OPEN ACCESS
Scholars Bulletin
Abbreviated Key Title: Sch Bull
ISSN 2412-9771 (Print) |ISSN 2412-897X (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Subject Category: Human Physiology

Lung Function Test of Smokers and Non-Smokers in Ubimini Community, Emohua Local Government Area of Rivers State

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DOI: 10.36348/sb.2023.v09i05.003 | **Received:** 07.05.2023 | **Accepted:** 16.06.2023 | **Published:** 27.06.2023

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Abstract

The Lung function test of smokers and non-smokers was carried out using spirometer and Peak Expiratory Flowmeter in 50 subjects in Ubimini Community of Rivers State. Their ages ranged from 19.0 to 40.0 years. Mean PEFR was 524.5±80/min in smokers and 418.4 ± 96/min in non-smokers. Smokers are insignificantly lower than non-smokers. Mean 'TV was 255.8+98 in smokers and 246.4±84 in non-smokers. These results obtained showed an exceptionally increase, instead of a decrease because of the passive smokers who were exposed to cigarettes smoke most of the time while in the midst of heavy smokers but do not smoke themselves. This agreed with the findings that cigarette particles inhaled by smokers and non-smokers settle on their airway epithclia and alveoli and can elicit allergic reactions. Mean 1RV was 401.2±110 in smokers and 402.7±126 in non-smokers. Mean ERV was 323.3±150 in smokers and 424±185 in non-smokers. Mean VC was 908.4±171 in smokers and 914.3±192 in non-smokers. This showed that a non-smoker is likely to have more respiratory volume than a smoker. Mean BM1 was 40.25± 8kg/m^2 in smokers and 37.55 ± 5kgm^2 in non-smokers. This fact also agreed with the findings that cigarette particles inhaled by smokers and non-smokers settle on their airway epithelia and alveoli thus, can elicit allergic reactions. In comparison, PEFR is lower in smokers than in non- smokers. Thus, smokers have low flow rate when compared with non-smokers. This means that, cigarette smoking has adverse effect on lung volumes.

Keywords: Lung function test, smokers, non-smokers, emohua, Rivers State.

INTRODUCTION

The Lung Function Test refers to a group of experiments useful in determining the capacity in which the lung can produce air (inhale and exhale) in the chest cavity. The experiments are carried out using the spirometer and the peak expiratory flowmeter (Balarajah and Ere, 2010).

The spirometer consists of a drum inverted over a chamber of water, with the drum counterbalanced by a weight. In the drum is a breathing

mixture of gases (air or oxygen). A tube connects the mouthpiece with a gas chamber. When a subject breathes in and out of the chamber. When a subject breathes in and out of the chamber, the drum rises and falls, and an appropriate recording is made on a kymogram (Balarajah & Ere, 2010).

Spirometry is the measurement of the volume of air that is moved in and out of the lungs in different conditions. The recording made by a spirometer is known as a spirogram; it shows the volume changes that occur during breathing and is used to assess lung function (Van & Derlenden, 2019).

The Peak Expiratory Flowmeter is a metre that has the shape of a space gun. The reading is on the side of the instrument, from right to left. The experiment is to test the amount of air that can be expelled from the subject's lungs (Van *et al.*, 2019).

Rationale of the Study

Increasing awareness of people's lung health through the use of lung function tests is a potential method to aid smoking cessation in the study area. It will give health practitioners in the area more information on how well the lungs can expand with each breath and whether they empty normally or whether there is obstruction in the airways. While the scientific community has made significant progress in enhancing the understanding of lung function in smokers and nonsmokers, more research integrating biological and environmental factors is required to fully elucidate the development of pulmonary disorders.

MATERIALS AND METHODS

A total of 50 human subjects were used for this study; out of this group, 24 constituted the control group. Both male and female subjects were used for both the experimental and control studies. The ages of the subjects ranged from 19 to 46. All the subjects were in the Ubimini community in Emolga Rivers State. The parameters measured for this study were weight and height. The body mass index (BMI), which is the ratio of weight (kg) to the square of height (M2), was estimated from the weight and the height.

The lung volumes measured are tidal volume (TV), inspiratory reserve volumes (IRV), expiratory reserve volumes (ERV), vital capacity (VC), and peak expiratory flow rate (PEFR). The materials used for weight and height measurement are a seca weighing balance and a height scale. The materials used for measurement of lung volumes are a spirometer and blue ink for the stylus writer. Kymograph and recording paper; deltol, methylated spirit, and cotton wool; tissue paper and cellotape; and a peak expiratory flowmeter.

Measurement of weight and height: The Seca weighing balance and height scale were used for the measurement of both the weight and height of the subjects. The subjects were made to put on only light clothing. They were also advised to remove their shoes. Heavy objects such as wrist watches were removed, and the subject was made to stand barefoot, backing the instrument in an erect position, placing the upper limbs on both sides of the body. The scale lever was brought down to touch the head surface. The height scale reading was taken, placing the eyes in a parallel position. The height scale is graduated from 75 to 200cm. It was thereafter converted to metres.

The Seca weighing balance possesses two graduated scales lying on either side of the scale. The large-weight metal square is moved along the scale, and the small-weight metal square is also moved until a balance point is obtained. The weight scale at the top is graduated from 0 to 10kg, while the weight scale below is graduated from 0 to 100kg. The weight is measured from the arrow point in the scale below, and some fraction is added at the top of the scale above it. It is measured in kilogrammes (kg). The measurement was carried out in one replication.

M**easurement of Lung Volumes:** The mouthpiece was sterilised with methylated spirit soaked in cotton wool. Comfortably seat the subject with the mouthpiece in position and the nose clipped. Subjects were allowed to get used to breathing through the mouthpiece into the atmosphere. The kymograph speed was set at 1 mm/sec. The temperature of the gas in the spirometer was recorded by turning the valve to the spirometer position at the end of expiration. The breathing of the resting subject was recorded for a few minutes (5 minutes). The subjects were asked to maximally breathe out and then to take the fullest inspiration possible. We checked for leaks in the system by carrying out the following procedure: Place the valve lever in the spirometer position, slowly raise the float to the maximum position, and then move the valve lever to the atmospheric position.

Measurement of Peak Expiratory Flow Kate: The mouthpiece was sterilised with methylated spirit soaked in cotton wool. 1) The subject inhaled deeply. 2) The subject placed the mouthpiece in the mouth, sealing its circumference with the lips. 3) The subject exhaled sharply and as forcefully as possible using the chest and diaphragm muscles.

Whenever the individual's air exceeds the limit of the scale, the peak expiratory flowmeter is adjusted by turning the rotatory part after the mouthpiece. The range selector is tuned clockwise or anti-clockwise to change the range of the metre. To take a reading, the range selector was adjusted, changed, and the subject tried again. The limit where the subject cannot exhale through the marker was taken as the reading value. This

procedure was repeated three times, and the average values of the force expiratory' volumes were recorded.

RESULT

The outlay of the results obtained in this study is as displayed in table 1 to 6. The parameters measured included weight (kg), Height (m2) and Body Mass Index (BMI). The BM1 is calculated as:
BMI = Weight (Kg)/Height (M^2).

Table 1: Mean values of Tidal volume (TV) of smokers and non-smokers

Parameters Measured	Smokers	Non-Smokers
Tv (Liters)	[a]255.8±98	[b]246.4±84

a Value is mean ±SD of mean for smokers (n:26); b value is mean ±SD of mean for non-smoker (n—24). The mean value for smokers is 255.8±98 while for non-smokers is 246.4±84.

Table 2: Mean values of inspiratory Reserve volume (IRV) of smokers and non-smokers

Parameters Measured	Smokers	Non-Smokers
IRV(litres)	[a]401.2±110	[b]402.7±126

a Value is mean ±SD of mean for smokers (n-26); b Value is mean ±SD of mean for smokers (n=24). The mean value for smokers is 401.2±110 while for non-smokers is 402.7±126. 110

Table 3: Mean values of Expiratory Reserve volume (IRV) of smokers and non-smokers.

Parameters Measured	Smokers	Non-Smokers
ERV(litres)	[a]323.3±150	[b]426 ±185

a Value is mean ±SD of mean for smokers (n=26); b Value is mean ±SD of mean for smokers (n=24). The mean value for smokers is 323.3 ± 150 while for non- smokers is 426.4±185.

Table 4: Mean value of Vital Capacity (VC) of smokers and non-smokers

Parameters Measured	Smokers	Non-Smokers
VC(litres)	[a]908.4±171	[b]914.3±192

a value is mean ±SD of mean for smokers (n=26); b value is mean ±SD of mean for smokers (n=24). The mean value for smokers is 908.4 ± 171 while for non -smokers is 914.3+192.

Table 5: Mean values of Peak Expiratory flow rate (PEFR) of smokers and non-smokers

Parameters Measured	Smokers	Non-Smokers
PEFR (Liters /min)	[a]338.9±67	[b]418.2±198

a value is mean ±SD of mean for smokers (n=26), b value is mean ±SD of mean for smokers (n=24). The mean value for smokers is 338.9 ±67 while for non-smokers 418.2±198.

Table 6: Mean values of body Mass Index (BMI) of smokers and non-smokers

Parameters Measured	Smokers	Non-Smokers
I (Kg/M^2)	[a]40.25±8	[b]37.55±5

a value is mean ±SD of mean for smokers (n—20); b value is mean ±SD of mean for smokers (n—24). The mean value for smokers is 40.25 ±8 while for non-smoker is 37.55±5.0

DISCUSSIONS

Our results showed that the mean tidal volume of smokers is significantly higher than that of non-smokers, as shown in Table 1. For example, the mean TV value for smokers is 255.8±98 while that for non-smokers is 246.4±884. This shows an exceptionally high increase instead of a decrease because passive smokers, who are exposed to cigarettes and smoke most of the time while in the midst of heavy smokers but do not smoke themselves, This fact also agreed with the findings that cigarette particles inhaled by smokers and non-smokers settle on their airway epithelia and alveoli and can elicit allergic reactions.

The mean IRV values of smokers were insignificantly lower than those of non-smokers, as shown in Table 2. E.g., the mean IRV value for smokers is 401.2±110, while that for non-smokers is 402.7 ± 126.

The mean ERV value of smokers was insignificantly lower than that of non-smokers, as shown in Table 3. E.g., the mean ERV value for smokers is 323.3 ± 150, while that for non-smokers is 426.4 ± 185.

Also, the mean VC value of smokers is insignificantly lower than that of non-smokers, as shown in Table 4. For example, the mean VC value for smokers is 908.4 ± 171, while that of non-smokers is 914.3 ±192. These results and interpretations agreed with the previously reported works by Krumbols,

Chevalier, and Ross (2017), which found that smoking, had the effect of reducing lung compliance and that abstinence from smoking increased vital capacity. Also agreeing with the previously reported work, Zanel *et al.,* (2019) and Pead Ashby (2017) separately showed that cigarette smoking caused a reduction in vital capacity. Similarly, Whitefield and Amnot (2017) showed a slight decrease in vital capacity and residual volume.

The mean PEFR values of smokers are insignificantly lower than those of non-smokers, as shown in Table 5. The mean PEFR value of smokers is 338.9 ± 67/min, while that of non-smokers is 418.2 ±98/min. This result agrees with Peter and Femi's (2019) finding that peak expiratory flow rate using a peak expiratory flowmeter is lower in smokers when compared to non-smokers.

The mean body mass index value of smokers is significantly higher than that of non-smokers at 37.55 ± 5 kg/m2. These findings buttress the fact that cigarette particles inhaled by smokers and non-smokers settle on their airway epithelia and alveoli and can elicit allergic reactions.

A literature review revealed that the few studies that have been carried out relate to the peak expiratory flow rate (PEFR (1) and vital capacity (VC) (5) and (6).

CONCLUSION

The study concludes that cigarette particles inhaled by smokers and non-smokers settle in their airway epithelia and alveoli and can cause allergic reactions. In comparison, peak expiratory flow rate (PEFR) is lower in smokers than non-smokers. Thus, smokers have a low flow rate. Compared to non-smokers, this means that cigarette smoking has an adverse effect on lung volume.

RECOMMENDATIONS

The following recommendations are drawn from the study:

1. Smokers are advised to quit smoking to prevent diseases of the lungs.
2. Smoking should be discouraged by the government through the Ministry of Health because of its tendency to elicit allergic reactions, which in turn cause harm to users.
3. Seminars should be organised in order to educate the public on the dangers of smoking.

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