

A Study of Lung Function Differences Between Smokers and Non-Smokers

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Abstract:

Introduction: Smoking is a significant global health issue, with a rising prevalence among younger populations, and is known to detrimentally impact the respiratory system. Lung function tests may reveal a decline in pulmonary function before the emergence of clinical symptoms, allowing for early detection and intervention. Cigarette smoking contributes to the onset of malignancies, cardiovascular illnesses, and respiratory conditions, including COPD. It presents a health issue in mitigating morbidity and mortality in developing nations such as India. Spirometry in smokers may indicate a decline in lung function metrics.

Materials and Methods: A cross-sectional study was conducted in conducted at Nalanda medical college and hospital, Patna, Bihar on 107 smokers and non-smokers asymptomatic male subjects. Spirometry by RMS Helios spirometer 401 was conducted according to American Thoracic society guidelines after enrolling the subject based on inclusion and exclusion criteria and collected data was analysed with independent t-test was used to compare smokers and non-smokers

Results: The groups were comparable in the parameters of weight, height, and age, and body mass index. The mean FEV₁, FVC, and PEF values were considerably lower in smokers than in non-smokers ($p < 0.05$). Smokers also had a lower FEV₁/FVC ratio, which suggests an obstructive pattern of lung damage. Lower spirometric indices show that smokers have substantially worse lung function than non-smokers.

Conclusion: All lung function test values exhibit a considerable reduction in asymptomatic smokers compared to non-smokers. Consequently, performing spirometry, particularly in smokers, may facilitate the early detection of cases and subsequently reduce morbidity.

Keywords: Pulmonary function test, Smokers, Non-smokers, Spirometry, COPD.

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Introduction

Worldwide, smoking is a significant avoidable cause of respiratory illness and mortality [1]. Numerous harmful compounds included in tobacco smoke cause oxidative stress, airway inflammation, and structural damage to lung tissue, all of which contribute to a cumulative deterioration in pulmonary function [2]. Lung cancer, obstructive lung illnesses like chronic obstructive pulmonary disease (COPD), and an increased risk of respiratory infections are all closely linked to prolonged exposure [3].

Forced vital capacity (FVC), forced expiratory volume in one second (FEV₁), and the FEV₁/FVC ratio are all measured using spirometry, a straightforward, non-invasive, and popular technique for evaluating lung function [4,5].

Spirometric index comparisons between smokers and non-smokers offer important information on the early functional alterations brought on by smoking, even before symptoms manifest [6]. The purpose of this study was to use spirometry to evaluate and compare lung function measures in smokers and non-smokers.

Methods

Study Duration: The study was conducted over a period of 10 months, conducted at Nalanda medical college and hospital, Patna, Bihar.

Study Design and Participants: A cross-sectional comparative study with 107 adult participants between the ages of 20 and 50 was carried out. Smokers and non-smokers made up the two groups

of participants. People who had smoked at least one cigarette a day for at least a year were classified as smokers. There was no history of active smoking or substantial second-hand smoke exposure among non-smokers.

Inclusion and Exclusion Criteria: The study excluded people with cardiovascular disease, acute respiratory infections within the previous four weeks, occupational exposure to dust or chemicals, and known respiratory illnesses (asthma, COPD, tuberculosis).

Data Collection: Anthropometric measures, smoking history, and demographic information were noted. Standardised spirometry was used to evaluate lung function in accordance with American Thoracic Society (ATS) recommendations. For analysis, the best of three acceptable manoeuvres was noted.

Spirometric Parameters

The following parameters were evaluated:

- Forced Vital Capacity (FVC)

- Forced Expiratory Volume in one second (FEV₁)
- FEV₁/FVC ratio
- Peak Expiratory Flow Rate (PEFR)

Statistical Analysis: Standard statistical software was used to analyse the data. The mean ± standard deviation was used to express continuous variables. The independent t-test was used to compare smokers and non-smokers. p-values less than 0.05 were regarded as statistically significant.

Results

A total of 107 participants were included, out of which 54 smokers and 53 were non-smokers among all the participants. The groups were comparable in the parameters of weight, height, and age, and body mass index. The mean FEV₁, FVC, and PEFR values were considerably lower in smokers than in non-smokers (p < 0.05). Smokers also had a lower FEV₁/FVC ratio, which suggests an obstructive pattern of lung damage. Participants who had smoked for a longer period of time showed a more noticeable reduction in lung function indicators.

Table 1: Demographic Characteristics of Study Participants

Parameter	Smokers	Non-Smokers	p-value
Age (years)	39.5 ± 7.3	35.8 ± 6.6	0.60
Height (cm)	188 ± 6.6	179 ± 6.1	0.59
Weight (Kg)	75.5 ± 7.2	78.1 ± 7.7	0.55
BMI (Kg/m ²)	25.5 ± 2.8	24.9 ± 2.8	0.48

Table 2: Comparison of Spirometric Parameters Between Smokers and Non-Smokers

Spirometric Parameter	Smokers (mean±SD)	Non-Smokers (mean±SD)	p-value
FVC (L)	3.25 ± 0.67	3.58 ± 0.60	<0.001
FEV ₁ (L)	2.67 ± 0.56	3.13 ± 0.45	<0.001
FEV ₁ /FVC (%)	78.6 ± 6.2	86.1 ± 5.7	<0.001
PEFR (L/min)	415 ± 68	445 ± 67	<0.001

Table 3: Prevalence of Spirometric Patterns

Lung function pattern	Smokers (%)	Non-Smokers (%)
Normal	58	89
Mild obstructive	30	12
Moderate obstructive	18	4

Discussion

The current study, highlights that the smoker’s lung function parameters are significantly lower than those of non-smokers. In line with earlier research, smokers lower FEV₁ and FEV₁/FVC ratios point to early airflow restriction. Cigarette smoke causes structural and inflammatory alterations that restrict airways and reduce elastic recoil, which impairs expiratory flow.

Smoking was linked to a detectable reduction in pulmonary function, even in relatively young persons, underscoring the negative consequences of tobacco use at a young age [7]. These results highlight the usefulness of spirometry as a screening

method for identifying smokers' subclinical lung impairment.

The study did not precisely measure smoking exposure in pack-years, and the cross-sectional methodology restricts the ability to draw conclusions about causality [8]. To evaluate how lung function declines over time, longitudinal studies with bigger sample sizes are advised.

Conclusion

Lower spirometric indices show that smokers have substantially worse lung function than non-smokers. Spirometry can be used to diagnose pulmonary damage early, which can help with prompt intervention and quitting smoking. To lower long-

term respiratory morbidity, public health initiatives should keep focussing on smoking cessation and regular lung function testing for smokers.

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