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Original Research Article

Comparative Research on Pulmonary Function Tests in Smokers and Non Smokers

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Abstract

Background and Aim: Smoking causes inflammation, squamous epithelium metaplasia, globlet cell alterations, the creation of mucus plugs in tiny airways, and ultimately alveolar structural abnormalities. The physical changes in respiratory disorders like asthma, COPD, etc. are caused by these changes in smaller airways. The purpose of the current study was to compare the results of lung function tests in smokers and non-smokers.

Material and Methods: The present study observational analysis included total of 200 individuals; which were divided into two groups: group A (Smokers group) included 100 individuals who had the habit of smoking and group B (non- smoker group) were taken as control group with no history of smoking. Spirometry recording was done for the included individuals in the study.

Results: Between smokers and nonsmokers, there is a statistical difference in the mean FVC (L), FEV1 (L), PEFR, and FEF25-75%) values for spirometry. Smokers' spirometric data were shown to be more obstructive than non-smokers'. When compared to non-smokers, the mean values of all lung function tests are significantly lower in smokers. In the current study, smokers were more likely to develop restricted (2.0%) than mixed (4.0%) or obstructive (36.0%) pulmonary alterations. 96.0 percent of nonsmokers had PFT results that were normal.

Conclusion: In each age group, nonsmokers had higher mean FVC, FEV1, and PEFR values. From adolescence to old age, lung function changes, but it does so differently in men and women. Most spirometric measures had little or no correlation with BMI. A larger investigation that adheres to the ATS criteria is required in order to generalize these reference values.

Keywords: Pulmonary Function Test, Smokers, Non Smokers, Spirometry.

Introduction

As lungs are frequently affected in multi-system disorders, primary respiratory diseases are mostly to blame for a heavy burden of morbidity and premature death on a global scale. In order to diagnose respiratory disorders, evaluate functional impairment, and track treatment or disease progression, pulmonary function tests are utilized. The many variables that affect pulmonary function in healthy individuals include race, physical activity, environmental factors, altitude, cigarette use, age, height, sex, and socioeconomic position [1,2]. Smoking is a serious public health issue that contributes to numerous common and curable conditions like asthma, COPD, and premature death all across the world. 1 According to a WHO assessment, smoking killed over 100 million people worldwide in the 20th century, and this number will rise to 1 billion in the 21st. Around 2030, it's anticipated that there would be 10 million tobacco-related deaths annually. Since 1975, smoking rates have gradually declined in affluent nations, but they have increased by 50% in low-income nations. 2 In both urban and rural areas of India, smoking is a widespread practice [3-5].

Smoking causes inflammation, squamous epithelium metaplasia, globlet cell alterations, the creation of mucus plugs in tiny airways, and ultimately alveolar structural abnormalities. The physical changes in respiratory disorders like asthma, COPD, etc. are caused by these changes in smaller airways. The prevalence of smoking directly correlates with each of these outcomes. So, the main etiological cause of chronic lung disease is smoking [6,7].

Smoke from cigarettes has a pH of 5.3, is moderately ionized, and is insoluble in lipids. If nicotine is inhaled into the lungs, which have a large surface area for decreased lipid solubility, just the desired amount of nicotine is absorbed. As a result, lung cancer claims a high number of smokers' lives [8,9]. Since the 1970s, pulmonary function testing has become widely used. A number of breakthroughs made possible by advancements in computer technology have made this easier. It is a useful technique for assessing the respiratory system, serving as a crucial adjunct to invasive tests like bronchoscopy and open lung biopsy as well as patient history and other lung imaging examinations.

Materials and Methods

The present study is the observational analysis done in the department of physiology in association with the department of tuberculosis and chest in the medical college and the associated medical college. The study included total of 200 individuals; they were divided into two groups: group A (Smokers group) included 100 individuals who had the habit of smoking and group B (non- smoker group) were taken as control group with no history of smoking. The institutional ethical committee ws informed abnout the study and the clearcne certificatewas obtained prior to the stuart of the study.

After providing study information in their native tongue and obtaining signed informed consent, participants who met the inclusion criteria were recruited.

Each smoker must have smoked at least five cigarettes per day and must be between the ages of 18 and 60.

1. Females will not be enrolled in the study owing to the exclusion criteria. 2. A confirmed instance of bronchial asthma. 3. The sick individual 4. A person who has a history of working in dusty or fumy environments that are dangerous to their health.

The individuals that were included had thorough clinical histories that paid particular attention to smoking, habits, and employment in drug addiction. Along with a thorough clinical examination, the research group participants' general histories included a physical examination that included recording their weight (kg), height (cm), pulse rate (/min), blood pressure (mmHg), and SpO2 (%). Spirometry measurements were taken of the study participants.

Before the surgery, each subject was given around 5 minutes to rest. Each participant received an explanation and demonstration of the procedure's steps. The subject was instructed to sit up straight, wear a nose clip, and get a good seal around the mouth in order to get an accurate recording.

The subject was instructed to inhale deeply while wearing the nasal clip, and then to exhale as quickly and forcefully as he could into the device's mouthpiece. All parameters were recorded. Manoeuvres were repeated until at least three technically acceptable recordings are obtained. The results thus obtained were analyzed.

Results

The grade of smoking distributions were as follows: The majority of smokers were light (42.0%), next moderate (32.0%), and finally heavy (26.0%). Ages 41 to 50 made up the largest percentage of smokers (44.0%). Majority of light smokers (51.85%) were in the age category of 41 to 50, followed by moderate smokers (46.66%) and heavy smokers (75.0%) in the age group of 51 to 60.

Only male patients were among the included subjects. According to Table 1, there is a statistically significant difference between the mean FVC (L), FEV1 (L), PEFR, and FEF25-75%) values between smokers and nonsmokers. Unpaired T-square test was used to calculate the findings. Smokers' spirometric data were shown to be more obstructive than non-smokers'. The t value is 7.10 and the p value is 0.001, making it highly significant after using the Sample T-square test. Comparisons to reference values obtained from a healthy population are necessary for the interpretation of lung function. The current study's findings have made it clear how crucial it is to gather reference values and create prediction equations for these factors in our population.

When compared to non-smokers, the mean values of all lung function tests are significantly lower in smokers. Applying an unpaired t test of significance revealed that the connection between impaired PFTs and smokers was statistically highly significant.

In the current study, smokers were more likely to develop restricted (2.0%) than mixed (4.0%) or obstructive (36.0%) pulmonary alterations. 96.0 percent of nonsmokers had PFT results that were normal.

Table 1: Comparison of mean spirometric values among study group (smokers) and control group (non-smoker)

Variables	Smokers	Non smokers	P value
FVC	3.27±0.59	4.42±0.20	< 0.001
FEV1	2.19±0.8	4.69±0.87	< 0.002
FEV1/FVC%	85.38±16.9	79.39±15.9	> 0.005
PEFR	372.38±97.9	628.6±75.9	<0.001
FEF25-75%	75.9±18.94	238.8±47.8	< 0.001

Discussion

Calculating the mean and standard deviation for smokers and non-smokers revealed that there was no discernible difference in the mean values of physical characteristics such as age, height, weight, body mass index, and body surface area, demonstrating that the two groups were appropriately matched. The majority of smokers (62.0%) solely smoked bidi, followed by smokers who mixed cigarettes and bidi (24.0%) and those who just smoked cigarettes (14.0%). None of the people smoked anything other than bidis or cigarettes when it came to tobacco [10,11]. Out of 200 trial participants, 150 had normal lung function and 50 had reduced lung function; 48 of the impaired subjects were smokers and only two were non-smokers. Compared to non-smokers, smokers had an 18 times higher risk of having compromised lung functioning. Falling FVC values indicated restrictive lung changes, while falling FEV, PEFR, and other values suggested obstructive lung conditions.

Out of 200 study participants, 88% had normal lung function, whereas 25% had impaired lung function, of whom 91.3% had obstructive features, 3 had restrictive features, and 1 had mixed. The findings agreed with those of Rubeena Bano, Mahagaonkar AM, and colleagues. Smoking and poor PFT were statistically significantly correlated. Compared to non-smokers, smokers had a 19.4 times higher risk of having compromised lung functioning.

In the current study, smokers were shown to have significantly lower FEV1. Cigarette smoking has a significant influence on respiratory processes and is a known cause of a number of respiratory disorders. As shown by Hind CR, smoking may directly produce increased platelet consumption and may reflect these cells' adhesion or deposition to the injured region.

Conclusion

In each age group, nonsmokers showed higher mean FVC, FEV1, and PEFR values. From adolescence until old age, lung function changes, but it does so differently in men and women. Most spirometric measures had little or no correlation with BMI. A larger investigation that adheres to the ATS criteria is required in order to generalize these reference values.

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