Subjects were divided into five groups: Group I with a height range of 101-120 cm, Group II with 121-130 cm; Group III with 131-140 cm; Group IV with 141-150 cm; and Group V with 151-160 cm. PEFR was measured using the pocket flow meter and wrights flow meter. **Results:** Mean PEFR values with standard deviation in the five groups with pocket flow meter and with wrights flow meter are Group I: 159 ± 18.3 and 118 ± 22.5, Group II: 227 ± 31.0 and 204 ± 31.8, Group III: 253 ± 52.0 and 234 ± 51.2, Group IV: 309 ± 43 and 296 ± 40.9, and Group V: 368 ± 51.0 and 343 ± 47.7. Correlation coefficient was also calculated between the height and PEFR, measured with pocket flow meter in all the five groups; 0.64, 0.68, 0.25, 0.47, and 0.69 from Groups I to V. **Conclusion:** PEFR is increased with the increasing in height of the subjects.

KEY WORDS: Peak Expiratory Flow Rate; School Children; Mini Wright Flow Meter; Pulmonary Functions

INTRODUCTION

Way back in 1942 Hadorn suggested the use of maximum forced expiratory flow rate, i.e., peak expiratory flow rate (PEFR) as a physiological index for the functional status of the respiratory system as a whole.

PEFR is the maximum respiratory flow rate during the forced expiration.[1] PEFR depends mainly on the strength of the respiratory muscles apart from age, gender, height, and weight of the subjects.[2] PEFR is affected by airway resistance, trans, and intrapulmonary pressures. PEFR values are significantly low in obstructive lung disorders like bronchial asthma and emphysema of the lung.[3] PEFR can be measured with pocket flow meter and also with wright's flow meter.[4] Measurement of PEFR has become widely popular method of objective assessment of the expiratory difficulty.

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Objectives

1. To observe the PEFR in school going healthy children, in a town located in the Southern State of India.
2. To illustrate the relation among the age, height, weight, and PEFR in the school going children.

MATERIALS AND METHODS

It is an observational study, permitted by the institutional ethical committee. After thorough explanation about this study, subjects were included after obtaining the written informed consent from their school authorities. 119 school going healthy boys were selected randomly, aged between 5 and 16 years. Anthropometric parameters, namely, height and weight of the subjects were measured to the nearest reading with minimal clothes on and without footwear using stadiometer and weighing machine, respectively.

Exclusion Criteria

Smoker's, subjects with H/O recurrent respiratory tract infections, H/O bronchial asthma, H/O congenital respiratory problems, deformities of the spine, recent H/O surgeries, and H/O continuous exposure to the industrial dust (cotton mills, etc.) are all excluded from the study.

Methodology

As the pulmonary functions are dependent on the height of the given subject, stratification of the subjects based on their height was made. Subjects were divided into five groups: Group I with a height range of 101-120 cm; Group II with 121-130 cm; Group III with 131-140 cm; Group IV with 141-150 cm; Group V with 151-160 cm. PEFR was measured using both pocket flow meter and wrights flow meter.

Statistical Analysis

Data were analyzed by Statistical Package for Social Sciences version 23.0. Data were summarized by mean ± standard deviation for continuous normal data. The relation between height (in cm) and PEFR was carried out with Karl Pearson's correlation coefficient for continuous normal data.

RESULTS

Findings of this study were depicted in Tables 1 and 2.

DISCUSSION

Table 1 shows that there is clear increase in the PEFR values with the increasing in height of the subjects. In our study, there is a positive correlation between the height, weight, and age with that of the PEFR. In general, pulmonary function tests values are more in male subjects than their female counter partners because of the greater strength of the respiratory muscles.[5] Greater strength of the respiratory muscles is because of more protein buildup in the respiratory muscles in males, which is the result of the effects of androgens mainly. More protein buildup means more anabolic processes and more anabolic processes means more oxygen demand and more oxygen demand can be maintained by increased intake of oxygen, which will result in greater PEFR values in males than in the female counter partners. In this study, only male subjects were included. PEFR was recorded in all the group subjects both with the Hudson's pocket flow meter and with mini wright flow meter. There was substantial difference in the recorded PEFR using the two types of flow meters. The obtained values were higher in all the groups with peak flow meter than with mini wright flow meter. The difference was more pronounced in the lower age group than in the higher age groups. At high lung volumes, i.e., approximately the first quarter of the forced expiration is effort dependent, the harder the person expires the more the expiratory flow rate. And at low lung volumes, i.e., the rest of the three-quarters of the forced expiration are effort independent (Lawrence Martin, 1987). Several frequently encountered pulmonary diseases results in varying degrees of obstruction to the flow of the air within the trachea-bronchial tree. Table 2 shows the correlation between the height and PEFR in all the three groups. Correlation coefficient was calculated in each group between height and PEFR. And in all the five groups, PEFR is positively correlated with age. It is also observed in our study that even the age and weight are also positively correlated with the PEFR. Moreover, the findings of this study were on par with the earlier research reported.[6,7] PEFR can be used in diagnosing the obstructive lung diseases in the school children,[8] though it cannot be used in differentiating the different degrees of asthma.[9] PEFR is more dependent on the height than the weight of the subject.[10]

Table 1: Mean PEFR with SD in relation with height (in cm), age (in months), and weight (in kg)

Height (in cm)	Age (in months)		Weight (in kg)	PEFR (PFM) (in L/min)	PEFR (WFM) (in L/min)
	Number of subjects	Mean±SD	Mean±SD	Mean±SD	Mean±SD
101-120	23	75.6±19.0	17.3±2.6	159±18.3	118±22.5
121-130	20	110±21.0	20.9±1.7	227±31.0	204±31.8
131-140	26	136±14.7	28.2±3.0	253±52.0	234±51.2
141-150	22	162±17.3	32.0±2.9	309±43.0	296±40.9
151-160	28	172±7.7	42.8±5.5	368±51.0	343±47.7

PEFR was mentioned after measuring both with PFM and WFM. PEFR: Peak expiratory flow rate, SD: Standard deviation

Table 2: Relation between height and PEFR values among all the five groups

Height (in cm)	Number of subjects	PEFR with mean±SD (in L/m)	Height with mean±SD (in cm)	*r*
101-120	23	159±18.3	112±5.6	0.64
121-130	20	227±31	126±3.08	0.68
131-140	26	253±52	136±13	0.25
141-150	22	309±43	146±3.2	0.47
151-160	28	368±51	155±2.75	0.69

PEFR values were measured with PFM. PEFR: Peak expiratory flow rate, SD: Standard deviation

CONCLUSION

PEFR values are at higher side in the subjects with more height than those with lesser height. The authors also advise, regular screening of the school going children especially underprivileged, for the PEFR to diagnose an obstructive lung disease at an early stage for prompt treatment and early prophylaxis.

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