

## To Study the Effect of Smoking on Lung Function in Terms of Changes in Spirometric Values in Asymptomatic Smokers

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**Article History**

*Received: 15.04.2018*

*Accepted: 25.04.2018*

*Published: 30.04.2018*

**DOI:**

10.36348/sjm.2018.v03i04.013



**Abstract:** Smoking is a pernicious scourge of the world today. Smoking is well known to increase the risk of pulmonary and cardiovascular diseases by affecting the cardio-pulmonary functions. Hence, emphasis should be paid on preventive strategies of these disorders. Our study was to evaluate the effect of smoking on lung functions and lipid profile in asymptomatic smokers. A total of 100 male subjects were included which were equally divided into two groups i.e. of smokers and non-smokers. The lung function tests and lipid profile was carried out on each subject in both the groups. No statistically significant difference was seen in the baseline characteristics of the two groups. There was no statistically significant difference between the two groups regarding mean values of blood pressure and heart rate, though; values were higher in smokers as compared to non-smokers. All the spirometric values in the two groups had statistically highly significant difference and were higher in non-smokers as compared to smokers. The spirometric values were reduced in smokers with history of smoking for as low as two pack years. No statistically significant difference was seen in the mean HDL – cholesterol values in the two groups. Although the smokers were young and asymptomatic, still the spirometric and lipid values were significantly deranged as compared to controls. Even smokers with history of less pack years of smoking also had significant abnormalities of lung function. All spirometric and lipid parameters deteriorated significantly with increasing pack years of smoking.

**Keywords:** Spirometric, Lung Function, Asymptomatic Smoker.

### INTRODUCTION

Spirometric values decline by smoking in the lung function tests. But most of these studies have included older patients who were symptomatic. There is paucity of literature on effects of smoking on lung function in young asymptomatic adults. There are also conflicting results about onset of deterioration of lung function after starting of smoking. This may be helpful in detecting early deterioration of lung functions in asymptomatic smokers [2].

This study has therefore been designed to study the effects of smoking on spirometry in asymptomatic smokers because studies have shown that if steps are taken to prevent or stop smoking then some of the deleterious effects of smoking may actually start reverting.

This study will demonstrate that the patients who participated in the smoking cessation program had a significant reduction in the prevalence of cough, sputum production, wheezing and shortness of breath. This will analyze the improvement in lung functions occurred in the first year of cessation or not.

Thus, if smoking is known to show changes in the lung function, then measures to prevent or stop smoking, in otherwise asymptomatic subjects, will be helpful in decreasing the incidence of chronic obstructive pulmonary diseases later in life.

### INDIAN PROFILES

In world, about 0.2% of all usable land is used for tobacco growing. In 1992, 578,800 tones and about 7.0% of the world's total unmanufactured tobacco produced in India, making it the world's third biggest tobacco growing country. In 1992, India produced about 767,436 million manufactured cigarettes and bidis, accounting for 13.5% of the world total. It has been estimated that during the recent past, India has been producing 100 billion cigarettes and 850,000 million bidis annually. Last two decades have seen a phenomenal growth in the chewing tobacco industry.

In 1992, 6.1% of the world's total unmanufactured tobacco and 1.5% of the total manufactured cigarettes were consumed in Indian. About 20% of the total cigarettes consumed in India is in the form of cigarettes, 40% is in the form of bidis

and the remaining 40% are consumed as chewing tobacco, pan masala, snuff and other tobacco mixture.

In 1993, 3.4 million people were estimated to be engaged full time in tobacco manufacturing. This accounted for 11.7% of all manufacturing work force. About 0.9 million people work in growing & curing tobacco. More than 20 big companies are involved in cigarette production and more than 100 brands of cigarettes are available in the Indian market.

### AIMS & OBJECTIVES

To study the effect of smoking on lung function in terms of changes in spirometric values in asymptomatic smokers.

### MATERIALS AND METHODS

The study was conducted in department of physiology, Netaji Subhash Chandra Bose Medical College, Jabalpur (M.P.)

#### Study design

This was a cross-sectional study to evaluate the effect of smoking on lung function and serum lipids in asymptomatic smokers.

#### Study population

The study was conducted on 100 subjects who were equally divided into two groups i.e. of smokers and non-smokers. Group 1 consisted of 50 smokers. Group 2 consisted of 50 comparable non-smokers as controls.

Following 10 subjects were not included in the study because.

- Four subjects were unable to follow the instructions for spirometry,

- Three subjects refused to give blood sample for lipid profile investigation.
- Three subjects did not turn up for the tests

#### Inclusion criteria

The following subjects were included in the smoking group:

- Sex : male
- Age : 20 years to 30 years

History of smoking for 1-5pack years (1pack year i.e. 10 cigarettes or 15 bidis per day for 1 year)

#### Exclusion criteria

The following subjects were excluded from the study:-

- History of any mode of smoking other than cigarette and bidis,
- History of cardio –pulmonary diseases.
- History of neuro- endocrine disorders.
- History of liver dysfunction renal impairment,
- History of atopy,
- History of exposure to occupation pollutants,
- History of drug/alcohol intake,

#### Controls

Healthy individuals (age, weight and height matched,) free from any diseases or condition, who do not have any of the exclusion criteria and without history of smoking were included in the study.

#### OBSERVATIONS

A total of 100 male subjects were included in the study which was equally divided in to two groups i.e. of smokers and non – smokers.

**Table-1: Baseline physical characteristics of the subjects in two groups compared.**

Base line variable	Smokers (Group I)n = 50	Non – Smokers (Group II)n = 50	P – value Gr. I V/S Gr. II
Age (years)	24.66 ± 3.13	24.74 ± 3.04	> 0.05
Socio – economic status	3.24 ± 0.98	3.16 ± 0.97	> 0.05
Height (Cms.)	162.92 ± 5.61	162.96 ± 5.31	> 0.05
Weight (Kgs.)	56.44 ± 6.84	55.96 ± 5.87	> 0.05
Body surface areas (m2)	1.59 ± 0.09	1.59 ± 0.08	> 0.05

### SPIROMETRY

The mean of the various spirometric parameters were calculated of the subjects for both the groups. The mean FVC in group I and group II was 2.60 ± 0.62 L and 4.10 ± 0.64L respectively. The mean FEV<sub>1</sub>

in group I was 1.91 ± 0.57L and 3.19 ± 0.77L in group II Group I had mean FEF<sub>25% - 75%</sub> and PEFR of 1.98 ± 0.67L/sec and 4.50 ± 1.57L/sec respectively. Group II had mean FEF<sub>25% - 75%</sub> of 4.22 ± 1.23L/sec and a mean PEFR of 7.22 ± 1.42L/sec.

**Table-2: Mean ± SD spirometric values of the subject in the two groups compared.**

Spirometric variable	Smokers (Group I) n = 50	Non – Smokers (Group II) n = 50	P – value Gr. I V/S Gr. II
FVC (L)	2.06 ± 0.62	4.10 ± 0.64	< 0.001
FEV <sub>1</sub> (L)	1.91 ± 0.57	3.19 ± 0.77	< 0.001
FEV <sub>25-75%</sub> (L/sec)	1.98 ± 0.67	4.22 ± 1.23	< 0.001
PEFR(L/Sec)	4.50 ± 1.57	7.22 ± 1.42	< 0.001

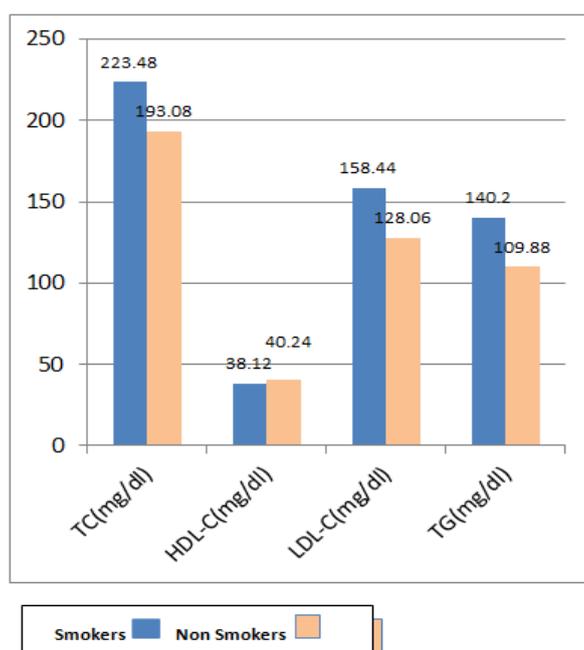
**Statistically highly significant**

The spirometric values in the two groups had Statistically highly significant difference ( $p < 0.001$ ) and were higher in non-smoker subjects as compared to smoker subjects in non-smoker subjects, the mean value

of all the spirometric parameters were within the normal standard spirometric ventilator function range for the Indian population. The mean value of the various spirometric parameters were calculated for each of the category of group 1.

**Table-3: Mean  $\pm$  SD spirometric values of the various categories of smokers.**

Category of smokers	SPIROMETRIC VALUES			
	FVC(L)	PEV <sub>1</sub> (L)	FEF25-75%(L/Sec.)	PEFR(L/Sec.)
Group A (n = 6)	3.54 $\pm$ 0.43	2.80 $\pm$ 0.39	3.13 $\pm$ 0.76	6.71 $\pm$ 0.98
Group B (n = 6)	2.89 $\pm$ 0.44	2.25 $\pm$ 0.38	2.29 $\pm$ 0.38	5.10 $\pm$ 1.34
Group C (n = 6)	2.54 $\pm$ 0.51	1.82 $\pm$ 0.39	1.92 $\pm$ 0.40	4.35 $\pm$ 1.15
Group D (n = 6)	2.35 $\pm$ 0.51	1.66 $\pm$ 0.45	1.68 $\pm$ 0.45	3.96 $\pm$ 1.48
Group E (n = 6)	2.05 $\pm$ 0.32	1.40 $\pm$ 0.27	1.39 $\pm$ 0.26	3.25 $\pm$ 0.73



**Fig-1: Comparison of Lipid Values in Smokers and Non-Smokers.**

**LIPID PROFILE**

**SERUM CHOLESTEROL**

The mean value of serum total cholesterol was 223.48  $\pm$  20.79 mg/dl and 193.08  $\pm$  22.29 mg/dl in group I and II, respectively. The range in the two groups was 167mg/dl - 256mg/dl and 148mg/dl-252mg/dl, respectively. The numbers of subjects with high serum total cholesterol level (>200mg/dl) were 42 and 16, respectively in the two study groups.

**SERUM HDL CHOLESTEROL**

The mean value of serum HDL - C levels in group I 38.12  $\pm$  5.75 mg/dl and 40.42  $\pm$  5.17 mg/ dl in group II. 15 subject in groups in group 1 and 5 subjects in group II had a serum HDL - C levels less than 35 mg /dl. The range was 26 - 54 mg / dl in the groups, respectively.

**SERUM LDL - CHOLESTEROL**

The mean values for serum LDL - C were 158.44  $\pm$  21.36 mg/dl and 128.06  $\pm$  21.69 mg / dl in group I and II, respectively. 43 subjects in group 1 and 17 subjects in group 2 had serum LDL - C levels > 135 mg / dl. The range was 115 - 197 mg/dl and 89 - 182 mg / dl in group I and II, respectively.

**SERUM TRIGLYCERIDES**

Group I and group II had mean serum triglycerides values of 140.20  $\pm$  31.80 mg/dl and 109.88  $\pm$  31.26 mg / dl. The range in the two groups was 83-216mg/dl and 66 - 203 mg/dl, respectively. 3 subjects in the group I and 1 subject in group II had serum triglyceride levels > 200mg/dl.

**Table-4: Mean ± SD lipid values of the subject in the two groups compared.**

Variable	Smokers (Group I) n = 50	Non - Smokers (Group II) n = 50	P – value Gr. IV/S Gr.II
TC (mg / dl)	223.48 ± 30.79	193.08 ± 22.29	< 0.001
HDL – C (mg / dl)	38.12 ± 5.75	40.24 ± 5.17	> 0.05
LDL - C (mg / dl)	158.44 ± 21.36	128.06 ± 21.69	< 0.001
TG (mg / dl)	140.20 ± 31.80	109.88 ± 31.26	< 0.001

**Statistically highly significant / statistically not significant**

The lipid profile values in the two groups had statistically highly significant difference (p < 0.001) and were higher in smoker subjects as compared to non-smoker subjects except for HDL – C. In non – smoker subjects, the mean lipid values were within the normal range [5]. The mean value of the various lipid values were calculated for each of the category of group I.

**DISCUSSION**

Smoking is the largest preventable cause of death in the world. Smoking is well known to increase the risk of pulmonary and cardiovascular diseases by affecting the cardio-pulmonary functions. Identification of smoking as one of the main causative factor of chronic obstructive pulmonary diseases and coronary artery diseases has increased interest in the study of cardio-pulmonary functions of smoking [1].

Unlike many developed countries the consumption of tobacco continues to rise in India and given the incubation period between smoking and the onset of symptomatic diseases a large quantum of preventable pulmonary and cardiovascular morbidity is incubating.

Smoking has been shown to affect the lung function and lipid profile. But most of the studies have included older patients who were symptomatic, while young asymptomatic adults were not studied.

The aims of the study were to evaluate the effects of smoking on lung functions and lipid profile in asymptomatic smokers.

The present study was under taken in the department of physiology Netaji Subhash Chandra Bose Medical College, Jabalpur, M.P. a total of 100 males subjects were included in the study which were equally divided in to two group i.e. of smokers and non-smokers.

**SMOKING AND SPIRO METRIC LUNG FUNCTIONS**

Jain *et al.*, [2] has reported significant difference in lung functions between smokers and nonsmokers. The finding of an increasing difference in lung function between smokers and non-smokers with increasing pack years possibly reflects chronic effects of smoking which develop over time in response to

repeated insults to the lung leading to gradual development of bronchoconstriction, inflammation and mucus production [3].

The present study also illustrates the usefulness of forced expiratory spirogram in evaluating early changes in lung function in smoking. Judging by the number of smokers who had abnormal results FEF was found to be the most sensitive indicator detecting early deterioration of lung function which was abnormal in 96% of the smoker. FEV also appeared to be sensitive but not be the extent of documented FEF to be the most sensitive indicator for the detection of early airway obstruction.

Lung function at low value are determined by small airway obstruction and elastic recoil of the lung. Smoking by increasing airway obstruction increase the parameters as small airway obstruction namely FEF 25-75% & FEV 1 However, the possibility of decreased recoil cannot be ruled out.

According to Dosman *et al.*, [4], early changes in lung function in the smokers are probably due to narrowing of the small airways. Our observations are in accordance with this view.

Since the changes in the lung functions are in the form of small airway obstruction, smoking should be strongly discouraged to prevent further deterioration of lung function.

**RESULTS**

No statistically significant difference was seen in the baseline characteristics of the two groups. There was no statistically significant difference between the two groups regarding mean values of blood pressure and heart rate, though; values were higher in smokers as compared to non-smokers.

All the spirometric values in the two groups had statistically highly significant difference and were higher in non-smokers as compared to smokers. The spirometric values were reduced in smokers with history of smoking for as low as two pack years.

**CONCLUSIONS**

- Although the smokers were young and asymptomatic, still the spirometric and lipid values were significantly deranged as compared to controls.

- Even smokers with history of less pack years of smoking also had significant abnormalities of lung function.
- All spirometric and lipid parameters deteriorated significantly with increasing pack years of smoking.

In view of the above finding, smoking should be strongly discouraged at the early asymptomatic stage to prevent any further lung damage.

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