Original Research Article

Assessment of peak expiratory flow rate in relationship with anthropometric parameters in male and female medical students

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Abstract

Background: Peak Expiratory Flow Rate is influenced by various factors such as sex, racial, body surface area, posture, obesity, physical activity, geography and climate. PEFR measurement is a simple, convenient, and more reliable method to evaluate the pulmonary functions. In one or two decades, obesity was found to be life threatening non communicable disease predisposing to health hazards in children, adolescence and young adults. **Aims:** This study was therefore designed to measure the PEFR in male and female medical students and to explore the association between PEFR and selected anthropometric variables such as height, weight and BMI among them. **Material and Methods:** This Cross sectional study consists of 118 medical students from GCRG Institute of medical sciences, Lucknow, Uttar Pradesh. We excluded Smokers, students who were doing regular exercises, History of cardiac or pulmonary diseases. **Results:** There were a gender difference in all the anthropometric parameters and PEFR. The mean height, weight and PEFR were observed to be significantly higher among male students than the female students, while mean values of BMI were higher in the female students and were not significantly difference between the genders. **Conclusions:** The present study showed that PEFR have strong positive correlation with height and weight. Our finding revealed that PEFR increases along with increase in height and Weight. It can be concluded that PEFR is affected variably by variation in BMI.
Key Word: Anthropometry, PEFR, Body Mass Index.

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INTRODUCTION

Peak Expiratory Flow Rate (PEFR) was first introduced by Hadorn in 1942 but however, PEFR was accepted as an index of pulmonary function test/spirometry in 19491. PEFR measurement is a simple, convenient, and more reliable method to evaluate the pulmonary functions[2]. PEFR is influenced by various factors such as sex, racial, body surface area, posture, obesity, physical activity, geography and climate[3, 4, 5]. An extensive review of literature, we found that many researchers evaluated the variations of different lung function parameters with anthropometric parameters like height and weight. Search of literature revealed many studies established the association between PEFR and anthropometric parameters like height and weight in males and females. The data which is accessible are based on males and females, children or old ages, and rural or urban areas[6, 7, 8, 9]. There are only few studies regarding the association between the PEFR and Body Mass Index (BMI) 10. This study was therefore designed to measure the PEFR in male and female medical students and to explore the association between PEFR and selected anthropometric variables such as height, weight and BMI among them.

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MATERIAL AND METHODS

The Study population consists of 118 medical students of different years, aged between 17 to 23 years of age who were among the students of GCRG Institute of Medical Sciences, Lucknow, Uttar Pradesh. They study was conducted in the Department of Physiology, GCRG Institute of Medical Sciences, Lucknow, after receiving ethical clearance from the institution. Only those who were willing to participate voluntarily were enrolled for the study. Participant's signature was taken on the consent form.

Inclusion Criteria

1. Medical students of GCRG Institute of medical sciences, Lucknow.
2. Non- smokers
3. Non – athletes
4. No history of cardiac or pulmonary disease like bronchial asthma. COPD.

Exclusion Criteria

1. Smokers.
2. Students who were doing regular exercises.
3. History of cardiac or pulmonary diseases.

After applying the exclusion criteria, relevant data from the selected medical students was recorded in a prescribed proforma. Anthropometric parameter includes the height, weight, and BMI. The landmarks for measuring the height, weight and BMI includes the following. Height of the subject was recorded in centimeters without shoes using standard height scale fixed to wall with moving head piece. Body weight was recorded in kilograms without shoes by using weighing machine. Body Mass Index (BMI) is illuminated as the body weight (Kgs) divided by square of heights in meters. Statistical analysis was done with the help SPSS version 18.0.

RESULTS

Our study consists of 118 medical students of different years between 17-23 years of age inclusive. One hundred and eighteen (118) subjects composed of 65 male medical students between the age of 17 to 22 with the mean age of 19.23 years and 53 female medical students between the age of 17 to 23 with a mean age of 18.79 years were enrolled in the study. Table 1 represents the comparison of PEFR and anthropometric parameters (height, weight and BMI) between the male and female students. The mean (± SD) of height, weight, BMI and PEFR of males and females were 166.7 (± 9.32) and 158.4 (± 8.3), 64.25 (± 12.52) and 58.34 (± 10.61), 22.60 (± 3.82) and 23.32 (± 3.63), 471.8 (± 77.98) and 344.7 (± 67.41) respectively. There were a gender difference in all the anthropometric parameters and PEFR. The mean height, weight and PEFR were observed to be significantly higher among male students than the female students, while mean values of BMI were higher in the female students and were not significantly difference between the genders.

Table 1: Distribution of anthropometry and PEFR between male and females students (n=118)

Parameters	Males	Females	*P value*
Age (Years)	19.23(± 1.34)	18.79 (± 1.31)	0.0769 ns
Height (cm)	166.7 (± 9.32)	158.4 (± 8.3)	<0.0001***
Weight (kg)	64.25 (± 12.52)	58.34 (± 10.61)	0.0074**
BMI	22.60 (± 3.82)	23.32 (± 3.63)	0.2986 ns
PEFR (L/min)	471.8 (± 77.98)	344.7 (± 67.41)	<0.0001***

Peak expiratory flow rate, BMI: Body mass index. Statistical Significance- *P<0.05, **P<0.001, ***P<0.0001 In relation to different height interval, the mean (± SD) PEFR values of male and female medical students were illustrated in table 2. There was statistically significantly higher PEFR values in males compared to females in all height intervals except in >180 category.

Table 2: Distribution of different height intervals and PEFR between male and females students (n=118)

Height Interval (cm)	Males		Females		*P* Value
	N	PEFR Mean (±SD)	N	PEFR Mean (±SD)	
140-150	4	465(± 43.59)	8	342.5 (± 20.53)	<0.0001***
151-160	10	371 (± 84.25)	27	315.9 (± 56.31)	0.0275*
161-170	28	492.1 (± 62.02)	13	356.9 (± 49.22)	<0.0001***
171-180	20	487.5 (± 66.88)	3	393.3 (± 46.19)	0.0297*
>180	3	523.3 (± 47.26)	2	440.0(±56.57)	0.1687ns

*P<0.05, **P<0.001, ***P<0.0001

In relation to different weight interval, the mean (± SD) PEFR values of male and female medical students were illustrated in table 3. There was statistically significantly higher PEFR values in males compared to females in all weight intervals except in 76-85 and 86-95 categories.

Table 3: Distribution of different weight intervals and PEFR between male and females students (n=118)

Weight (kg)	Males		Females		*P* Value
	N	PEFR Mean (±SD)	N	PEFR Mean (±SD)	
35-45	4	402.5 (±132.0)	8	296.3 (± 23.87)	0.0433*
46-55	14	456.4 (± 101.3)	15	324.7 (± 56.43)	0.0002***
56-65	22	483.2 (± 54.02)	24	367.1 (± 77.65)	<0.0001***
66-75	15	480.7 (±72.94)	2	366 (±14.14)	0.0085**
76-85	6	495 (± 81.91)	2	370 (± 42.43)	0.0931 ns
86-95	4	465(± 36.97)	2	410 (± 36.97)	0.1248 ns

*P<0.05, **P<0.001, ***P<0.0001

Table 4: Distribution of different BMI and PEFR in both Male and Female students

BMI based classification	Males			Females		
	N	Mean	Std. Deviation	N	Mean	Std. Deviation
Underweight	5	530.00	95.917	6	328.22	43.970
Normal Weight	35	509.13	47.282	17	341.25	57.721
Over Weight	25	467.20	59.268	30	303.33	32.042
Total	65	491.32	61.956	53	337.14	48.563

The mean values in Table 4, illustrate the distribution of different BMI groups had different PEFR values with the normal weight highest and the overweight group showing lowest value in both the gender.

Table 5: Correlation coefficient between various anthropometric variables and PEFR

Variables	Males (r)	Females (r)	Total (r)	*P* Value
Height (cm)	0.4052***	0.5336***	0.5893	<0.0001***
Weight (kg)	0.1251	0.3166*	0.3048	0.0008***
BMI	-0.0947	0.0606	-0.0877	0.3448 ns

Peak expiratory flow rate, BMI: Body mass index. Statistical Significance- *P<0.05, **P<0.001, ***P<0.0001 Table 5 represents the pearson's correlation co-efficient (r and p) values between the PEFR and anthropometric parameters (p<0.05). We observed a very strong correlation between the PEFR and all anthropometric parameters except BMI.

DISCUSSION

In the present study, medical students from different academic years were involved and divided into two study groups based on genders. After applying the exclusion criteria, their peak expiratory flow rate (PEFR) values along with anthropometric parameters were measured. The mean age of male students was found to be 19.23 years (range 17-22 years) whereas in female students, mean age was 18.79 years (range 17-23 years). There was no statistical age difference found between the male and female students (table 1). Seema *et al* tabulated the PEFR based on age distribution and reported that the highest mean values of PEFR was observed in the age group of 25-29 years.[11] Similar results were reported by Udwadia FE *et al* and Malik SK *et al*.[12,13] In the literature review, we are evident that the mean value of PEFR was declined along with advancing age.[11] The mean values of all the anthropometric parameters like height, weight, and BMI was documented based on genders. We observed that all the anthropometric values were higher in males than females. The present study reveals the results which was similar to previous studies [14, 15]. The mean height was observed to be significantly higher among male students than the female students. The mean values of PEFR were highest in the height group of >180 cm in both male and female students. There was statistically significantly higher PEFR values in males compared to females in all height intervals except in >180 category (table 2). It is evident by analysis that there is increased tendency of mean PEFR values with increasing height interval. Our results are in accordance to study done by Seema *et al* and Mohammadzadeh I *et al* [11, 16]. The mean and standard deviation of PEFR for weight interval in both the groups was tabulated in table 3. There was statistically significantly higher PEFR values in males compared to females in all weight intervals except in 76-85 and 86-95 categories. It is evident by analysis the table that the mean of PEFR increases steadily with increasing weight interval upto 76-85 kg in males and then it declines whereas in females there is increased tendency of PEFR with increasing weight interval. This is in accordance to study done by Dharamshi *et al*. They observed that the association of PEFR with weight in both the genders increases to certain interval of increasing weight and then decreases as weight increases further [14]. PEFR showed strong positive correlation with height (r^2 = 0.5893, P = <0.0001) and with weight (r^2 = 0.3048, P = <0.0008). The present finding revealed that PEFR increases along with

increase in height and Weight. PEFR has no significant correlation with BMI in the present study. But it was contradicting to previous studies [17]. This difference may be due to disparity in sample collection and population. PEFR was measured based on BMI under various different groups, BMI being one of the important parameter to assess obesity. At the turn of new millennium, obesity was found to be life threatening non communicable disease predisposing to health hazards in children, adolescence and young adults. We observed that the mean and standard deviation of BMI in female students (23.32 ± 3.63) was slight higher than the male students (22.60 ± 3.82) which are not statistically significant (table1). BMI was classified as underweight, normal weight and overweight among the study groups. We observed that the distribution of different BMI groups had different PEFR values with the normal weight highest and the overweight group showing lowest value in both the gender (table 4). Our findings were very similar to Borse LJ *et al*, Saxena Y *et al* who also reported the mean values of PEFR was more in normal weight than overweight students in both the genders.[17,18]

CONCLUSION

The present study showed that PEFR have strong positive correlation with height and weight. Our finding revealed that PEFR increases along with increase in height and Weight. It can be concluded that PEFR is affected variably by variation in BMI. We observed that the distribution of different BMI groups had different PEFR values with the normal weight highest and the overweight group showing lowest value in both the gender.

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