

Variations in Peak Expiratory Flow Rate Among Males and Females with Respect to Age, Body Mass Index, Blood Pressure and Heart Rate

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DOI: 10.21276/sasjm.2019.5.7.4

| Received: 20.07.2019 | Accepted: 27.07.2019 | Published: 30.07.2019

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Abstract

Original Research Article

Objective: To study the variations in Peak Expiratory Flow Rate (PEFR) among Males and Females with respect to age, body mass index, blood pressure and heart rate in healthy young individuals. **Methods:** This was a cross-sectional study conducted 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 143 subjects, 44.1% were ≤18 years followed by 19-20 (41.3%) and >20 (14.7%). There were 38.5% males and 61.5% 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. PEFR increases with increase in age and BMI in both male and female subjects.

Key words: Healthy subjects, PEFR, BMI.

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INTRODUCTION

Peak Expiratory Flow Rate (PEFR) is considered as the simplest index of pulmonary function to assess the ventilatory capacity. It is effort dependent and reflects mainly the calibre of the bronchi and larger bronchioles, which are subjected to reflex bronchoconstriction [1]. 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 [2]. 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. The peak flow meter which is a reliable and safe, bedside instrument fulfills the need of assessing the ventilatory function. The portability and simplicity of the peak flow meter make it particularly suitable for studies of respiratory function [3].

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 [4, 5]. 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 [6]. Pulmonary function is known to vary considerably between different regional and ethnic groups, residing within the same country [7].

There are very few studies assessing PEFR variations with respect to demographic, body mass index and heart rate [8-10]. Therefore, the present study was planned to study the variations in PEFR among Males and Females with respect to age, body mass index, blood pressure and heart rate in healthy young individuals.

MATERIAL AND METHODS

This was a cross-sectional study conducted among young male and female subjects. The study was approved the Ethical Committee of the institute. The consent was taken from each subject before including in the study. A total of 143 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.

Methods

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 \pm 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 16.0 version (Chicago, Inc., USA).

RESULTS

Out of the total subjects 143 subjects, 44.1% were ≤ 18 years followed by 19-20 (41.3%) and >20 (14.7%). There were 38.5% males and 61.5% 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

Age in years	Male		Female		Total	
	No.	%	No.	%	No.	%
≤ 18	16	25.4	47	74.6	63	44.1
19-20	27	45.8	32	54.2	59	41.3
>20	12	57.1	9	42.9	21	14.7
Total	55	38.5	88	61.5	143	100.0

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

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

¹Unpaired t-test, *Significant

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

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

¹Unpaired t-test, *Significant

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

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

¹Pearson correlation

DISCUSSION

A number of factors influence PEFR in normal subjects. PEFR is best correlated to height and weight, even though other physical factors such as age and body surface area may also correlate well [11]. 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 [12, 13]. A

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 [14].

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 [15] among young adults from Tripura. In this study, PEFR increased with age which is in agreement with other various studies [8-10].

In this study, BMI was positively correlated with PEFR in both male and females. Ulger *et al.* [16] 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.* [17] 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 [18, 19].

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. PEFR increases with increase in age and BMI in both male and female subjects.

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