



## Original Research Article

## A study on pulmonary function tests in smokers and after cessation of smoking (Quitters)

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## ABSTRACT

**Introduction:** Smoking leads to development of cancers, cardiovascular, respiratory diseases including COPD. it poses a health challenge in reducing morbidity and mortality in developing countries like India. Spirometry in Smokers may show reduction in lung function parameters. Cessation of smoking leads to decrease in rate of decline in pulmonary functions to almost the same level of nonsmokers.

**Materials and Methods:** A cross-sectional study was conducted in a tertiary healthcare level institute in Greater Noida on 100 smokers, 50 Quitters and 100 Nonsmokers total 250 healthy 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 epi info 7 software using appropriate statistical methods.

**Results:** Smokers and Nonsmokers were not much different in mean age and other physical parameters. Pulmonary function parameters like FVC, and FEV1 were significantly less in Smokers as compared to Nonsmokers and after cessation of smoking. Lung function parameters in Quitters were not significantly different from Nonsmokers.

**Conclusion:** All the lung function test parameters show a significant decline in asymptomatic Smokers as compared to Nonsmokers and Quitters. After cessation of smoking there was not any significant difference in lung functions between Quitters and Nonsmokers. Therefore, by conducting spirometry, especially in smokers, cases may be detected at early stage and by quitting smoking the decline in lung functions & subsequent morbidity may be lessened.

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## 1. Introduction

According to the reports published by World Health Organization (WHO) tobacco smoking killed 100 million people worldwide in the 20th century and that it could kill one billion people around the world in the 21st century also.<sup>1</sup> In India smoking is a common habit prevalent in both urban and rural areas irrespective of mode of smoking. Tobacco has remained as one of the most important predisposing factors responsible for so many respiratory and cardiovascular diseases. Smoking leads to rapid decline in pulmonary function tests (PFTs). Smoking is the single most significant risk factor contributing to the development of

COPD.<sup>2</sup>Chronic Obstructive Pulmonary Diseases (COPD) recognized as one of the most important causes of morbidity and mortality in chronic tobacco smokers. Smoking affect small airways are less than 2mm in diameter and leads to decline in Forced vital capacity (FVC) and Forced Expiratory Volume in the First Second (FEV1) the two most important lung function test parameters.<sup>2</sup> On an average, cigarette smokers have a high annual rate of decline in FEV1 of about 50 ml, which is nearly double the average value of 30 ml annually present in non-smokers.<sup>3</sup> Smokers who quit smoking reduce their risk of developing and dying from tobacco-related diseases and progression to COPD.<sup>2</sup> Approximately 70 percent of smokers say that they want to quit, and over 50 percent of Smokers report that they tried to quit in the past year. Quitting smoking

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early may help reduce the effects of smoking on decline of lung functions and may reduce the morbidity and mortality associated with Smoking. Being unexpensive, non-invasive and reproducible and cause minimum discomfort to the subjects, pulmonary function testing is a routine test for assessing Pulmonary functions. Spirometric values vary according to age, height, sex, and body size. Thus, cigarette smoking has extensive effects on respiratory function, which can be detected with pulmonary function test. The aim of the study was to compare the pulmonary function among smokers and non-smokers and Quitters.

## 2. Material and Methods

A cross-sectional study was conducted in the department of Physiology of Tertiary level health care institute in Greater Noida from June 2019 to November 2019. A total of 250 male subjects were included in the study including 100 smokers, 100 Nonsmokers and 50 quitters who visited or working in the institution. A pretested semi-structured questionnaire was used to gather information regarding smoking habits, occupation, medical history etc. The individuals were enrolled in the study as per the following inclusion & exclusion criteria.

### 2.1. Inclusion criteria

1. Non-smoker: According to definition non-smoker is a person who does not smoke tobacco.
2. Smoker: They are persons who are engaged in the inhalation and exhalation of fumes of burning tobacco from cigarette. Every smoker must have been smoking at least one cigarette a day for one year.
3. Quitter: Former smoker who has not smoked at least for last six months
4. Age 18-60 years.

### 2.2. Exclusion criteria

1. Those suffering from respiratory or cardiovascular diseases like bronchial asthma, pulmonary tuberculosis, Pleurisy, chronic obstructive airway disease.
2. The person who have history of cough with sputum, haemoptysis or are ill.
3. The person with occupational history of working in mills and factories or other places where lungs are affected by dust or fumes.
4. Those with a history of hospitalization with chronic ailment.

Spirometric manoeuvre RMS Helios 401 Spirometer was used for evaluating the respiratory functions. The subjects were asked to sit comfortably on a chair. The complete procedure was explained and the subjects were instructed to breathe in fully by deep inspiration with their nostrils

closed, to seal their lips around the sterile mouthpiece of the spirometer and to forcefully expire air out. The three consecutive readings were recorded and best of the three was used for the study.

Following activities were avoided prior to test, according to American thoracic society (ATS) guidelines.

1. Smoking with in 1 hour of testing.
2. Consuming alcohol within 4 hours of testing.
3. Performing vigorous exercise within 30 mins of testing
4. Wearing clothing that substantially restricts full chest and abdominal expansion.
5. Eating a large meal within 2 hours of testing.

The ethical clearance was obtained from the institutional ethical committee and data was collected & the results were analysed with epi info 7 software using appropriate statistical methods.

## 3. Result

All the subjects included in the study were of almost the same age & physical characteristics.

There was significant decline in FVC and FEV1 in Smokers in comparison to nonsmokers.

The FVC and FEV1 parameters of pulmonary function showed significant difference between Smokers and Quitters. They were significantly high in case of Quitters.

There was no significant difference in FVC and FEV1 between Nonsmokers and Quitters.

## 4. Discussion

The results in the study show that there was significant decrease in pulmonary function (FVC and FEV1) in Smokers as compared to Nonsmokers. It is consistent with the findings, Bano et al.<sup>3</sup> and similar studies.<sup>4-6</sup>

FVC and FEV1 did not show any significant difference between quitter and Nonsmokers. Brchfiel et al.<sup>7</sup> published similar findings rate of decline of FEV1 after 2 years of smoking cessation was similar to Nonsmokers.

Further FVC and FEV1 were significantly lower in smokers as compared to quitters. It shows the benefits of cessation of smoking as has been found in other studies like Aldo Pezzuto et al.<sup>8</sup> who reported significant increase in FEV1 after 3 months of cessation of cigarette smoking. Similarly, Peter Lee et al.<sup>9</sup> also showed significant decline in smokers as compared to Quitters. Finding in our study is consistent with these previous studies.

It has been shown in many studies that performing pulmonary tests helps in quitting smoking especially in persons with advancing age and these tests show obstruction.<sup>10</sup>

**Table 1:** Age and sex distribution

Physical characteristic	Nonsmoker male (Mean±SD)	Smokers male (Mean±SD)	Quitters (Mean±SD)
Age(years)	36± 8.12	39±8.65	38±9.25
Height (in centimetres)	159.64± 0.51	160.25±0.46	161.40±0.53
BMI	23.84±0.32	24.21±0.40	24.52±0.51

**Table 2:** Comparison in FVC and FEV1 between smokers and nonsmokers

Pulmonary Functions	Smokers N= 100	Non-smokers N= 100	inference
FVC	2.89±.54	3.12±.53	significant < .05
FEV1	2.34±.41	2.73±.41	Highly significant < .001

**Table 3:** Comparison in FVC and FEV1 between smokers and quitters

Function	Smokers N=100	Quitters N=50	t	P	inference
FVC	2.84±0.44	3.02±0.43	2.45	< .05	Significant
FEV1	2.34±0.41	2.48±0.42	1.95	< .05	Significant

**Table 4:** Comparison of FVC and FEV1 in Non-smokers and Quitters (males)

Pulmonary Function	Quitters N=50	Non-smokers N=100	t	P	Inference
FVC	3.02±0.43	3.12±0.53	1.19	> .05	Not significant
FEV1	2.48±0.42	2.59±0.41	0.74	> .05	Not significant

## 5. Conclusion

Smoking leads to decline in FVC and FEV1. Cessation of smoking leads to improvement in lung functions and it may be not much different FVC and FEV1 in Nonsmokers. Quitting smoking may help in improvement of Pulmonary function and may reduce the sharper decline in FVC and FEV1 in Smokers and thus may help abetting the complications of morbidity and mortality associated with smoking. Showing Lung Function tests result to smokers helps in smoking cessation.

## 6. Source of Funding

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## 7. Conflict of Interest

None declared.

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