



A comparative study of peak expiratory flow rate and anthropometry in college students of same age group

Swati Jangam*¹, Sangeeta Tuppad D¹ and RH Taklikar²

¹Department of Physiology, Khaja Banda Nawaz Institute of Medical Sciences, Gulbarga, Karnataka, India

²Department of Physiology, Navodaya Medical College, Raichur, Karnataka, India

Received for publication: December 13, 2013; **Revised:** January 08, 2014; **Accepted:** January 17, 2014

Abstract: Peak expiratory flow rate is a simple parameter for assessing the lung functions. Lung functions are affected by age, height, weight, chest circumference, socioeconomic factors and environmental factors. Present study was carried out to study variation in peak expiratory flow rate (PEFR) in relation to anthropometry in college students of same age group and to compare PEFR in male and female students of same age group. 50 male and 50 female healthy and non-smoker students between age group 17 to 22 years were selected for the study. PEFR was measured in standing position using mini Wright's flow meter. Chest circumference measured at the level of nipples. Statistical analysis done by Pearson's coefficient correlation. PEFR in female students was between 300 liters/min to 396 liters/min and in male students it was 450 liters/min to 620 liters/min. PEFR was more in male students than in female students of same age group. PEFR increased as height, weight, chest circumference increased. Variations seen in PEFR are due to sex related variation and also variation in built of the subjects, which is also affected by food culture and environmental factors.

Keywords: PEFR, Anthropometry.

INTRODUCTION

Measurement of Peak expiratory flow rate using portable mini Wright's peak expiratory flow meter is a very simple procedure. Peak expiratory flow rate is the maximum flow per minute achieved during an expiration delivered with maximal force starting from the level of maximum lung inflation. PEFR is expressed in terms of liters/min. In males and females age, height, weight and chest circumference are the main factors, which affect PEFR. Race and the environmental conditions also affect PEFR^{1,2,3,4,5}. The average PEFR in healthy young Indian males is about 500 liters/min and in females it is about 350 liters/min. The PEFR reaches a peak by 18-20 years; it remains same at this level up to age 30 years in males, and up to 40 years in females. After that with increasing age PEFR decreases.⁶ In India wide variation in lung functions is seen in normal subjects. This is due to regional variation in culture and climate, latitude and food habits.^{7,8}

Objectives:

- 1) To study variation in PEFR in relation to anthropometric measurements in students of same age group.
- 2) To compare PEFR in male and female students of same age group.

MATERIALS AND METHODS

50 male and 50 female healthy and non-smoker students between age group 17 to 22 years were selected for the study. The study was conducted in November - December 2011 at Physiology department Navodaya Medical College, Raichur, Karnataka. PEFR was measured in standing position using mini Wright's peak flow meter. Three readings were taken and best of three attempts was considered for study. Chest circumference measured at the level of nipples.

Exclusion criteria

- H/o any acute or chronic respiratory disease
- H/o any prolonged medication for respiratory complaints

Ethics

Written consent from all participants and institution's ethical clearance was obtained.

Statistics

For comparison Pearson coefficient correlation (2 tailed) was done.

*Corresponding Author:

Dr. Swati Jangam,
C/o Dr. Sanjeev Tadasadmath,
Plot NO: 241, Godutai Nagar, Jewargi Road,
Gulbarga-585102, Karnataka, India.



RESULTS

Table 1: Descriptive statistics of male and female students

Sex	N	Minimum	Maximum	Mean	Std Deviation
Female:					
PEFR in L/min	50				
Age in years	50	300.00	396.00	357.6471	21.42412
Height in cm	50	17.00	22.00	18.3137	0.83643
Weight in Kg	50	130.00	170.00	153.9216	7.92551
Chest circumference in centimeters	50	34.00	75.00	51.725	9.10841
Valid N list wise	50	56.00	97.00	76.0431	8.68406
Male:					
PEFR in L/min	50	450.00			
Age in years	50	17.00	620.00	522.36	44.48286
Height in cm	50	157.20	22.00	18.4200	0.97080
Weight in Kg	50	50.00	187.50	169.744	8.18855
Chest circumference in cm	50	73.00	90.00	63.60	9.71429
Valid N list wise	50	107.00		86.1760	6.04657

Table 2: Descriptive Statistics of Height and PEFR

Height category (centimetres)	N	Minimum PEFR L/Min	Maximum PEFR L/min	Mean	Standard Deviation
130 -140	3	300.00	390.00	346.6667	45.09250
141 -150	14	330.00	380.00	355.2857	14.91735
151 -160	33	310.00	500.00	386.30	52.32858
161 -170	31	300.00	590.00	473.4194	79.66295
171 - 180	14	480.00	590.00	522.8571	26.72612
181 - 190	6	540.00	620.00	600.0000	30.33150

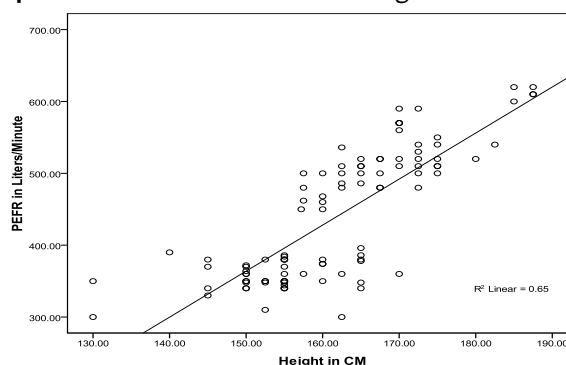
Table 3: Descriptive statistics of Weight and PEFR

Weight category (Kg)	N	Minimum PEFR L/min	Maximum PEFR L/min	Mean L/min	Standard Deviation
30 - 40	4	300.00	380.00	342.5000	33.04038
41 - 50	25	310.00	460.00	363.9200	32.63679
51 - 60	42	300.00	570.00	440.0952	77.94176
61 - 70	16	360.00	590.00	501.6250	68.97040
71 - 80	12	374.00	620.00	514.1667	91.09619
81 - 90	2	590.00	620.00	605.0000	21.21320

Table 4: Descriptive statistics of Chest Circumference and PEFR

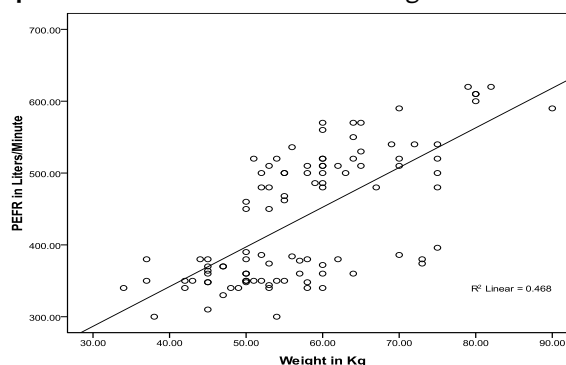
Chest circumference (centimetres)	N	Minimum PEFR L/min	Maximum PEFR L/min	Mean	Standard Deviation
50 - 60	1	300.00	300.00	300.00	
61 - 70	15	300.00	380.00	350.2667	21.27194
71 - 80	31	310.00	560.00	398.0000	67.11781
81 - 90	41	340.00	610.00	475.4146	73.65900
>91	13	374.00	620.00	536.4615	81.13427

Graph 1: Pearson’s Correlation for Height and PEFR

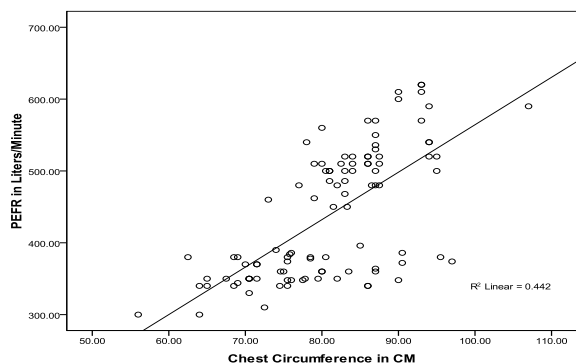


** Correlation is significant at the 0.01 level (2-tailed)

Graph 2: Pearson’s Correlation for Weight and PEFR



** Correlation is significant at the 0.01 level (2-tailed)

Graph 3: Pearson's correlation for Chest Circumference and PEFR

**Correlation is significant at the 0.01 level (2-tailed)

RESULTS

PEFR in female students is 300 L/min to 396 L/min and in male students it is 450 L/min to 620 L/min. PEFR is more in male students than in female students of same age group. PEFR increased as height, weight, chest circumference increased. Pearson's coefficient correlation for PEFR and height, weight and chest circumference is significant at level 0.01

DISCUSSION

In this study PEFR in male students was more than that of female students of same age group. PEFR showed linear positive correlation with height, weight and chest circumference in both male and female students. These findings are similar to other studies in India.^{9,10} In healthy person PEFR increases as height, weight and chest circumference increase.¹¹ With increase in height and weight, oxygen demand for the body tissues is increased. To cope with increased oxygen demand, ventilation has to increase. The increased ventilation increase respiratory function and leads to increase in PEFR.¹² With increase in height the chest volume also increases. Growth of airway passage and efforts by respiratory muscle are more in taller person¹³ in our study male and female students are of same age group. Here anthropometric measurements are important factors affecting PEFR.

REFERENCES

1. Cotes JE. Lung function. Third edition. Oxford: Blackwell; 1975

2. Qureshi KA, Hassan G, Masoodi MA, Khan GQ. Peak Expiratory flow rate among gujar and non-gujjar population of Kashmir valley. JK science. 2004; 6:84-87.
3. Elebute EA, Femipearse D. Peak flow rate in Nigeria: Anthropometric determinants and usefulness in assessment of ventilator function. Thorax. 1971; 26:597-601.
4. Hankinson JL, Odencrantz JR, Fedan KB, Spirometric reference values from a sample of the general U.S. population. Am J Respir Crit Care Med. 1999; 159:179-87.
5. Tahera H. Doctor, Sangeeta S, Trivedi and Rajesh K Chuasamma. Pulmonary function test in healthy school children of 8 to 14 years age in south Gujarat region, India. Lung India. 2010 Jul-Sep; 27(3): 145-148.
6. Dikshit MB, Raje S, Agrawal MJ, Lung functions with spirometry: an Indian perspective--I. Peak expiratory flow rates. Indian J Physiol Pharmacol. 2005 Jan; 49(1):8-18.
7. D Ray, A Rajaram, J Richard, Peak expiratory flow in rural residents of Tamil Nadu, India. Thorax. 1993 February; 48(2): 163-166.
8. Jepegnam V, Amritraj G, Sulochana, Damodarasamy, Rao VM, Peak expiratory flow rate in a random healthy population of Coimbatore. Indian J Physiol Pharmacol, 1996 Apr;40(2):127-33
9. Prasad R, Verma SK, Agrawal GG, Mathur N. Prediction model for peak expiratory flow in North Indian population. Indian J Chest Dis Allied Sci. 2006 Apr-Jun; 48(2):103-6
10. Ebomoyi MI, Iyawe VI, Variations of peak expiratory flow rate with anthropometric determinants in a population of healthy adult nigerians. Niger J Physiol Sci, 2005 Jun-Dec; 20 (1-2):85-9.
11. Bandopadhyay P, Verma SS, Lakhera SC, Kishore N, Ghadiok AK, Kain TC, Butanj B. Age and height as predictors of peak expiratory flow rate in Indian girls. Ann Hum Biol. 1993 Mar-Apr; 20 (2): 147-53.
12. Malhotra, Varun; Srinivasaragavan N; Patil, Rajkumar; Jaiganga R, Correlation of peak expiratory flow rate with anthropometric measurement in young adults. International Journal of Current Research & Review; Nov 2011, Vol. 3 Issue 11, p149.

Source of support: Nil

Conflict of interest: None Declared