VOLUME-7, ISSUE-2, FEBRUARY-2018 • PRINT ISSN No 2277 - 8160

Original Research Paper

Physiology

STUDY OF PEAK EXPIRATORY FLOW RATE AND ITS ASSOCIATION WITH WEIGHT AND HEIGHT IN FEMALES OF WEST BENGAL.

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ABSTRACT

Introduction: Peak expiratory flow rate (PEFR) is one of the important parameters among the pulmonary function tests. The PEFR values may be affected by various factors. On this background the present study was undertaken to study the variations in the PEFR with various factors like age, height, weight, BMI in healthy women of West Bengal

Material and Methods: A retrospective study was conducted in the Dept. of physiology, R.G.Kar Medical College, Kolkata. About 850 female subjects who were aged 20-50 years were selected and their PEFRs were determined. The influences of age, height, weight, and BMI on the PEFR were studied. The PEFR test was performed by RMS-HELIOS Spirometer.

Results: The mean PEFR of the women was found to be 268.4 ± 67.8 litres/minute. PEFR was positively correlated with height and weight.

Conclusion: Peak expiratory flow rate has significant association with age, height, weight and BMI in women.

KEYWORDS : bio-medical waste management, knowledge, hospital

INTRODUCTION:

Peak Expiratory Flow Rate (PEFR) is used as a measurement of ventilatory function and was accepted as an index of spirometry in 1949 [1]. PEFR is the largest expiratory flow rate after a maximally forced effort from a position of maximal inspiration, that is expressed in litres/min" [2]. PEFR is effort dependent are subjected to reflex bronchoconstriction [2]. The procedure for measuring PEFR is very simple and may be carried out using portable instruments in the field. The average PEFR of healthy young Indian males and females are around 500 and 350 litres/minute respectively [3]. In India with several latitudes, climatic zone, ethnic groups and dietary habits, lung function within the normal population would be expected to vary. It is well documented that sex, age, height and chest circumference are the main factors affecting Peak Expiratory Flow Rate (PEFR) [1]. The PEFR also may be changed with age.

There have been reports on the variations of various ventilatory parameters with anthropometric determinants like height and weight in previous studies [6, 7, 8, 9 10]. On this background the present study has been taken up to find out any relationship between PEFR and anthropometric parameters like height and weight in females of Westbengal.

Aims and objectives:

1. To study the variations in the Peak Expiratory Flow Rate (PEFR) with age, height, weight in healthy adult female subjects.
2. To find out any association of Peak Expiratory Flow Rate (PEFR) with height and weight in healthy adult female subjects.

MATERIALS AND METHODS:

Spirometric data obtained from subjects who were reffered to the Pulmonary Function Laboratory of the Physiology Department, R.G.Kar Medical College, Kolkata for medical checkup, over a period of one year from March 2012 to July 2014, were considered for inclusion in this retrospective study. About 850 were included in the present study following inclusion and exclusion criteria. Written informed consent from every subject was taken before performing the test. The essential inclusion criteria were (i) the performance of acceptable spirometry manoeuvre as per the ATS and European Respiratory Society (ERS) recommendations4, (ii) subjects were 15 to 50 years of age, (iii) apparently healthy (iv) spirometric values considered: FVC ≥ 80% of predicted, FEV1 ≥ 80% of predicted, FEV1/FVC≥ 70% of predicted.The following subjects were excluded from the study: (i) history of chest trauma; tobaccosmoking; exposure to substances known to cause lung injury i.e., asbestos, silica, cotton dust,coal, etc.; (ii) professions, such as, stone crushers, wood workers, cotton dust workers, pigeonbreeders etc.; (iii) known to have other diseases such as bronchial asthma, chronic obstructive pulmonary disease, pulmonary tuberculosis, pneumonia, chronic bronchitis, emphysema, hypertension, heart failure, diabetes mellitus or any other abnormality (iv) abnormal chest radiograph and electrocardiogram (ECG); and (v) use of diuretics, cardiac glycosides or betaadrenergic blocking drugs. Pulmonary functions were measured by the electronic spirometer, model-RMS Helios-702 in accordance with the standards of lung function testing of the American Thoracic Society/European Respiratory Society (ATS/ERS) [2]. The test was explained and demonstrated to the subjects. After a rest for 5–10 minutes, the test was carried out. The best of the three acceptable results was selected. Post bronchodilator (reversibility test) testing was performed 10 minutes after administration of the bronchodilator. Pulmonary function report included patient's gender, height, weight, age and smoking status. Standard spirometric measurements included were forced vital capacity (FVC), forced expiratory volume in one second FEV1, the ratio of forced expiratory volume in one second to forced vital capacity (FEV1/FVC), Forced Expiratory Flow in 25% (FEF25%), Forced Expiratory Flow in 50% (FEF50%), Forced Expiratory Flow in 75% (FEF75%), and Forced Expiratory Flow in 25-75% (FEF25%-75%), peak expiratory flow rate (PEFR). Spirometric parameters were recorded as a percentage of the normal value predicted on reported height and age. Weight was measured nearest to 0.1 kg using a standardized electronic weighing machine, with the subjects standing without footwear, with light clothes. The height of the subjects was measured with the stadiometer, to the nearest centimetre. The data were expressed in mean ± SD and they were analyzed by SPSS (Statistical Package for Social Sciences) statistical software version 17 using proper statistical test. Differences were considered statistically different when $p < 0.05$

RESULTS:

In our study Table-1 shows the baseline characteristics of the subjects. Mean age of the female subjects was 37.5 years. Mean(SD) Height, weight, BMI of the subjects were 149.5 (8.93) cm, 56.45(15.2) kg and 26.8(3.2) kg/m2 respectively.

The female subjects were grouped according to their height (Table-2) and the mean PEFR value recorded in each group. The PEFR in 166-170 cm height range was 324.66 ± 57.67 L/ min and it was maximum among the other height ranges whereas among the subjects having height less than 140 cm PEFR was 200.73±50 L/min and it was the minimum PEFR. From the Table-2 we observe that a gradual trend of increasing PEFR with respect to increasing height.

The female subjects were grouped according to their weight (Table-3) and the mean PEFR recorded in each group. It shows a proportionate increasing trend of PEFR values with weight and it was maximum among the age group 61-65 years and after that PEFR decreases with increasing age. Table 4 shows that Pearson correlation analysis of PEFR. From the table-4 we see that there is a significant strong positive correlation of PEFR with Height and Weight.

Discussion:

There are multiple factors like the strength of the expiratory muscles generating the force of contraction, the elastic recoil pressure of the lungs and the airway size which may influence PEFR in normal subjects [11]. Abdominal adiposity may influence pulmonary functions by restricting the descent of the diaphragm and limiting lung expansion as compared to overall adiposity which may compress the chest wall.

Previous study showed that there was an increase in the PEFRs with an increase in their heights [12-16]. This observation was consistent with the findings of our studies. In our study we observe that there was a gradual trend of increasing PEFR with the increasing height (Table-2). There was a significant strong (r= 0.47, p<0.0001) positive correlation of the PEFR with height in the study subjects, as shown in [Table-4]. This was probably because of the greater chest volume in the taller subjects. The growth of the airway passages and the expiratory muscle effort also increase with an increase in the height. Our study also shows a proportionate increasing trend of PEFR values with weight and PEFR and was found to be positively correlated with the weight, as shown in [Table-4] and that association was highly significant (r=0.34, p<0.0001). This observation was consistent with the reports of other authors [17].

Conclusion: Hence, it was concluded that the PEFR increases with an increase in height,Weight in Indian female subjects.

Table 1. Mean anthropometric data, body mass index (BMI), in females

Parameters	(n)	Mean	SD
Age(years)	850	37.5	20.6
Height (cm)	850	149.5	8.93
Weight(kg)	850	56.45	15.2
BMI (Kg/m2)	850	26.8	3.2
PEFR litres/minute.	850	268.4	67.8

TABLE 2: Variations of PEFR with height in normal young adult females

Height (cm)	No. of persons	PEFR (Mean ±S.D) L/min
<140	23	200.73±50
140-145	143	243.38±102.29
146-150	189	260±51.74
151-155	315	289.5±65.17
156 – 160	142	288. ± 54.75
161 – 165	30	293.68 ± 57.63
166 – 170	8	324.66 ± 57.67

TABLE 3: Variations of PEFR with weight in normal young adult females

Weight (kg)	(n)	PEFR L/min
<35	40	247.50±67.50
36-40	98	260.50±60
41-45	113	269.3±50
46 – 50	128	276.00 ± 57.06
51 – 55	150	300.00 ± 51
56 – 60	120	305.00 ± 53 .7
61 – 65	95	309.16 ± 60.33
66 – 70	38	294 ± 54.34
71 – 75	39	289.4 ± 65
76 – 80	29	308.00 ± 30

Table-4: correlation of PEFR with Height and Weight.

Correlation with PEFR	Pearson correlation coefficient (r)	p-values
Height (m)	0.47**	0.0001
Weight (Kg)	0.34**	0.0001

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