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Original Research Article

Variations In The PEFR With Various Factors With Respect To Age, Body Mass Index, Blood Pressure And Heart Rate Among Males And Females Patients

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Abstract

Introduction: PEFR is considered as the simplest index of pulmonary function. Ventilatory function tests like PEFR provide a better understanding of the changes in the lungs from a diagnostic viewpoint. It is effort dependent and reflects mainly the calibre of the bronchi and larger bronchioles, which are subjected to reflex bronchoconstriction. ***Objective:*** To study the variations in the PEFR with various factors with respect to age, body mass index, blood pressure and heart rate among males and females patients. ***Methods:*** This was a cross-sectional study conducted at Department of Medicine, Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh from January to December 2020 among young male and female subjects. The subjects with no history of cardio, availability & capacity to cooperate adequately, non- smokers; and no history of any drug intake which could affect the lung functioning were included in the study. PEFR was measured with the subject comfortably seated during the same time of the day for all subjects. It was determined in litres/minute with the help of "The Peak", Individualised Peak flow meter from Multispiro Inc. ***Results:*** Out of the total subjects 121 subjects, 45.4% were ≤18 years followed by 19-20 (42.1%) and >20 (12.3%). There were 37.1% males and 62.8% females. PEFR was found to be significantly (p=0.0001) higher among males compared to females in all the age groups. PEFR increased with increasing age in both male and female subjects. PEFR was found to be significantly (p<0.0) higher among males compared to females in the entire body mass index (BMI) category. PEFR increased with increasing BMI in both male and female subjects. ***Conclusion:*** PEFR is higher among male than female subject. Also, PEFR was higher in males than females in all the age groups and BMI status. The effects of various factors like age, height, weight, BSA and BMI on the PEFR values have also been discussed in this study. PEFR increases with increase in age and BMI in both male and female subjects.

Keywords: PEFR, BMI, Wright peak expiratory flow meter, man, Women.

INTRODUCTION

PEFR is considered as the simplest index of pulmonary function. Ventilator function tests like PEFR provide a better understanding of the changes in the lungs from a diagnostic viewpoint. The PEFR has been defined by the European Respiratory Society as the maximal flow which is achieved during the expiration which is delivered with maximal force, starting from the level of maximal lung inflation, following the maximal inspiration which was expressed in litres/min [1, 2]. It is effort dependent and reflects mainly the calibre of the bronchi and larger bronchioles, which are subjected to reflex bronchoconstriction [3]. It is relatively a simple procedure, and may be carried out in the field using portable instruments. The average PEFR of healthy young Indian males and females are around 500 and 350 litres/minute respectively [4]. The PEFR

reaches a peak at about 18-20 years, maintains this level up to about 30 years in males, and about 40 years in females, and then declines with age. This lung function test is useful for screening and monitoring the severity of asthma in a community, especially when the prevalence of asthma and asthma related hospital admissions are rising [5]. The PEFR is one of the convenient methods of measuring lung functions and also used as a screening tool in surveys and can be measured by untrained individuals with an inexpensive Mini-Wright peak flow meter [6, 7]. Assessment of lung function in middle aged and elderly persons is important for studying the effects of aging on the respiratory system and in clinical geriatric practice [8]. Pulmonary function is known to vary considerably between different regional and ethnic groups, residing within the same country [9]. The PEFR can be easily measured by using a peak flow meter which is easily portable and cheap, whereas the FEV_1 can only be measured by using a spirometer [5]. Thus, the FEV_1 measurements could be substituted by the easier PEFR measurements. The normal range of the PEFR is related to factors such as age, height, weight, gender, race and the environmental conditions [10, 11]. This study was done to show the variations of the PEFR with the age, height, weight, Body Surface Area (BSA) and the Body Mass Index (BMI) in healthy women of the Malwa region of Punjab, who were living within similar socio-cultural environments and were engaged in similar forms of physical activities.

MATERIAL AND METHODS

This was a cross-sectional study conducted at Department of Medicine, Shaheed Tajuddin Ahmad Medical College Hospital, Gazipur, Bangladesh from January to December 2020 among young male and female subjects. The consent was taken from each subject before including in the study. A total of 121 subjects were included in the study. The subjects with no history of cardio, availability & capacity to cooperate adequately, non-smokers; and no history of any drug intake which could affect the lung functioning were included in the study. The subjects were advised to have light breakfast in the morning and avoid wearing any tight clothes. They were then made to relax physically and mentally for 15 minutes. The vital parameters like blood pressure and heart rate were measured. Standing height was measured in centimeters with a standard height measuring rod; weight was measured in kilograms with calibrated Libra Weighing Scale. PEFR was measured with the subject comfortably seated during the same time of the day for all subjects. It was determined in litres/minute with the help of "The Peak", Individualised Peak flow meter from Multispiro Inc. Instructions and method of carrying out the test was demonstrated to all the subjects individually. The subjects were asked to inspire deeply, and then blow into the instrument's mouthpiece with nostrils closed.

Statistical Analysis

The results are presented in frequencies, percentages and mean±SD. The Unpaired t-test was used for comparisons. The Pearson correlation coefficient was calculated. The p-value<0.05 was considered significant. All the analysis was carried out on SPSS 19 version (Chicago, Inc., USA).

RESULTS

Out of the total 121 subjects, 45.4% were ≤18 years followed by 19-20 (42.1%) and >20 (12.3%). There were 37.1% males and 62.8% females (Table-1). PEFR was found to be significantly (p=0.0001) higher among males compared to females in all the age groups. PEFR increased with increasing age in both male and female subjects (Table-2). PEFR was found to be significantly (p<0.0) higher among males compared to females in the entire BMI category. PEFR increased with increasing BMI in both male and female subjects (Table-3). There was no significant (p>0.05) correlation of PEFR with blood pressure and heart rate in both male and females (Table-4).

Table 1: Distribution of age and gender of young healthy subjects (N=121)

Age in years	Male		Female		Total	
	No.	%	No.	%	No.	%
≤18	13	23.6	42	76.3	55	45.4
19-20	23	45.0	28	54.9	51	42.1
>20	09	60.0	06	40.0	15	12.3
Total	**45**	**37.1**	**76**	**62.8**	**121**	**100.0**

Table 2: Comparison of PEFR (L/min) between male and female with age among young healthy subjects (N=121)

Age in years	Male	Female	p-value[1]
≤18	445.00±61.31	340.21±36.32	0.0001*
19-20	466.67±69.06	331.25±57.23	0.0001*
>20	469.17±42.95	360.00±33.54	0.0001*
Total	**460.91±61.83**	**338.98±45.13**	**0.0001***

Table 3: Comparison of PEFR (L/min) between male and female with BMI among young healthy subjects (N=121)

BMI	Male	Female	p-value[1]
Underweight	396.00±28.81	312.50±33.70	0.001*
Normal	469.19±61.16	342.55±47.61	0.0001*
Overweight	460.00±67.33	336.92±42.68	0.0001*
Obese	470.00±43.58	366.67±28.86	0.02*

Table 4: Correlation of PEFR (L/min) in male and female with blood pressure and heart rate among young healthy subjects (N=121)

Blood pressure and heart rate	Male		Female	
	Correlation coefficient	p-value[1]	Correlation coefficient	p-value[1]
Systolic blood pressure	0.21	0.12	0.11	0.28
Diastolic blood pressure	0.22	0.09	-0.02	0.80
Heart rate	0.07	0.60	0.07	0.48

DISCUSSION

The decrease in the PEFR with an increase in age was probably because this variable was dependent on the expiratory effort and the elastic recoil of the lungs and the airway size, factors which are known to reduce with advancing age. A number of factors influence PEFR in normal subjects. This study showed that the PEFR decreased with an increase in age, as shown in table-1. This correlation was found to be negative and the results were found to be statistically highly significant ($p<0.005$). This was in agreement with the reports of other investigators [12-15]. PEFR is best correlated to height and weight, even though other physical factors such as age and body surface area may also correlate well [16]. Pulmonary function tests (PFTs) are one of the indicators of the health status of the individuals and could be used as a tool in general health assessment [17, 18]. There was a positive correlation of the PEFR with height in the study subjects, as shown in Table-2. The results were found to be statistically highly significant ($p<0.005$). This showed that there was an increase in the PEFRs of the study subjects with an increase in their heights. This observation was consistent with the findings of the studies which were conducted by other authors [19]. 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. The values of PEFR in this study were within the normal ranges for the healthy young male (360-900 L/min) and female (168-600 L/min) subjects [20]. The mean value of PEFR were higher for males compared to females ($P=0.0001$). The similar finding was also reported by Choudhuri and Choudhuri [21] among young adults from Tripura. In this study, PEFR increased with age which is in agreement with other various studies [12-15]. In this study, BMI was positively correlated with PEFR in both male and females. Ulger *et al.*, [22] had previously reported a significant positive correlation between BMI and PEFR in obese children and in obese patients with asthma respectively. The variation with this study may be as a result of the normal BMI recorded, compared to that reported by those researchers mentioned. Jena *et al.*, [23] found that BMI independently affects PEFR both in male female subjects of younger age group. The other studies found BMI and PEFR was negatively correlated in elderly (>40 years) age group persons [24, 25]. One of the limitations of this study was small sample size. The studies having large sample are recommended to have robust findings.

CONCLUSION

PEFR is higher among male than female subject. Also, PEFR was higher in males than females in all the age groups and BMI status. The effects of various factors like age, height, weight, BSA and BMI on the PEFR values have also been discussed in this study. PEFR increases with increase in age and BMI in both male and female subjects.

CONFLICT OF INTEREST

None.

FINANCIAL OR OTHER COMPETING INTERESTS

None.

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