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A Study of Pulmonary Function Test in Asymptomatic Smokers

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Abstract: Smoking is a pernicious scourge of the world today. Smoking is well known to increase the risk of the risk of pulmonary diseases by affecting the pulmonary functions. Hence, emphasis should emphasis should be paid on preventive strategies of these disorders. Our study was to evaluate the effect of smoking on lung functions in asymptomatic smokers. A total of 100 subjects were included which were equally divided in to two groups i.e. of smokers and non - smokers. The lung functions tests were 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, through; values were higher in smokers as compared to non-smokers. All spirometric values in two groups had statistically high difference and were higher in non-smokers as compared to smokers. FEF25-75% was the n he most sensitive indicators for the detection of early airway obstruction. There was progressive s progressive deterioration in all the four spirometric parameters with increasing pack years of smoking. Although the smokers were young and asymptomatic, still the spirometric 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 parameters deteriorated significantly with increasing 3 pack years of smoking. FEF 25-75% seems to be the most sensitive parameter in detecting early airway obstruction. In view of the above finding, smoking should be strongly discouraged at the early asymptomatic stage to prevent any further lung damage.
Keywords: Pernicious scourge, lung functions, smokers, blood pressure.

INTRODUCTION

In recent years we have observed that tobacco is responsible for significant amount of morbidity and mortality among the young and the elderly. Clinically it has been revealed that over 60% of heart disease patients less than 40 years of age are tobacco users; while over half of the patients aged 40-60 years are also smokers. This also contributes to 7 million cases of coronary artery diseases (CAD) annually. It is estimated that 25% of all persons above the age of 40 year in urban India who smoke, suffer from chronic bronchitis. One out of every two smokers who started smoking at a young age and continue smoking throughout their lives will ultimately be killed by a tobacco - related illness.

On an average, smoker who begin smoking in adolescence and continue to smoke regularly have 50% change of dying from a tobacco – related diseases. Half of these will die in middle age, before 70 year losing around 22 years of normal life expectancy.

With prolonged smoking, smokers have a death rate about 3 times higher than non-smoker at all ages starting from young adulthood. A WHO study found the world wide deaths due to smoking could triple in the next two decades. Chronic obstructive pulmonary diseases are a major chest problem in Northern India and the disease presents a great challenge to the physicians of this part of the country. In chest clinics, as distinct form of tuberculosis clinics. Chronic bronchitis without emphysema tops the list among respiratory diseases as shown in the

Table-1: Various respiratory diseases as seen in the chest of All India Institute of Medical Sciences" [1]

1.	Bronchiectasis	322
2.	Chronic Bronchitis with Emphysema	250
3.	Naso-Bronchial Allergy	249
4.	Chronic Bronchitis	138
5.	Chronic Bronchitis, Emphysema and Bronchiectasis	82
6.	Chronic Bronchitis, Emphysema and Cor-Pulmonale	37
7.	Others	722
	Total	1850

In these clinics bronchitis with and without its complications formed about 30% of the total chest cases. Smoking has also been shown to lead to decline in the lung function and various spirometric values. But most of these studies have included older patients who were symptomatic who were symptomatic. There is paucity of literature on effects of smoking on lung function in young asymptomatic adults. These are also conflicting results about onset of deterioration of lung function after initiation of these is the most sensitive and may be helpful in detecting early deterioration of lung of function in asymptomatic smokers.

In studies involving established major cardiovascular risk factor i.e. smoking, hypertension and hypercholesterolemia; persons having only one of these risk factors show a two to four times increase in the incidence of coronary heart disease. The combinations of two of these risk factors have been found to increase the incidence of coronary heart disease by as much as nine times and by as much as 16 times when all three factors are presents[2]. Thus, the adverse cardiovascular effects of these risk factors appear to instruct in a multiplicative rather summative manner. Dyslipidemia is a major factor in the pathogenesis of atherosclerosis and coronary artery disease. Smoking has been show to after the lipid profile. Studies have shown a direct co-relation reports [3].

This study has there for been designed to study the effects of smoking on spirometry and serum lipids 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.

Te lung Health study [4,5] demonstrated 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. The improvement in Lung function occurred in the first year of cessation.

Studies have also shown the beneficial effects of smoking cessation on the serum lipids, mainly HDL cholesterol (HDL-c) [13]. The risk of coronary artery disease reverts rapidly after cessation of smoking. On an average the excess risk of coronary artery disease among smokers drops by 50% within the first year after stoppage of smoking and disappears completely within 10 years. Thus, if smoking is shown to changes in the lung function and serum lipids, then measures to prevent or stop smoking, in otherwise asymptomatic subjects, will be helpful in decreasing the incidence of chronic obstructive pulmonary as well as coronary artery diseases later in life.

AIMS AND OBJECTIVES

- To study the effect of smoking on lung function in terms of changes in spirometric values in asymptomatic smokers.
- To study the onset and progression of airway abnormality in terms 01 alteration in PFT in asymptomatic smokers.
- To assess the sensitivity and reproducibility of PFT parameters in evaluating the lung functions in asymptomatic smokers.

MATERIALS AND METHODS

The study was conducted in Department of Physiology, Index Medical College Hospital and Research Center, Indore (M.P.)

STUDY DESIGN

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

Study population

The study is to be conducted on a group of subjects who were equally divided into two groups i.e. of smokers and non-smokers.

Example:
Group 1 consisted of 50 smokers.
Group 2 consisted of 50 comparable non-smokers as controls.

Inclusion criteria

The following subjects were included in the smoking group:

- Sex: male
- Age: 20 years to 30 years
- History of smoking for 1-5 peak years (1 peak year i.e. 10 cigarettes or 15 bidis per day for 1 year)

Exclusion Criteria

The following subjected 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 exposure to occupation pollutants.
- History of drug/alcohol intake.

Parameter recorded

The following measurements were carried out on each subject:-

- ANTHROPOMETRY - Height, Weight and body surface area
- CARDIOVASCULAR PARAMETERS - Heart rate and Blood pressure.
- PULMONARY FUNCTION TESTS –
- Forced vital capacity (FVC)
- Forced expiratory volume in the first second (FEV^1)
- Forced expiratory flow during the middle half of the FVC curve (FEF 25-75%)
- Peak expiratory flow rate (PFR)

PULMONARY FUNCTION TESTS

The static and dynamic lung volumes were recorded using Spirolab-II manufactured by MIR SRL, Via Del Maggiolino, 125, 00155 Rome, Italy.

All the tests will be done with the subject in sitting position. The subject will be instructed to take 2-3 normal tidal volume breaths followed by a deep Spiration and then to exhale as forcefully as possible. A minimum of three ing will be recorded form the forced expirograms. The maximum values were taken. The smoker subjects were advised to refrain from smoking at least 24 hours before spirometric evaluation. The following parameters were assessed (as per the guide line of the American Thoracic Society)

Forced vital capacity (fvc)

This is the maximal volume of air which can be exhaled as rapidly and forcibly as possible, following a maximum inspiration. This is a same like vital capacity (VC) Except that there is a special stress on rapid, forcible and complete exhalation. Normal value: FVC = 2.6L/M- BSA in males and 2.6L/M' BSA in females.

Forced expiratory volume in first second (fev)

This is the maximal volume of air which can be exhaled in the first second of a forced expiration following a full inspiration. This may be expressed as absolute volume or as percentage of forced vital capacity (FVC). Normal volume: FEV;= 75% - 80% of EVC

Forced expiratory flow during middle half of fvc (fef 25-75%)

This is the mean C mean expiration flow rate during the middle half of forced vital capacity (FVC) also called as maximum) also called as maximum mid expiratory flow rate (MMEFR). Normal value: FEF 25-75%-300 L/min

Peak expiratory flow rate (pefr)

This is the maximum flow rate or peak flow in a single forced expiration which can be developed by forced expiratory effort following a full inspiration. Normal value: PEFR = 350-500 L/min.

Criteria

The following criteria were used for the various comparing parameters:

Socio-economic status (ses)

The socio - economic status (SES) of the objects was determined depending upon his education, occupation house holding and earnings.

I-High Income
II - Upper middle, income
III – Middle income
IV -'Lower income V – Poor

Smoking

Each subject will be asked about the history of smoking i.e. the total number of bidis or cigarettes smoked per day and the number of years smoked.

All the subjects will be divided into four groups.

- Non-smokers: Subjects who have smoked, taken as healthy controls,
- Mild smokers: Subjects smoking 1 - 10 cigarettes or 1-15 bidis/day
- Moderate smokers: subject smoking 11-20 cigarettes or 16-30 bidis/day.
- Heavy smokers: subjects smoking more than 20 cigarettes or 30 bidis/day.

SPIROMETRY

Following were considered as standard spirometric ventilator function values of the Indian population 103.

- Forced vital capacity (FVC): 4.0L
- Forced expiratory volume n first second (FEV):3.0L
- C) Forced expiratory flow during 25 - 75% of FVC (FEV):4.0L/Sec
- Peak expiratory flow rate (PEFR): 8.0L/Sec.

OBSERVATIONS

Table-2: Distribution of smokers and non-smokers according to age group (n=100)

Age Group	Non-Smokers (n=50)		Smokers (n=50)	
Less than 20	11	22	04	08
21-40 years	16	32	45	90
41-60 years	11	22	01	02
61-80 years	10	20	00	00
More than 80	02	04	00	00
Total	50	100	50	100

Table-3: Distribution of smokers according to Bidis / Cigarettes per day

Age Group	Non-Smokers (n=50)	
Mild (1-15)	28	56
Moderate (16-30)	16	32
Heavy (More than 30)	06	12
Total	50	100

Table -4: Comparison of mean height and weight among smokers and non-smokers

Parameter	Non-Smokers (Mean±SD)	Smokers (Mean±SD)	't' Value	P – value
Height	154.40 ± 14.45	163.24 ± 6.37	-.958, df=98	0.000*
Weight	53.46 ± 16.06	57.40 ± 11.78	-.399, df=98	0.165, NS

Unpaired't' test applied. P value < 0.05 was taken as statistically significant

Table-5: Comparison of FVC, FEV1, FEV1/FVC, FEF and PEFR among smokers and non-smokers

Parameter	**Non-Smokers (Mean±SD)**	**Smokers (Mean±SD)**	**'t' Value**	**P – value**
FVC	2.49 ± 0.67	2.63 ± 0.61	-1.026, df=98	0.308, NS
FEV_1	1.99 ± 0.61	1.96 ± 0.56	0.272, df=98	0.786, NS
FEV_1/FVC	0.79 ± 0.07	0.74 ± 0.05	4.501, df=98	0.000*
FEF	2.80 ± 0.88	2.19 ± 0.78	3.642, df=98	0.000*
PEFR	6.37 ± 1.80	5.12 ± 1.86	3.417, df=98	0.001*

Unpaired't' test applied. P value < 0.05 was taken as statistically significant

DISCUSSION

Smoking is the largest preventable cause of death in the development world. Smoking is the largest pre well known to increase the risk of pulmonary diseases is by affecting pulmonary functions. Identification of smoking as one of the main causative factor of chronic obstructive pulmonary diseases has increased interest in the study of pulmonary functions of smoking.

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 morbidity is incubating.

Smoking has been shown to affect the lung function. But most of the studies 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 in asymptomatic smokers.

The present study was under was under taken in the Department of Physiology Index medical college hospital and research center Indore M.P. a total of 100 males subjects were included in the study which were equally divided into two group i.e. of smokers a Smokers and non-smokers.

Physical characteristics

The baseline physical characteristics of the subjects in the two study groups i.e. of smokers & non-smokers were comparable. There was no statistically significant difference ($p>0.05$) between the two groups regarding age, sex, significant difference height, weight and body surface area (BSA). The subjects were mostly from the middle or lower socio-economic strata Cs and were selected randomly from the patients attending OPD of the hospital, students and staff of the college, volunteer members of the offices and those.

Smoking and spiro metric lung functions

The mean FVC in group I and group II was 2.4940.67 L and 4.1040.64 L respectively. The mean FEV, in group I was 1.91+0.57 L and 3.1940.77 L in Group II. Group I had a mean FEF25-75% and PEFR of 1.98+0.67 L/sec and 701.57 L/sec. respectively. Group II had mean FEF25-75% of 4.2241.23 L/sec. And a mean PEFR of 7.22+1.42L/sec., Even though the two group 81 the two groups were comparable regarding their baseline physical characteristics, yet there were statistically highly significant difference (p>0.001) in the in the spirometric value in the two groups.

In our study there progress ere progressive determination in all the four lung function parameters namely (FVC, FE"VC, FEVI, FEF25-75% and PEFR) with increasing pack years of smoking.

Jain *et al*.[6] has reported significant difference in lung function between smokers and nonsmokers. The finding of an increasing difference in lung function between smokers and nonsmokers 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.

Our study show that the percentage of smoker who had abnormal spirometric parameter were 84%, 80%, 96% and 76% in the FV, FEV, FEF and PEFR category respectively. Whereas in non-smoker the mean value of all the spirometry parameter were within the normal standard spirometric ventilator function fang for the Indian population.

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

Lung function at low value is determined by small airway obstruction and elastic coil of the lung. Smoking by increasing airway obstruction increase the parameters as small airway obstruction namely FEF25-75% and FEV_1 However, the possibility of decreased recoil cannot be ruled out.

According to Dosman *et al*. [7], early changes in lung function in the smoker are probably due to narrowing of the small airways. Our observations are in accordance with this view. Since the changes in the lung function in the form of small airway obstruction, start in the airway of smoking, smoking should be strongly discouraged to prevent further deterioration of lung function.

SMOKING AND LUNG DAMAGE

Smoking affects lung function by inhibiting mucociliary action of the toy airway. This coupled with mucosal gland hypertrophy result in the accumulation of mucus in the infiltration inflammatory cells exacerbate airway obstruction.

Smoking recruits inflammatory cells to the lungs. Smoke can stimulate alveolar macrophages to release from release from neutrophils chemo - attraction and can also cause elastase release from neutrophils. In addition smoke can inactivate alpha 1antitrypsin probably by oxidation. Local inactivation of alpha-1 antitrypsin may also result from the release of oxidants from activated neutrohils and macrophages. In smokers the three for the scan of protease antiprotease imbalance is well and although the detail remain to be define it seems likely that this is the cause of the ephysema found in association with chronic bronchitis.

SUMMARY AND CONCLUSION

Smoking is a pernicious scourge of the world today. Smoking is well known to increase the risk of the risk of pulmonary diseases by affecting the pulmonary functions. Hence, emphasis should emphasis should be paid on preventive strategies of these disorders.

Our study was to evaluate the effect of smoking on lung functions in asymptomatic smokers. A total of 100 subjects were included which were equally divided in to two groups i.e. of smokers and non - smokers. The lung functions tests were carried out on each subject in both the groups.

The results of the present study are as follows

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, through; values were higher in smokers as compared to non-smokers. All 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. FEF25-75% was the most sensitive indicators for the detection of early airway obstruction.

There was progressivesprogressive deterioration in all the four spirometric parameters with increasing pack years of smoking.

It was concluded that

- Although the smokers were young and asymptomatic, still the spirometric 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 parameters deteriorated significantly with increasing pack years of smoking.
- FEF 25-75% seems to be the most sensitive parameter in detecting early airway obstruction.
- In view of the above finding, smoking should be strongly discouraged at the early asymptomatic
- stage to prevent any further lung damage.

REFERENCES

1. David MB – Cigarette and Cigarette smoking, in clinics in chest Medicine. Volume 12, 4, 631.
2. Enas EA, Yusuf S, Mehta JL. Prevalence of coronary artery disease in Asian Indians. American journal of cardiology. 1992 Oct 1;70(9):945-9.
3. Green MS, Jucha E, Luz Y. Blood pressure in smokers and nonsmokers: epidemiologic findings. American heart journal. 1986 May 1;111(5):932-40.
4. Goldbeust U, Medic JH. Characteristics of smokers, non-smokers and ex-smokers among 10,000 adult males in Isreal. Am J Epidemiol 1977, 105-75.
5. Karvonen M, Orma E, Keys A, Fidanza F, Brozek J. Cigarette Smoking, Serum-Cholesterol, Blood-Pressure, and Body Fatness. Observations in Finland. Lancet. 1959:492-.
6. Jain BL, Abraham , Kokan AK. A study of ventilator lung functions in smokers from tropical area. J trop. Med. Hyg. 1972, 75, 103-8
7. DosMAN JA, Bode F, Urbanetti J, Martin R, Macklem PT. The use of a helium-oxygen mixture during maximum expiratory flow to demonstrate obstruction in small airways in smokers. The Journal of clinical investigation. 1975 May 1;55(5):1090-9.