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Impact of Lung Volume among Tobacco Smokers and Non-Tobacco Smokers of Kerala

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Abstract

The purpose of this study is to examine the lung capacity between tobacco smokers and non-tobacco smokers. This was a casual comparative study, where the statistical population included 25 tobacco smokers and 25 non-tobacco smokers age between 20 to 25 from pathanamthitta District, Kerala. The parameters measured in spirometer are Lung Volume (LV), Forced vital capacity (FVC), Forced expiratory volume (FEV) at timed intervals of 0.5, 1.0 (FEV1), 2.0, and 3.0 seconds, maximal voluntary ventilation (MVV), also known as Maximum breathing capacity. After the collection of relevant data, to know the difference between tobacco smokers and non-tobacco smokers, the data was collected with the Spiro meter and the t-test was employed and with the help of Statistical technique. The level of significance was set at 0.05. Based on the statistical analysis of data following findings were drawn by the researcher. The result of present study proved that there was significant difference between MVV maximum voluntary ventilation of tobacco smokers and non-tobacco smokers. Further the statistical analysis shows that non-tobacco smokers has more MVV then tobacco smokers. The result of present study proved that there was significant difference between FVC force vital capacity of tobacco smokers and non-tobacco smokers. Further the statistical analysis shows that a non-tobacco smoker has more FVC then tobacco smokers. The result of present study proved that there was significant difference between FVC1 of tobacco smokers and non-tobacco smokers. Further the statistical analysis shows that a non-tobacco smoker has more FVC1 then tobacco smokers. The result of the study proved that was significant difference between PEFR OF tobacco smokers and non-tobacco smokers. These results of the study confirm the findings of Rao *et al* (1992) who also reported significant difference between tobacco smokers and non-tobacco smokers. The statistical analysis shows that non-tobacco smokers has more PEFR then tobacco smokers.

Keywords: Tobacco smokers, non-tobacco smokers, lung volume, forced vital capacity (FVC), maximal voluntary ventilation (MVV), Forced expiratory volume (FEV1) and Peak expiratory flow Rate (PEFR)

Introduction

Tobacco use increases the risk for many types of cancer, such as Lung cancer. Studies show a direct link between cigarette smoking and coronary heart disease. Smoking, including during the teenage years, increases the risk of dying from COPD. Studies show that just being around smoke on a regular basis makes people more likely to get cancer and heart disease (Brandili, *et al.* 1996) [2]. Light smoking can shorten your life. Even people who averaged less than one cigarette per day over their entire lives were 64% more likely to die early than people who'd never smoked. Smoking cigarettes affects the respiratory system, the circulatory system, the reproductive system, the skin, and the eyes, and it increases the risk of many different cancers. In addition to health care interventions and a person's surroundings, a number of other factors are known to influence the health status of individual, including their background, lifestyle, and economic, social conditions, and spirituality; these are referred to as "determinants of health." Studies have shown that high levels of stress can affect human health. The respiratory system is involved in the intake and exchange of oxygen and carbon dioxide between an organism and the environment. In air-breathing vertebrates like human beings, respiration takes place in the respiratory organs called lungs (Atif *et al.*, 2015) [1]. The passage of air into the lungs to supply the body with oxygen is known as inhalation, and the passage of air out of the lungs to expel carbon dioxide is known as exhalation; this process is collectively called breathing or ventilation. In humans and other mammals, the anatomical features of the respiratory system include

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trachea, bronchi, bronchioles, lungs, and diaphragm. Molecules of oxygen and carbon dioxide are passively exchanged, by diffusion, between the gaseous external environment and the blood. This exchange process occurs in the alveoli air sacs in the lungs (Bernspang, 2011) [4].

The Effects of Cigarette Smoking on the Respiratory System; Damage to the respiratory system from cigarette smoking is slow, progressive, and deadly. A healthy respiratory system is continuously cleansed. The mucus produced by the respiratory tubules traps dirt and disease-causing organisms, which cilia sweep toward the mouth, where it can be eliminated. Smoking greatly impairs this housekeeping. With the very first inhalation of smoke, the beating of the cilia slows. With time, the cilia become paralyzed and, eventually, disappear altogether. The loss of cilia leads to the development of smoker's cough. The cilia no longer effectively remove mucus, so the individual must cough it up. Coughing is usually worse in the morning because mucus has accumulated during sleep (Bennett, 2015) [3]. To make matters worse, excess mucus is produced and accumulates, clogging the air passageways. Pathogenic organisms that are normally removed now have easier access to the respiratory surfaces and the resulting lung congestion favors their growth. This is why smokers are sick more often than nonsmokers. In addition, a lethal chain reaction begins. Smokers cough leads to chronic bronchitis, caused by destroyed respiratory cilia. Mucus production increases and the lining of the bronchioles thickens, making breathing difficult (Caldirola, 2004) [5]. The bronchioles lose elasticity and are no longer able to absorb the pressure within the alveoli (microscopic air sacs) enough to rupture the delicate alveolar walls; this condition is the hallmark of smoking-induced emphysema. The burst alveoli cause worsening of the cough, fatigue, wheezing, and impaired breathing (Dockery, 1988) [7]. Eighty percent of lung cancer cases are due to cigarette smoking. Only 13% of lung cancer patients live as long as 5 years after the initial diagnosis. Smokers not only increase their risk of lung disease, including lung cancer, but they also increase their risk of other illnesses, including heart disease, stroke, and oral (mouth) cancer (Cook, 1993) [6]. Risks from smoking, as they relate to lung disease, include the following:

Chronic obstructive pulmonary disease (COPD) which includes: Chronic bronchitis, Emphysema, Lung cancer and other cancers; The symptoms of smoking-related lung diseases may look like other lung conditions or medical problems. Second hand smoke is smoke that is exhaled by smokers and smoke emitted from the burning end of a lit cigarette, cigar, or pipe. It causes more than 7,000 lung cancer deaths each year in persons who do not smoke. Children and infants exposed to tobacco smoke are more likely to experience ear infections, and asthma. They are also at a higher risk for sudden infant death syndrome (SIDS) than children and infants not exposed to secondhand smoke. Health of a person is depend on their lungs capacity. It is vast aspect of our health. Vital capacity is the maximum volume of air that a person can exhale after maximum inhalation. It can be the maximum volume of air that a person can inhale after maximum exhalation. Vital capacity is the maximum amount of air a person can exhale from the lungs after first filling the lungs to their maximum extent and then expiring to the maximum extend (about 4600 milliliters). It equals the inspiratory reserve volume plus the tidal volume plus the expiratory reserve volume

($VC=IRV+TV+ERV$). We can measure the vital capacity with the help of Spirometer (Frampton, 1997) [8].

Materials and Methods

Subjects: The purpose of the present study was to compare the lung volume of tobacco smokers and non-tobacco smokers. To attain this purpose total twenty five (N=25) tobacco smokers and twenty five non tobacco smokers between age group of 20 – 25 years from Pathanamthitta District of Kerala were selected as subjects.

Tools: Spirometer is the most common of the pulmonary function tests (PFTs), measuring lung function, specifically the amount (volume) and/or speed (flow) of air that can be inhaled and exhaled. Spirometer is an important tool used for generating pneumotachographs, which are helpful in assessing conditions such as asthma, pulmonary fibrosis, cystic fibrosis, and COPD. **Parameters:** The parameters measured in spirometer are Lung Volume (LV), Forced vital capacity (FVC), Forced expiratory volume (FEV) at timed intervals of 0.5, 1.0 (FEV1), 2.0, and 3.0 seconds, maximal voluntary ventilation (MVV), also known as Maximum breathing capacity. Other tests may be performed in certain situations. A bronchodilator is also given in certain circumstances and a pre/post graph comparison is done to assess the effectiveness of the bronchodilator. See the example printout.

Statistical Technique: After the collection of relevant data, to know the difference between tobacco smokers and non-tobacco smokers, the data was collected with the Spirometer and the t-test was employed and with the help of Statistical technique. The level of significance was set at 0.05.

Table No 1: Mean, SD and T-Value for FVC of Tobacco Smokers and Non-Tobacco Smokers

Variable	Group	Mean	SD	t-value
FVC	Tobacco Smokers	4.26	0.85	3.64*
	Non-Tobacco Smokers	5.08	0.74	

t.05 (48) = 2.01

The findings of Spirometric test on Tobacco Smokers and Non- Tobacco Smokers namely Mean, SD and t values for FVC are shown in table no 1. The table statistically reveals that the calculated t value 3.64* for FVC of Tobacco Smokers and Non Tobacco Smokers is higher than table value 2.01. Therefore the Values of table show that, there has been significant difference between force vital capacity of tobacco smokers and non- tobacco smokers. The results of table no 1 are also depicted in figure no 1.

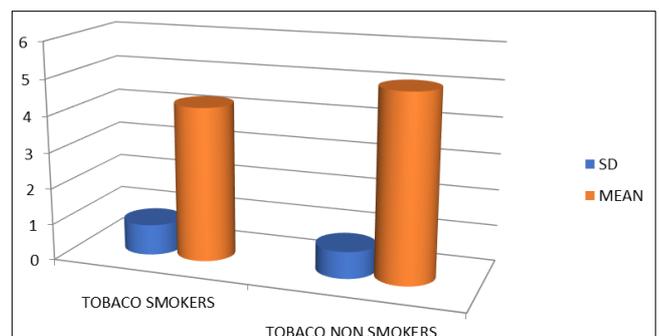


Fig 1: Mean, SD and T-Value for FVC of Tobacco Smokers and Non- Tobacco Smokers

Table No 2: Mean, SD and T-Value for MVV of Tobacco Smokers and Non- Tobacco Smoker

Variables	Group	Mean	SD	t- Value
FVC	Tobacco Smokers	4.26	0.85	3.64*
	Non- Tobacco Smokers	5.08	0.74	

$t_{.05} (48) = 2.01$

The findings of Spiro metric test on Tobacco Smokers and Non Tobacco Smokers namely Mean, SD and t values for MVV are shown in table no 2. The table statistically reveals that the calculated t value 3.06 for MVV of Tobacco Smokers and Non Tobacco Smokers is more than table value 2.01. Therefore the values of table show that, there has been significant difference between Maximum voluntary ventilation of tobacco smokers and non- tobacco smokers. The results of table no 2 are also depicted in figure no. 2

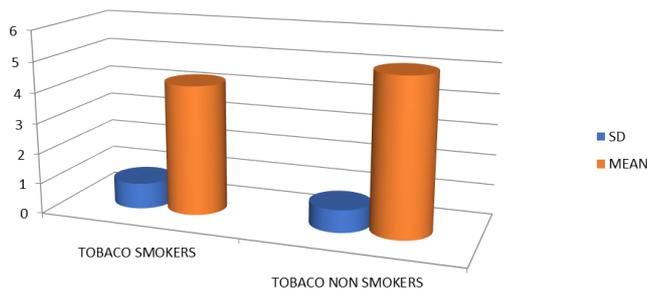


Fig 2: Mean, SD and T-Value for MVV of Tobacco Smokers and Non-Tobacco Smoker

Table No 3: Mean, SD and T-Value for FEV1 of Tobacco Smokers and Non Tobacco Smokers

Variables	Group	Mean	SD	t- Value
FEV1	Tobacco Smokers	3.75	0.66	4.44*
	Non- Tobacco Smokers	4.57	0.63	

$t_{.05} (48) = 2.01$

The findings of Spiro metric test on Tobacco Smokers and Non Tobacco Smokers namely Mean, SD and t values for FEV1 are shown in table no 3. The table statistically reveals that the calculated t value 4.44* for FEV1 of Tobacco Smokers and Non Tobacco Smokers is more than table value 2.01. Therefore the values of table shows that, there was significant difference between Forced expiratory volumes in 1 second of tobacco smokers and non- tobacco smokers. The results of table no 3 are also depicted in figure no 3.

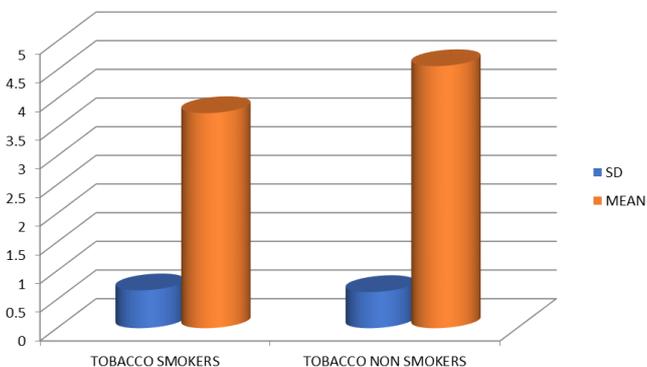


Fig 3: Mean, SD and T-Value for FEV1 of Tobacco Smokers and Non Tobacco Smokers

Table No 4: Mean, SD and T-Value for PEFR of Tobacco Smokers and Non Tobacco Smokers

Variable	Group	Mean	SD	t-value
PEER	Tobacco Smokers	9.76	1.34	2.09*
	Non-Tobacco Smokers	10.73	1.87	

$t_{.05} (48) = 2.01$

The findings of Spiro metric test on Tobacco Smokers and Non Tobacco Smokers namely Mean, SD and t values for PEFR are shown in table no 4. The table statistically reveals that the calculated t value 2.09 for PEFR of Tobacco Smokers and Non Tobacco Smokers is higher than table value 2.01. Therefore the values of table shows that, there was significant difference between Peak expiratory flow Rate of tobacco smokers non tobacco smokers. The results of table no 4 are also depicted in figure no. 4.

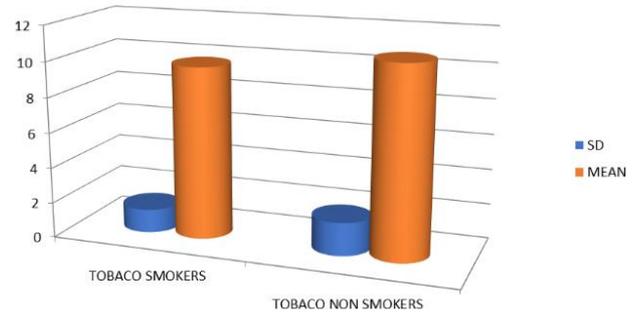


Fig 4: Mean, SD and T-Value for PEFR of Tobacco Smokers and Non Tobacco Smokers

Discussion of findings

The purpose of the present study was to compare the lung volume of tobacco smokers and non-tobacco smokers. To attain this purpose total twenty five (N=25) tobacco smokers and twenty five non tobacco smokers between age group of 20 – 25 years from Pathanamthitta District were selected as subjects. After the collection of relevant data, to know the difference between tobacco smokers and non- tobacco smokers, the data was collected with the Spiro meter and the t-test was employed and with the help of Statistical technique The level of significance was set at 0.05.

Based on the statistical analysis of data following findings were drawn by the researcher:

- The result of present study proved that there was significant difference between FVC force vital capacity of tobacco smokers and non- tobacco smokers. Further the statistical analysis shows that non- tobacco smokers has more FVC then tobacco smokers.
- The result of present study proved that there was significant difference between MVV maximum voluntary ventilation of tobacco smokers and non- tobacco smokers. Further the statistical analysis shows that non -tobacco smokers has more MVV then tobacco smokers.
- The result of present study proved that there was significant difference between FEV1 of tobacco smokers and non- tobacco smokers. Further the statistical analysis shows that non- tobacco smokers has more FEV1 then tobacco smokers.
- The result of the study proved that was significant difference between PEFR OF tobacco smokers and non- tobacco smokers. These results of the study confirm the findings of Rao *et al* (1992) who also reported

significant difference between tobacco smokers and non-tobacco smokers. The statistical analysis shows that non-tobacco smokers has more PEFV then tobacco smokers.

Conclusions

Based on the results of the study the following conclusions were drawn by the investigator: The results substantiate that there was significant difference between FVC, MVV, FEV1, and PEFV of tobacco smokers and non-tobacco smokers.

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