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Factors Influencing Peak Expiratory Flow Rate among Selected People in Basrah City

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Abstract

Background: In many obstructive airway diseases, including asthma, the Maximum Expiratory Flow (PEFR) measurement offers a reliable and objective technique for estimating the amount of airway blockage. Peak expiratory flow rate can be easily evaluated with a peak flow meter at home by the patient or their parents. The peak expiratory flow rate test measures how fast the air is circulating through the lungs.

Materials and Methods: The study was done in college of Dentistry, University of Basrah, we select 301 person who agree to participate of this study, an anthropometric measure were obtained from all subjects after simple interview, peak expiratory flow rate was obtained by using peak flow meter, then the result were analyzed using SPPSS.

Conclusions: Peak expiratory flow rate in males was higher than females and showed a strong positive correlation with the study participants' age, height, weight, and body surface. The subjects' age and body mass index had an inverse relationship with peak expiratory flow rate; however, it was not statistically significant

Keywords: PEFR, BMI, height, weight, surface area

Introduction

Knowledge of the normal function of individual organs in humans is fundamental in examining the effect of the patient's pathological process. In many obstructive airway diseases, including asthma, the Maximum Expiratory Flow (PEFR) measurement offers a single, reliable, and objective technique for estimating the amount of airway blockage. The PEFR can be easily evaluated with a peak flow meter at home by the patient or their parents[1]. The anatomy of the respiratory system is well adapted to its primary function of transporting gases (O_2) and out (CO_2) of the body. The tidal volume (TV) is the amount of air moving in and out of each respiratory cycle of the lungs. In a healthy male and a healthy female, it measures around 500 mL, and on average, 400 ml respectively. The extra volume of air that can be

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inspired after the normal, calm inspiration is reached, is inspiratory reverse volume (IRV. ~2 L), while the extra air volume can be expired from the lungs after the normal expiry of the tidal volume with a certain effort, is the expiratory reserve volume (ERV; ~1 L), and the amount of air remaining in the lungs of a person after exhalation is the residual volume. (RV; ~1.3 L. The total volume of air in the lungs is the lung capacity (TLC), with the greatest inspiration. The average lung capacity of healthy adults is approximately 6 liters. The different lung capacity of individuals depends on their age, gender, body composition, and ethnicity[1]. The inspiratory capacity (IC, ~2. 5 L) is the maximum air volume that can be inspired by a normal quiet expiration that is the total of the tidal volume (TV) and the inspiratory reverse volume. While the functional residual capacity (FRC; ~2.5 L) reflects the volume of the air left in the lungs after the expiration of a normal breath (RV + ERV).[2]

The pulmonary dysfunction was determined using dynamic measurements of lung volumes and capabilities. CVF is often clinically measured as an index of pulmonary function, the highest air that can be exhaled by maximum inspiration. It provides important information about the strength and other aspects of the pulmonary function of the breathing muscles. Forced expiratory volume (FEV) measures the amount of air that can exhale a person during the forced breath. The air exhaled in the first (FEV1), second (FEV2), and/or third (FEV3) of the forced breath can be measured. The peak expiratory flow rate (PEFR), which originates from full lung inflation, is the maximum flow rate generated during the forceful expiration. PEFR reflects large airway flows in particular and is dependent on the patient's voluntary work and muscular strength.[3]

In order to make the PERF test useful, you need to keep records of your flow rate, except that when the flow rate is low or decreasing, you will not see the trend. These trends can help prevent worse symptoms before a complete attack on asthma. The PEFR test can help you decide if your medicine is adjusted. It can also help you to determine if pollutants or environmental factors affect your breathing. PEFR was introduced in 1942 and accepted as a spirometrically-sensitive index by Hadron as a measure of ventilatory function).[2]

Materials and Methods

We chose 301 participants at random from Basrah City and neighboring areas who met the normality criteria outlined in an earlier paper during their attendance to the outpatient-teaching clinic at College of Dentistry, Basra, Iraq. Al subjects in the current study were over the age of 18 and were either nonsmokers or symptom-free smokers. The age, sex, height without shoes, and weight were recorded, the surface area was calculated using:

$$surface\ area = \sqrt{\frac{m \times H}{3600}}$$

Where m mass (Kg) and H height (Cm).

The use of parameters in addition to the body mass is in some cases required for a more precise scaling relationship. One example is the scatter of a person's surface area, A (m2). Which depends on height H (m) and mass (Kg).

$A = 0.202 \times m^{0.425} \times H^{0.725}$

All respondents' heights were measured without shoes, as well as their chest measurements following expiration (empty chest) and inspiration (full chest). The Peak flow meter correctly made a maximum effort and recorded the greatest value obtained in three consecutive attempts while standing. We normalized the data by dividing a subject's measured PEFR by the predicted peak, because PEFR is a function of both height and age. All of the factors, as well as the PEFR, were encoded and entered into a spreadsheet (Ms. Excel), which was then employed in conjunction with the statistical package SPSS version 23.

Results

The participants in this prospective interventional study were 301 people who met the inclusion criteria. One hundred twenty one males (40.2%) and 180 women (59.8%) participated in the survey. All of the people chosen are between the ages of 17 and 75, with a mean age of 27.95 and a standard deviation of ± 12.4. The participants' heights ranged from 141 to 197 cm, with a mean of 161.17 and SD of ±9.78, and their weights ranged from 41 to 155 kg, with a mean of 161.17 and SD of ±15.77. About 30% of the people chosen live in rural areas. Only approximately a quarter of the men in the study smoked (22.3%).

According to the body mass index (BMI) in this study, underweight people made up only 1.3 percent, normal people made up 54.5 percent, and overweight people made up 44.2 percent. The tables (1, 2, and 3) show the measure of EPRF in terms of smoking habits, gender, and residency participants, respectively. Men had a higher PEFR than women, and those who lived in rural regions had a higher PEFR, which was statistically significant, and as expected, it was higher among non-smokers men, although the difference was not statistically significant.

The association between PEFR and all participants' age, height, weight, BMI, and surface area is shown in table (4). The age of the participants in this study was shown to be inversely correlated with the measured PEFR, but with no statistical significance, but the PEFR was found to be positively correlated with height, weight, and surface area, with significant statistical significance. Despite the fact that BMI has a negative correlation, it is not statistically significant.

The calculated Regression equation of both genders was:

Female: 402.679-0259 Hight+0.023weight-1.057 age.

Male: 100.912+3.44 Hight+0.234weight-1.562 age.

Discussion

Age of the people was a good predictor of PEFR(4). In this study, the age was associated positively with the PEFR, but with no statistical significance, The PEFR decreased with age, most likely, as it was dependent on expiratory effort, lung elastic recoil, and airway size, all of which are known to decline with age[5,6]. PEFR was also significantly higher in males than females, which is consistent with earlier findings[7,4,8,9]. Males with a higher PEFR score than women with a weaker body and more fat deposits are influenced by body composition, muscular strength and nutritional status.[10]

The PEFR was highly statistically significant correlated/associated positively with the participants' weight. This finding was consistent with many studies[11], in which we concluded that the PEFR was significantly lower in obese women, and in12 which stated that the PEFR was significantly lower in overweight adolescents, and in study[6], which concluded that the PEFR of the study individuals increased as their weight increased, .despite a study conducted in India in 2019 finding no correlation8. PEFR was found to be significantly correlated with participants' height, as found in another study that stated that the PEFR correlated well with height and weight, another study concluded that age, height, and weight were significant predictors of PEFR[4], and another study[8,6] stated that the PEFR was significantly correlated positively with people's height. The PEFR had a positive relationship with the study individuals' height, which was likely due to the taller respondents' larger chest volume. With an increase in height, the airway channels expand and the expiratory muscle work increases[5].

All of the study participants' residences were found to have an impact on the measured PEFR, with those who resided in rural areas having a significantly higher; this conclusion contradicted a study conducted in Bangladesh, which reported that rural areas had a significantly lower PEFR.[13] Regarding body surface area was found to be positively correlated with PEFR, and this finding was consistent with other studies [(6)], which demonstrated an increase in body surface area resulted in an increase in the PEFR of the study subjects, as well in agreement with a study from Bangladesh[13], which found a significant positive correlation between PEFR and body surface area.

In the study individuals, the PEFR was found to be adversely linked with BMI, with a reduction in the PEFR as the BMI increased. However, there was no significant association between the PEFR and BMI (p>0.05), this finding was consistent with other study[5,8]. PEFR was higher in nonsmokers solely among males, as expected, however this was not statistically significant. However, comparable findings have been observed in other studies, such as one conducted in India[2,9] .

Conclusions

The PEFR was higher in males than females in this study, and it exhibited a strong positive correlation with age, height, weight, and body surface area of study participants. The subjects' age and BMI had an inverse relationship with PEFR, however it was not statistically significant.

Table 1: PEFR measurement of the study sample according to the smoking habit

	Smoking habit	N	Mean	SD. Deviation	SD. Error Mean
PEFR	Non smoker	94	458.670	91.0317	9.3892
	Smoker	27	437.358	80.4690	15.4863

P value 0.274

Table 2: PEFR measurement of the study sample according to gender

	Gender	N	Mean	SD. Deviation	SD. Error Mean
PEFR	Male	121	453.915	88.9079	8.0825
	Female	180	337.917	69.2101	5.1586

P value 0.01

Table 3: PEFR measurement of the study sample according to residency

	Residency	N	Mean	SD. Deviation	SD. Error Mean
PEFR	Urban	211	381.387	93.9691	6.4691
	Rural	90	391.956	101.5724	10.7067

P value 0.384

Table 4: Correlation of PEFR with age and anthropometric measurement

		Age	Height	Weight	BMI	Surface area
Peak expiratory flow rate	Correlation Coefficient	-.030-	0.491**	.265**	-.009-	.376**
	Sig. (2-tailed)	.602	0.000	.000	.883	.000
	N	301	301	301	301	301

Ethical Clearance: taken from institutional ethical committee.

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Conflict of Interest: Nil

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