

RESEARCH ARTICLE

Study of peak expiratory flow rate in male and female young adults with respect to their weight status

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ABSTRACT

Background: Young adults are more attracted toward fast food, alcohol, and sedentary lifestyles. Previous study shows that peak expiratory flow rate (PEFR) correlates better with height in males and weight in females. Body mass index (BMI) is one of the main factor that affect PEFR values. PEFR, a pulmonary function test is routinely used to confirm the diagnosis of the respiratory disease. **Aim and Objectives:** This study was conducted to evaluate PEFR values in male and female young adults in underweight, normal, overweight, and obese categories of weight status. **Materials and Methods:** The study was conducted in four groups. 40 participants in each group, includes males (20) and female (20) young adults. The groups were divided according to BMI values, underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), and obese (>30). Data were taken and calculated 2 h post lunch after relaxing for 15 min in the afternoon. In the sitting position, at the same time of the day, PEFR values were measured using Wright's Peak Flow Meter. **Results:** We found significantly high PEFR values in males as compare to females in the category of underweight (<0.01), normal (<0.05) and overweight (<0.05). The study also shows positive correlation between BMI and PEFR in underweight male and females, normal males, overweight females, and obese females, which is statistically non-significant, except in obese males. **Conclusion:** We concluded that male have high PEFR values than female as there are differences in their body build-up and low PEFR values in underweight and obese young adults as they have low body fat and reduced expansion of lungs, respectively.


KEY WORDS: Underweight; Obese; Peak Expiratory Flow Rate; Young Adults

INTRODUCTION

In the Indian population, asthma and chronic obstructive pulmonary disease are the main two causes of respiratory disabilities. More than 300 million people are suffering from asthma and its clinical presentations mainly starts in early childhood. Peak expiratory flow rate (PEFR) and a pulmonary function test is routinely used to confirm the diagnosis of the respiratory disease.^[1] The European Respiratory Society

defines PEFR as the maximal expiratory flow which is delivered with maximal force that begins from the level of maximal inspiration.^[2] It is the maximum velocity of flow in liters per minute with which air is forced out of the lungs, and it is recorded by using peak-flow meter. Moreover, these values are highest in young adults that is maintained up to 30 years in male and 40 years in female.^[3,4]

As per recent trends, young adults are more attracted toward fast food, alcohol, and sedentary lifestyles. Previous study shows that PEFR correlates better with height in males and weight in females. Body mass index (BMI) is one of the main factors that affect PEFR values. Underweight subjects have compromised respiratory function as there is a decrease in diaphragmatic mobility with reduced respiratory muscle activity. General obesity reduces the pulmonary function by

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compressing the chest wall and limiting the movement of diaphragm, however fat that accumulated in the abdomen has adverse effect on lung compliance and elastic recoil.^[5,6]

The present study evaluates PEFR in male and female young adults according to their weight categories underweight, normal, overweight, and obese. This study is required as it helps young generations to perform routine exercises to increase their respiratory efficiency to reduce respiratory morbidity and mortality.

MATERIALS AND METHODS

The study was approved by the Institutional Ethical Committee of Dr. Kiran C Patel Medical College and Research Institute Bharuch. Written informed consent was obtained from each participant before the study. Male and female healthy young adults between the age group of 18 and 25 years were recruited, height and weight were taken, and BMI values were calculated.

BMI = Weight in kg/height² in meters^[7]

This study was conducted in four groups. 40 participants in each group, includes males (20) and female (20) young adults. Groups were divided according to BMI values, underweight (<18.5), normal (18.5–24.9), overweight (25–29.9) and obese (>30).^[8] Data were taken and calculated 2 h post lunch after relaxing for 15 min in the afternoon.

In the sitting position, at the same time of the day, PEFR values were measured using Wright's peak flow meter in liters per minute. Participants were asked to inspire deeply which is followed by maximum expiration in the mouth piece of the instrument with nostril closed. This procedure was done three times and the highest value was taken.^[9]

All the data were compared using unpaired *t*-test. *P* < 0.05 was considered statistically significant, *P* < 0.01 was considered highly significant. In all groups, correlation between BMI and PEFR was found by calculating Pearson's correlation factor (*r*). All statistical analysis was done in SPSS software version 17.

RESULTS

- Age, height, and weight of male and female young adults were comparable to each other in the category of underweight, normal, overweight, and obese
- Significantly high PEFR values in males as compare to females in the category of underweight (<0.01), normal (<0.05), and overweight (<0.05)
- Nonsignificantly high PEFR values in males as compare to females in obese (>0.05)
- Comparison of underweight with normal: Significantly (<0.05) low PEFR values in males, and non-significantly (>0.05) low PEFR values in females

- Comparison of overweight with normal: Significantly (<0.01) high PEFR values in males and non-significantly (>0.05) high PEFR values in females
- Comparison of obese with normal: Significantly (<0.05) low PEFR values in males, and non-significantly (>0.05) low PEFR values in females
- Underweight: Non significant positive correlation of BMI with PEFR in male and female
- Normal: Non significant negative correlation of BMI with PEFR in male and non-significant positive correlation of BMI with PEFR in female
- Over weight: Non-significant positive correlation of BMI with PEFR in male and insignificant negative correlation of BMI with PEFR in female
- Obese: Significant positive correlation of BMI with PEFR in male and non-significant positive correlation of BMI with PEFR female

DISCUSSION

The current study was conducted to evaluate PEFR values in male and female young adults in underweight, normal, overweight and obese categories of weight status. PEFR values in this study were within the normal ranges for the healthy young male (360–900 L/min) and female (168–600 L/min) subjects.^[10] This study shows high PEFR in males as compared to female young adults. Furthermore, we found low PEFR in underweight and obese participants.

Table 1 shows anthropometric data of male and females in the categories of underweight, normal, overweight and obese participants. We found significantly high PEFR values [Table 2] in males as compare to females in category of underweight (<0.01), normal (<0.05), and overweight (<0.05) which is in accordance with the study of Hossain *et al.*,^[2] Mishra and Mishra,^[4] Choudhuri and Choudhuri.^[11] We have reported significantly low PEFR values [Table 3] in males of

Table 1: Age, height, and weight of male and female young adults according to their weight status

Variables	Age (years)	Height (m)	Weight (kg)
Underweight			
M	18.23±0.81	1.73±0.07	50.96±3.91
F	18±0.81	1.58±0.06	42.55±3.86
Normal			
M	18.5±0.93	1.72±0.06	61.8±7.62
F	18.25±0.72	1.57±0.06	53.01±5.55
Over weight			
M	18.2±0.91	1.78±0.05	87.1±8.84
F	18.57±0.85	1.58±0.05	66±6.53
Obese			
M	18.71±0.75	1.48±0.17	75.42±10.26
F	18.85±0.89	1.56±0.06	79.14±5.78

Table 2: Comparison of PEFR values in male and female young adults with their weight status

Variables	Male	Female	P-value
Underweight	378.84±102.11	276.5±52.40	<0.01
Normal	435±79.4	305.73±64.14	<0.05
Overweight	502±104	314.28±60.47	<0.05
Obese	344.28±124.88	295.71±48.25	>0.05

PEFR: Peak expiratory flow rate

Table 3: Comparison of PEFR values of underweight, overweight, and obese with normal

PEFR Values	Variables	P-values
Comparison of underweight with normal	M	<0.05
	F	>0.05
Comparison of overweight with normal	M	<0.01
	F	>0.05
Comparison of obese with normal	M	<0.05
	F	>0.05

PEFR: Peak expiratory flow rate

Table 4: Correlation of PEFR values with BMI in male and female young adults according to their weight status

Variables	BMI	PEFR	r	P-value
Underweight				
M	16.98±0.81	378.84±102.11	0.090	0.662
F	16.96±1.11	276.5±52.40	0.243	0.130
Normal				
M	20.78±1.85	435±79.4	-0.192	0.309
F	21.17±1.90	305.73±64.14	0.120	0.329
Overweigh				
M	27.34±1.74	502±104	0.216	0.550
F	26.32±1.60	314.28±60.47	-0.036	0.903
Obese				
M	34.59±5.31	344.28±124.88	0.859	0.013*
F	52.40±2.51	295.71±48.25	0.147	0.753

PEFR: Peak expiratory flow rate, BMI: Body mass index

underweight category as compare to normal weight status. Study by Priyanka *et al.* supports our study and mentioned that low PEFR values in underweight is due to low body fat as compare to normal. They also reported significantly low PEFR values in overweight male and females, which is in contrast to our study as we found significantly high PEFR in males and non-significantly high PEFR in females. Table 3 also shows decreased PEFR values in obese male and females as they have limited lung expansion and restricted movement of the diaphragm due to the accumulation of fat in the abdominal cavity.^[12,13] This study also shows positive correlation between BMI and PEFR [Table 4] in underweight male and females, normal males, overweight females and obese females, which is statistically nonsignificant, except in obese males. In addition to this, we also found negative

correlation of BMI and PEFR in normal males and overweight females. Study by Namita and Ranjan reported significant negative correlation between BMI and PEFR and mentions that high BMI with low PEFR suggestive of obesity is an important risk factor for lung function and reduced airflow.^[14]

As this study involves young adults according to their weight status categories is required to give them a message to live healthy and stay away from fast food. It is also required to convey a message that adding a routine exercise in their schedule help them to increase respiratory efficiency. Although this study have some limitations, as in future further detailed studies are required that involves a large number of participants.

CONCLUSION

This study was conducted to find the relation of PEFR in male and female young adults as per their weight status. We concluded that male have high PEFR values than female as there are differences in their body build-up. In addition to this, we also found low PEFR values in underweight and obese young adults as they have low body fat and reduced expansion of lungs, respectively.

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