



A Study of Correlation of Peak Expiratory Flow Rate with Body Mass Index in Healthy School Going Children

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Abstract

Introduction: Peak expiratory flow rate is the maximum rate at which the air can be expired after deep inspiration and it is an effort dependent parameter. PEFr is measured to detect the cardiorespiratory efficiency of an individual and it is also affected by BMI of an individual. By taking appropriate measures like physical activity we can reduce the negative effect of BMI on cardiorespiratory function.

Aims and Objectives: the present study was done to see the effect of BMI on PEFr and also to compare the PEFr between boys and girls.

Materials and Methods: In the present study 300 school going children were selected and their PEFr was measured with the help of mini peak flow meter and their BMI was also calculated.

Result: the present study showed that in case of girls PEFr increased with increase in BMI but there was slight decrease in 19-22.99 categories and in case of boys the PEFr increased with correspondence with BMI but there was decrease in PEFr in 23-26.99 category.

Conclusion: from the present study we had found that BMI had a great effect on PEFr. So early physical activity will decrease BMI and thus improve one's cardiorespiratory fitness.

PEFr peak expiratory flow rate, BMI body mass index.

Abbreviations HR heart rate, BMI body mass index.

INTRODUCTION

Peak expiratory flow (PEF) is the maximal flow achieved during a forced expiration following a full inspiration. The peak obtained in this way can be exceeded involuntarily during coughing. The flow reflects the strength of the expiratory muscles, the mechanical properties of the lungs and airways and the inertia, resistance and sensitivity of the recording equipment. PEF is particularly susceptible to dynamic compression of extra pulmonary airways because whilst such airways are subject to pleural pressure, their walls are not supported by traction from lung tissue.⁽¹⁾ The index is widely used by

health professionals and by patients for detection and management of variable airflow limitation. There are few variables such as age, gender, and body size which have an impact on the PEFr. During childhood and adolescence the mass of the body increases in parallel with skeletal growth. In adults through into middle age the mass often continues to increase but at a slower rate. Adults who put on weight usually accumulate fat. However, in persons who undertake physical training, a gain in weight is due to an increased quantity of muscle and mineralisation of bone. The quantity of fat may then be relatively small. In later life the body mass

often stabilises, and then declines. These changes influence the lung function and capacity.⁽²⁾ Normal tables account for these variables by giving predicted PFT data for males or females of a certain age and height. Some times as people age increases they begin to increase their body mass by increasing their body fat to lean body mass ratio. If they become too obese the abdominal mass prevent the diaphragm from descending as far as it could and the PFT results will demonstrate smaller measured PFT outcome than expected, i.e. – the observed values are actually smaller than the predicted values. For references the standard laid down in the western country are not applicable to the people in tropical country like India having varied ethnic, climatic, cultural, and social-economical conditions. Data available on Indian people in different age group and sex from various parts of country are limited and easternmost parts of India are specially lacking. With view to find out the different parameters the lung function test was carried out among the healthy school going children

MATERIALS AND METHOD:

In the present study 300 school children were selected in and around the Dibrugarh town. The children having any lungs disease such as asthma, common cold etc and cardiac disease were excluded from the study. Before starting the work the informed consent was taken. The height and weight were measured and the BMI was calculated. The children were then grouped according to their BMI. The PEFr was measured with the help of peak flow meter. After practical demonstration the subjects were asked to inspire as deeply as possible and blow as hard and quickly as possible in one short sharp blast in the peak flow meter. The indicator was stop at a figure on the scale and noted this reading. At least three reading were taken and the highest value out of the three was recorded.

RESULTS

In the present study the boys and girls were divided into groups according to their BMI. In the BMI group 11-14.99 there was 93 numbers of girls and

83 numbers of boys. In the BMI group 15-18.99 there was 64 numbers of girls and 34 numbers of boys. There was 11 girls and 10 boys in the BMI group 19-22.99 and 2 girls and 3 boys in the BMI group 23-26.99.

In case of girls the mean PEFr in the BMI group 11-14.99 was 1.52±0.57L/sec, in 15-18.99 group mean PEFr was 1.79±0.90, in 19-22.99 group it was 1.83±0.61 and in 23-26.99 group mean PEFr was 1.82±0.2 the correlation coefficient was and p value was 0.001.

Table1: showing the distribution of boys and girls in different BMI groups:

BMI group	Boys	Girls
11-14.99	83	93
15-18.99	34	64
19-22.99	10	11
23-26.99	3	2

Fig1: distribution of boys according to their BMI

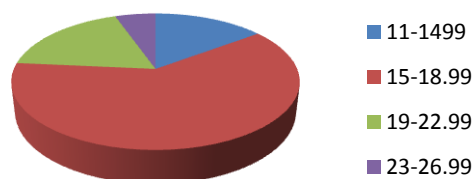
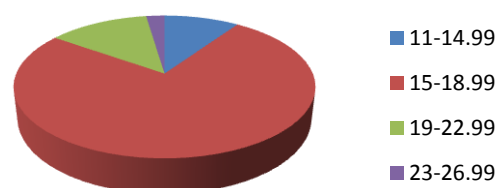


Fig2: distribution of girls according to their BMI

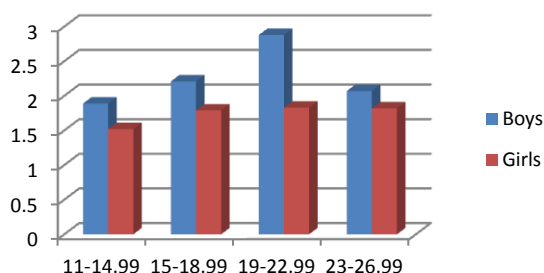


In case of boys the mean PEFr in BMI group 11-14.99 was 1.89±0.68, in 15-18.99 group mean PEFr was 2.21±0.80, in 19-22.99 group 2.88±0.74 and in 23-26.99 group mean PEFr was 2.07±0.15. The correlation coefficient was and p value was 0.01. When we compare PEFr between boys and girls of same BMI group it was found that mean PEFr was more in case of boys than the girls except in the BMI group 23-26.99 where boys had less PEFr than the girls.

Table 2: showing the mean PEFR of both boys and girls in different BMI groups.

BMI group	Mean PEFR	
	Boys	Girls
11-14.99	1.89±0.68	1.52±0.57
15-18.99	2.21±0.80	1.79±0.90
19-22.99	2.88±0.74	1.83±0.61
23-26.99	2.07±0.15	1.82±0.20

Fig 3: bar diagram showing the mean PEFR in both boys and girls in different BMI groups



DISCUSSION

From the present study we had found that PEFR is more in higher BMI group both in case of boys and girls except in the BMI group 23-26.99 where PEFR is decreased in comparison to the other groups. Which may be due to increased BMI that is due to the increased accumulation of fat under the diaphragm which hamper function of expiratory muscle? When the PEFR of boys and girls of the same BMI group were compared it was found that mean PEFR was more in case of boys in comparison to the girls which may be due to the difference in development of muscle of respiration. Singh et al (1979) measured PEFR in 851 healthy South Indian men and women. Men have higher PEFR than women, the average difference being about 140L/min. the PEFR was found to correlate best with height in subjects below 30yrs and weight did not show consistent relation with PEFR. There was a high negative correlation with AGE in the subjects over thirty.⁽³⁾

The study conducted by Sonu Ajmani, Anupama N et al “EFFECT OF ABDOMINAL FAT ON DYNAMIC LUNG FUNCTION TESTS” where PFT variables of low BMI and overweight BMI group was compared with that of normal BMI group, the result showed inverse relation between BMI.⁽⁴⁾

In the study “Effect of Obesity on Pulmonary Function in Children” conducted by Ergun Çetinkaya , Reha Cengizlier et al showed PEFR results of the obese group were 95.26±11.90, 89.48±12.5, 85.30±21.54 and 78.75±17.45, respectively. In non obese group the results were 90.66±13.74, 90.80±15.84, 90.35±22.89 and 76.91±18.83 respectively.⁽⁵⁾

In the study conducted by Dr. Smita P. Galphade, Dr. Manish D. Dhadse “EFFECT OF BODY FAT PERCENTAGE ON PEAK EXPIRATORY FLOW RATE (PEFR) IN YOUNG ADULTS OF INDIAN POPULATION” found a negative relation of PEFR with BMI. In their study 120 students of 18-25 years age group who had no lung disease were recruited. 60 students with BMI 25.0 - 29.9 kg/m² constituted study group and 60 students with BMI 18.5- 24.9 kg/m² constituted control group. In the study group the male subjects had mean PEFR of 381±12.81L/min and that of in the female subjects was 272±20.56L/min. The mean PEFR in the control group male was 464±23.92L/min and in case of female the mean PEFR was 328±10.11L/min. Maliik et al (1975) measure PEFR in 414 healthy Indian males and females. It was observed that PEFR values were linearly related to height and PEFR was uniformly lower in women than in male of corresponding age group.⁽⁶⁾

S. Natarajan and K. Radha (1978) recorded PEFR I 2060 healthy south Indian men and women. The highest reading for men was obtained in the age group from 21-25 years and women in the age group from 17-20years. They found that as the age advances above 35 yrs there was significant decline in the values and height is one of the most important factor which determines the PEFR in an individuals.⁽⁷⁾

A study done by Dikshit M. B. et al (1991) in 124 normal elderly men found that the PEFR regressed at rate of 4.47Lpm/year increase in age but was positively correlate to the subjects height (cm).⁽⁸⁾

Gupta et al (1979) reported flow rate with other function parameters in Rajasthani subjects. Their mean value of PEFR were 488.55L/min in men and

393.65L/min in women which also showed higher PEFR in male than female of same age group.⁽⁹⁾

The mean value reported by Kamat et al (1967) in South Indian men and women in the age group of 17-29years was 555L/min and 392L/min respectively. These values showed a higher PEFR in male subjects than the female subjects of the same age group.⁽¹⁰⁾

CONCLUSION

So from the present study we can conclude that BMI had a direct effect on PEFR and increased BMI due to accumulation of fat may hamper expiratory function. So regular exercise program in school may reduce the fat accumulation and there by BMI which will lead to good ventilatory functions. The present study also showed that PEFR is also affected by sex of the individual. In male due to good muscle development and increased chest circumference the ventilatory functions are more than in case of female.

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