VOLUME - 12, ISSUE - 04, APRIL - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper | General Medicine

"LUNG FUNCTION CHARACTERISTICS IN ASYMPTOMATIC SMOKERS- A CROSS SECTIONAL STUDY IN A TERTIARY CARE CENTER, MANDYA"

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ABSTRACT **Introduction:** Cigarette smoking has an extensive effect on the respiratory function and it has been clearly implicated in the aetiology of respiratory diseases like chronic bronchitis, emphysema, and bronchial carcinoma. Smoking is one of the major causes of preventable morbidity and mortality in both developed and developing countries. The World Health Organization reported that tobacco smoking killed 100 million people worldwide in the 20th century and warned that it could kill one billion people around the world in the 21st century. Chronic exposure to cigarette smoke reduces small air ways function significantly. Smoking increase inflammatory cells in lung, which produce free radicals. This significantly leads to progressive deterioration in lung function and affects all the parameters of pulmonary function tests. **Aim/objectives:** To estimate the prevalence of lung function abnormalities and the pattern of airflow limitations in the asymptomatic smokers. To assess dose response relationship between pack years of smoking and severity of lung function abnormalities. **Methods:** This cross sectional study was carried at a tertiary care center, Mandya. 450 asymptomatic smokers above the age of 18 years were included in this study after obtaining the informed consent. Spirometry was performed according to ATS criteria.Data were entered into spreadsheet/database and used for statistical analysis after grouping as following: I)<10 pack years II) 10-20 pack years III) 21-30 pack years **Results:** There was a statistically significant dose response relationship between smoking and reduction in various pulmonary function parameters (FVC, FEV1, FEV1/FVC, FEF-25-75%). **Conclusion:** We conclude that smoking causes decline in pulmonary function test parameters especially obstructive type. So tobacco smoking control programme to be strengthened aimed to prevent the morbidity and mortality from tobacco smoking.

KEYWORDS : asymptomatic smokers, spirometry, lung function abnormality, pack years

INTRODUCTION

Smoking is one of the major cause of preventable morbidity and mortality in both developed and in developing country. Smoking is one of the main risk factor for a number of chronic diseases including cancer, lung diseases and cardiovascular diseases. Moreover inhalation of smoke from even a single cigarette has been shown to cause brief broncho-constriction in smokers and non-smokers.2

Cigarettes kill an estimated 5 million people annually worldwide. The World Health Organisation (WHO) reported that, tobacco smoking killed 100 million people worldwide in the twentieth century and warned that it could kill one billion people around the world in 21st century.

By the early 2030, tobacco related death would increase to about 10 million ayear.1

The overall prevalence of current tobacco use from the National Household Survey of Drug and Alcohol Abuse in India (NHSDAA) is 55.8%.3

Functional defect in smokers with chronic obstructive pulmonary diseases is that of air flow obstruction. Cigarette smoking is overwhelmingly the most important cause of cough and mucous overproduction.4 Chronic exposure to cigarette smoke reduces small airways function significantly. Smoking increases inflammatory cells in lung which produces free radicals.

The oxidative stress is involved in the development of smoking related respiratory conditions and other pathologies. They significantly leads to progressive deterioration lung function and affects all the parameters of pulmonary function tests.3

This study is aimed to detect the lung function changes in asymptomatic smokers with increasing pack years to assess whether early detection of lung function abnormalities can help to provide early intervention of tobacco cessation.

AIMS/OBJECTIVES

To estimate the prevalence of lung function abnormalities and the pattern of airflow limitations in the asymptomatic smokers. To assess dose response relationship between pack years of smoking and severity of lung function abnormalities.

MATERIALS AND METHODS

Source of data:

This study was carried out in the tertiary care center, Mandya over a period of 1 month from January to February 2023

The subjects for study were selected from relatives and friends of patients after fulfilling the inclusion and exclusion criteria.

Type of study:

Cross sectional study

Sample size:

450

Inclusion Criteria:

Clinically asymptomatic adult smokers >18 years of age Grouped into following:
I) <10 pack years II) 10-20 pack years III) 21-30 pack years

Exclusion criteria:

1) Subjects have active pulmonary TB
2) Contraindications for spirometry like
a) History of abdominal/chest/eye surgery, MI in past 3 months.
c) Pneumothorax
d) Respiratory infections in past 3 weeks

Method of collection of data:

We used NDD for assessing the pulmonary functions. This spirometer has a mouth piece attached to a transducer assembly which is connected to an adaptor box and this is connected to the computer by a serial cable. Software from Recorders and Medicare system is loaded onto the computer.

This software allows the calculation of the predicted values for age, sex, weight and height and it also gives the recorded values of all the parameters.

Subject was motivated prior to the initiation of manoeuvre. He was made to sit on a stool, then place the mouth piece firmly in his mouth. He was asked to take a maximum inspiration following which we would attach a nose clip and ask him to execute a maximum forced expiration with full efforts which was followed by a maximum forced inspiration.

The test was performed over ATS criteria like within manoeuvre criteria, individual spirograms are "acceptable", they are free from artefacts like cough during the first second of exhalation, glottis closure that influences the measurement, early termination or cut off, effort, effort that is not maximal throughout, leak and obstructed mouth piece. They show satisfactory exhalation like duration of ≥6s or a plateau in the volume time curve for atleast 1 sec.

After 3 acceptable spirograms have been obtained, the two largest spirogram should be within 5% or 150ml of each other for both FVC and FEV1. The two largest values of FEV1 must be within 0.150L of each other. If both of these criteria are not met, continue testing until both of the criteria are met with analysis of additional acceptable spirograms or a total of eight tests have performed (optional) or the patient/subject cannot or should not continue.

Save, as a minimum, the three satisfactory manoeuvres. The machine gives the comparison of various parameters between the three manoeuvres and we accepted the best manoeuvre.

As with spirometry, a minimum of three acceptable VC manoeuvres must be obtained. If the difference in VC between the largest and next larges manoeuvre is >0.150L, additional trials should be undertaken.

Then the subject was asked to perform the slow vital capacity test. He was asked to breathe normally followed by a deep inspiration and a deep expiration, again continuing with normal breathing.
Statistical methods used:

All the data collected were entered into MS Access database, statistical analysis was conducted using Epi info version 7 (CDC, Atlanta, USA) and IBM SPSS version 20 (IBM Corp, Armonk, USA).

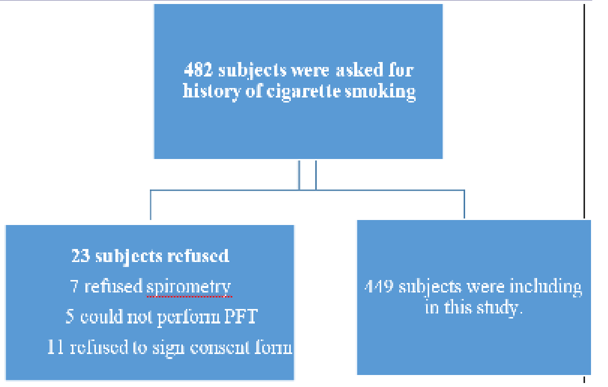
Descriptive statistics: The continuous variables like age, height, weight, BMI were presented as mean (standard deviation) and categorical/nominal variables were presented as frequencies.

Pearson's correlation was used to analyse the correlation of variables like pack years with spirometry values.

Comparison of means was done for assessing the difference of lung function parameters between the pack year groups Sub-group analysis to assess dose response relationship between pack-year groups and severity of lung function abnormalities was carried out.

RESULTS

During the study period, a total 472 subjects were screened for inclusion and exclusion criteria: 22 subjects were excluded from the study for the one of the following reasons: refused to perform PFT or unable to perform PFT or refused to sign consent form.



In present study total of 450 subjects were included are grouped in to:
224 in to 0-10 pack years.
139 in to 11-20 pack years.
87 in to 21-30 pack years.

Demographic characteristics of the study are as follows

TABLE -1 DEMOGRAPHIC CHARACTERISTICS OF GROUP 1

	Range		Mean	SD
	Minimum	Maximum		
Age (yrs)	18	85	49.25	16.11
Weight (kg)	36	121	64.72	13.69
Height (cm)	143	187	166.57	7.47
BMI	14.8	41.8	23.26	4.68

TABLE -2 DEMOGRAPHIC CHARECTERISTICS OF GROUP 2

	Range		Mean	SD
	Minimum	maximum		
Age (yrs)	32	83	56.93	10.05
Weight (kg)	35	106	63.97	15.01
Height (cm)	150	184	166.75	7.23
BMI	14.1	34.6	22.7	4.64

TABLE 3. DEMOGRAPHIC CHARECTERISTICS OF GROUP 3

	Range		Mean	SD
	Minimum	Maximum		
Age (yrs)	41	83	65.945	7.94
Weight (kg)	40	87	58.14	10.57
Height (cm)	148	185	166.36	6.842
BMI	14.7	34	20.72	3.38

TABLE 4. COMPARISON AGE AMONG GROUP 1, 2 & 3

Variable	Study group	Mean	SD
AGE (yrs)	0-10 pack years	49.25	16.11
	11- 20 pack years	56.93	10.05
	21-30 pack years	65.94	7.94

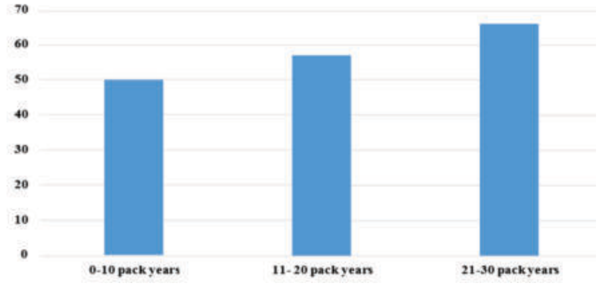


Figure 7. Demographic Characteristics Of Group 1, 2 & 3

TABLE 5. COMPARISION OF BMI AMONG GROUP 1,2,& 3

Variable	Study group	Mean	SD
BMI	0-10 pack years	23.26	4.68
	11- 20 pack years	22.73	4.64
	21-30 pack years	20.72	3.38

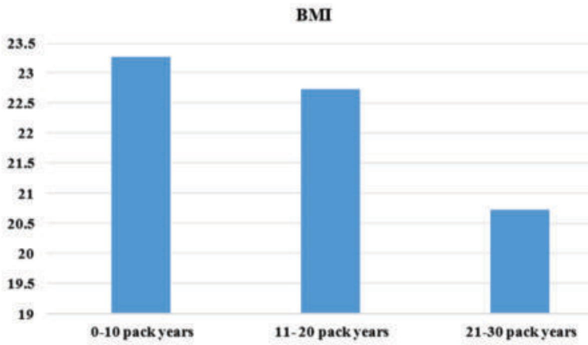


Figure 8. Comparision Of Bmi Among Group 1,2,& 3

TABLE 6. FVC-PRE AMONG GROUP 1,2 & 3						
	Pack years	N	Mean (L)	SD	Min	Max
FVC-PRE	0 to 10	223	3.29	0.701	1.32	4.91
	11 to 20	139	2.90	0.679	1.65	4.80
	21 to 30	87	2.60	0.619	1.47	4.31

The mean value of FVC-PRE in 0-10 pack years is 3.29. $\pm$ 0.701, in 11-20 pack years is 2.90 $\pm$ 0.679 and in 21-30 pack years is 2.60 $\pm$ 0.619. There is a significant difference in FVC-PRE values in all the three groups.

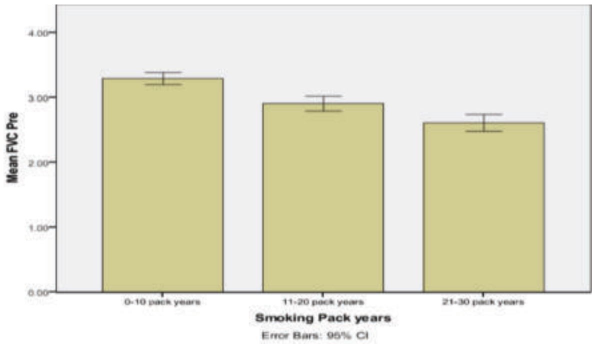


Figure 9. Fvc-pre Among Group 1,2 & 3

TABLE 7. FVC- PRE BRONCHODILATOR % PRED AMONG GROUP 1,2 & 3								
	Pack years	N	Mean (%)	SD	Min	Max	P Value	Post HOC
FVC-PRE	0 to 10	223	100.46	13.591	19	137	<0.001	1 & 2,
BRONCHO	11 to 20	139	91.62	13.809	55	144		1 & 3
DILATOR								2&3
% PRED	21 to 30	87	90.39	18.641	48	184		Not significant

The mean value of FVC-% PRED IN 0-10 pack years is 100.461$\pm$13.59, in 11-20 pack years is 91.62 $\pm$13.80 and in 21-30 pack years is 90.39 $\pm$18.64.

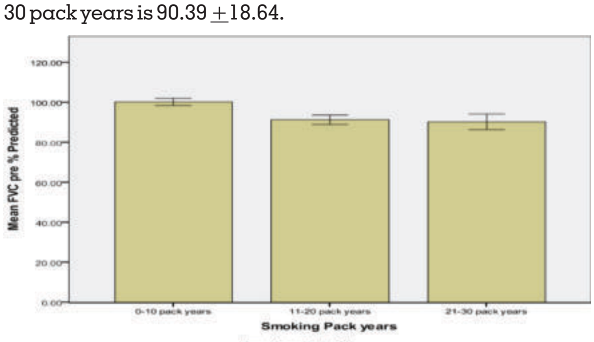


Figure 10. Fvc- Pre Bronchodilator % Pred Among Group 1,2 & 3

TABLE 8. FVC- POST AMONG GROUP 1, 2 & 3						
	Pack Years	N	Mean (L)	SD	Mini	Max
FVC-POST	0 to 10	223	3.3239	.69611	1.43	4.96
	11 to 20	139	2.9922	.67993	1.62	4.90
	21 to 30	87	2.7413	.63212	1.68	5.05

The mean value of FVC-POST in 0-10 pack years is 3.32 $\pm$ .696, in 11-20 pack years is 2.99. $\pm$ .679 and in 21-30pack years is 2.741. $\pm$.632.

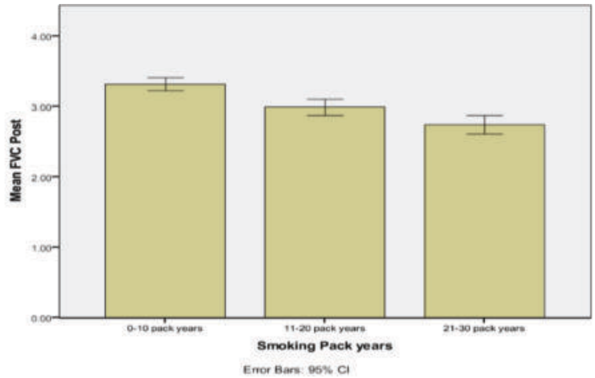


Figure 11. FVC- Post Among Group 1, 2 & 3

The mean value of FVC-% POST PRED in 0-10 pack years is 101.31$\pm$14.75, in 11-20 pack years is 94.02 $\pm$16.80 and in 21-30 pack years is 94.931$\pm$18.22. There is a significant difference in FVC % PRED values in all the three groups.

TABLE 9. FVC - POST BRONCHODILATOR % PRED AMONG GROUP 1, 2 & 3								
	Pack Years	N	Mean (%)	SD	Min	Max	P Value	Post HOC
FVC POST	0 to 10	223	101.31	14.757	17	139	<0.001	1 & 2, 1
BRONCHOD	11 to 20	139	94.02	16.808	19	149		& 3
ILATOR %								2&3 Not
PRED	21 to 30	87	94.93	18.225	63	174		significant

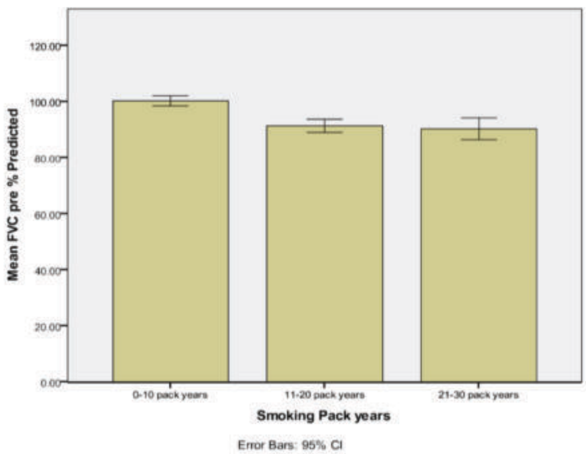


Figure 12. Fvc - Post Bronchodilator % Pred Among Group 1,2 & 3

TABLE 10. FEV1-PRE AMONG GROUP 1,2 & 3						
	Pack Years	N	Mean (L)	SD	Min	Max
FEV1-PRE	0 to 10	223	2.6901	.61442	1.11	4.37
	11 to 20	139	2.2414	.60880	.95	3.86
	21 to 30	87	1.7786	.49949	.74	3.24

The mean value of FEV1-PRE in 0-10 pack years is 2.69 $\pm$.614, in 11-20 pack years is 2.241$\pm$.608 and in 21-30 pack years is 1.778 $\pm$.499.

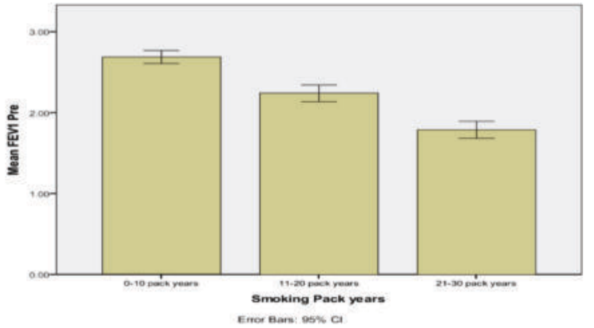


Figure 13. Fev1-pre Among Group 1,2 & 3

The mean value of FEV1 %PRED in 0-10pack years is 100.60 ±12.98, in 11-20 pack years is 86.63 ±15.23 and in 21-30 pack years is 76.83 ±17.43.

TABLE 11. FEV1- BRONCHODILATOR PRE % PRED AMONG GROUP 1,2 & 3								
FEV1-PRE BRONCHODILATOR % PRED	Pack Years	N	Mean (%)	SD	Min	Max	p Value	Post HOC
	0 to 10	223	100.60	12.984	70	177	<0.001	All three groups
	11 to 20	139	86.63	15.239	47	177		
	21 to 30	87	76.83	17.439	39	139		

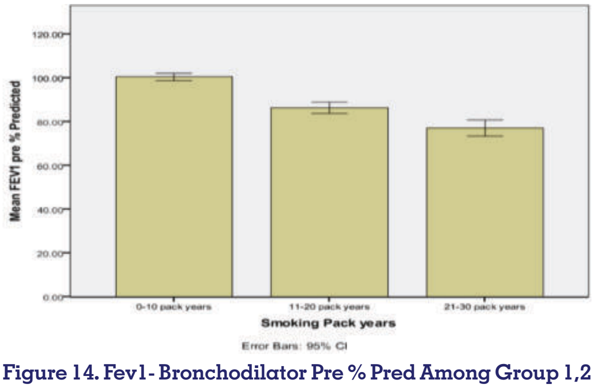


Figure 14. Fev1- Bronchodilator Pre % Pred Among Group 1,2 & 3

TABLE 12. COMPARISION OF FEV1-POST AMONG GROUP 1,2,& 3						
FEV1-POST	Pack Years	N	Mean (L)	SD	Min	Max
	0 to 10 years	223	2.7663	.63164	1.27	4.65
	11 to 20 years	139	2.3596	.62340	1.03	4.02
	21 to 30 Years	87	1.9202	.51371	.93	3.41

The mean value of FEV1-post in 0-10pack years is 2.766 ±.63,in 11-20 pack years IS 2.35 ±.623 and in 21-30pack years is 1.92 ±.513.

TABLE 13. FEV1- POST BRONCHODILATOR % PRED AMONG GROUP 1,2,& 3								
FEV1-POST BRONCHODILATOR	Pack Years	N	Mean (%)	SD	Min	Max	p value	Post HOC
	0 to 10 years	223	103.30	12.957	72	147	<0.001	All three groups
	11 to 20 years	139	90.87	14.212	51	133		
	21 to 30 Years	87	81.64	18.155	1	124		

THE mean value of FEV1 %PRED in 0-10pack years is 103.3 ±12.95,in 11-20 pack years is 90.87 ±14.21 and in 21-30pack YEARS is 81.64 ±18.15. There is a significant difference in FEV1 -POST values in all the three groups.

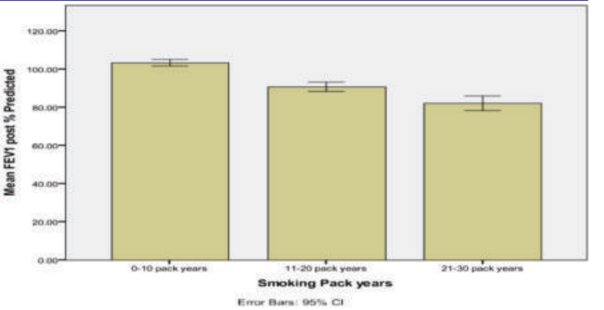


Figure 15. Fev1- Post Bronchodilator % Pred Among Group 1,2,& 3

FEV1/FVC-POST

TABLE 14. FEV1/FVC POST AMONG GROUP 1,2,& 3						
FEV1/FVC - POST	Pack Years	n	Mean	SD	Min	Max
	0 to 10 years	223	.83178	.057520	0.681	0.991
	11 to 20 years	139	.78499	.075204	0.516	0.957
	21 to 30 Years	87	.69677	.079297	0.483	0.840

The mean value of FEV1/FVC-POST in 0-10pack years is .831 ±.057, in 11-20 pack years is .784 ±.075 and in 21-30pack years is .696 ±.079.

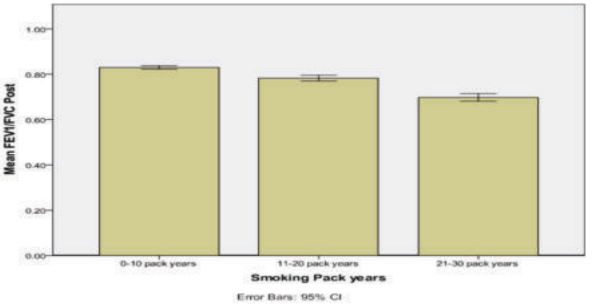


Figure 16. Fev1/fvc Post Among Group 1,2,& 3

TABLE 15. FEF 25-75 % PRE AMONG GROUP 1,2,& 3						
FEF25-75%- PRE	Pack years	N	Mean (L/S)	SD	Min	Max
	0 to 10 years	223	2.8735	1.056	.75	5.50
	11 to 20 years	139	3.4149	10.79	.42	92.00
	21 to 30 Years	87	1.1983	.569	.37	3.23

FEF25-75%-%PRED

TABLE 16. FEF 25-75 PRE BRONCHODILATOR % PRED AMONG GROUP 1,2,& 3								
	Pack years	N	Mean (L/S)	SD	Min	Max	P Value	Post HOC
FEF25-75% -PRE	0 to 10 years	223	86.43	25.823	23	160	<0.001	All three Groups
BRONCHODILA	11 to 20 years	139	64.35	24.028	21	125		
TOR %PRED	21 to 30 Years	87	41.77	16.627	4	85		

The mean value of FEF25-75%PRED in 0-10pack years is 86.43 ± 25.82,in 11-20 pack years is 64.35 ± 24.02 and in 21-30pack years is 41.77 ±16.62. There is a significant difference in FEF25-75% PRED values in all the three groups.

FEF25-75%-POST

TABLE 17. FEF 25-75 % POST AMONG GROUP 1,2,& 3						
FEF25-75%-POST	Pack years	n	Mean (L/S)	SD	Min	Max
	0 to 10	223	3.1974	1.15394	.59	6.78
	11 to 20	139	2.3973	1.16277	.41	5.36
	21 to 30	87	1.3689	.66321	.07	3.59

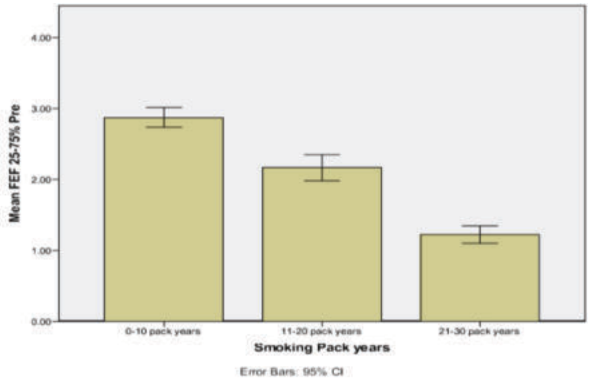


Figure 17. Fef 25-75 Pre Bronchodilator % Pred Among Group 1,2,& 3

The mean value of FEF25-75%-post in 0-10pack years is 3.19 ±1.15,in 11-20 pack years is 2.39 ±1.16 and in 21-30pack years is 1.36 ±.66.

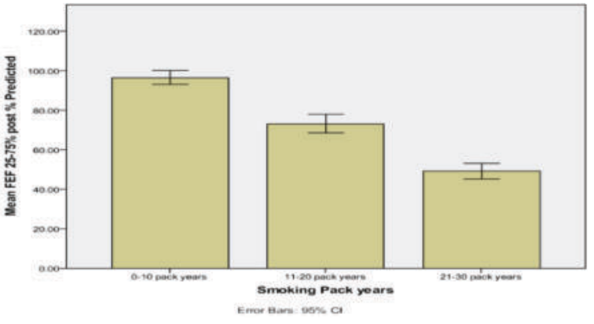


Figure 18. Fef 25-75 % Post Among Group 1,2,& 3

TABLE 18. FEF 25-75 % PRED POST BRONCHODILATOR AMONG GROUP 1,2,& 3								
FEF25-75%-%PRED POST BRONCHODILATOR	Pack years	N	Mean (L/S)	SD	Min	Max	p value	Post HOC
	0 to 10	223	96.54	26.696	30	188	<0.001	All three groups
	11 to 20	139	73.31	27.471	22	153		
	21 to 30	87	48.44	18.177	13	92		

There is a significant difference in FEF25-75% PRED values in all the three groups.

The mean value of FEF25-75%-%PRED in 0-10pack years IS 96.54 ± 26.69,in 11-20 pack years is 73.31± 27.47, and in 21-30pack years is 48.44±18.177. There is a significant difference in FEF25-75% PRED values in all the three groups.

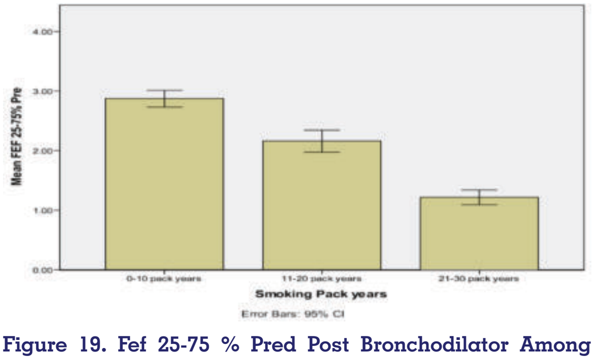
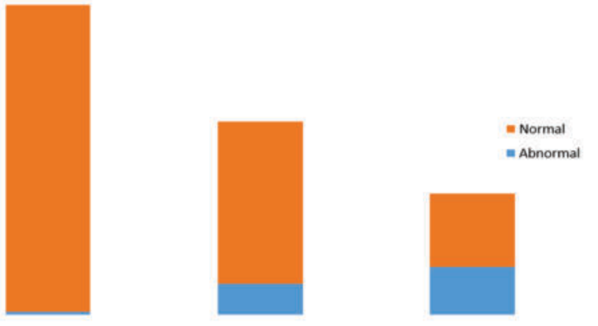


Figure 19. Fef 25-75 % Pred Post Bronchodilator Among Group 1,2,& 3

		GROUP 1 (0-10 pack years)	GROUP 2 (11-20 pack years)	GROUP 3 (21-30 pack years)
FEV1-POST BRONCHODILATOR	Abnormal (<80% PRED)	2/223 (0.89%)	22/139 (15.8%)	34/87 (39.09%)
	Normal (>80% PRED)	221/223 (99.1%)	117/139 (85.4%)	53/87 (60.91%)

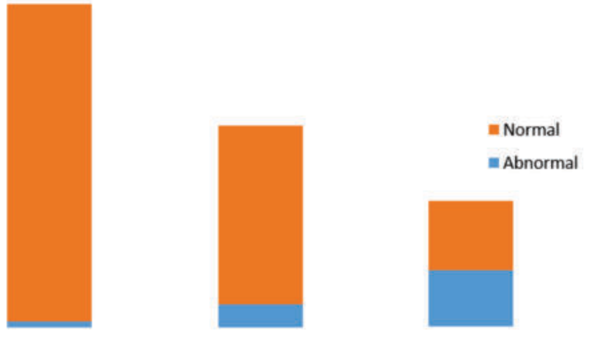
P value: <0.001



We found that abnormal FEV1 post value in 2 subject of group 1, 22 subjects of group 2, 34 subject of group 3.

		GROUP 1 (0-10 pack years)	GROUP 2 (11-20 pack years)	GROUP 3 (21-30 pack years)
FEV1/FVC POST BRONCHODILATOR	Abnormal (<0.7 PRED)	4/223 (1.7%)	16/139 (11.51%)	39/87 (44%)
	Normal (>0.7 PRED)	219/223 (98.2%)	123/139 (88.4%)	48/87 (56%)

P value: <0.001



We found that abnormal FEV1/FVC post values in 4 subjects of group 1, 16 subjects of group 2, 39 subjects of group 3.

DISCUSSION

Evidence accumulated in the past 30years, shown an Irrefutable association between the long term inhalation of cigarette smoke and the development of obstructive airway disease. The available data indicate that the life expectancy of habitual smokers is reduced by 15-20 years and approximately half will die as a consequence of their habit. 5

Cigarette smoking has extensive effects on the respiratory function and it has been clearly implicated in the aetiology of a number of respiratory diseases, particularly chronic bronchitis, emphysema and bronchial carcinoma.6

Tobacco smoke contains number of substances which may exert some effects upon body. During burning of tobacco in cigarettes various processes such as pyrolysis, prosynthesis, distillation, sublimination, hydrogenation, oxidation, decarboxylation, dehydration result in generation of more than 4000 identifiable compounds present in tobacco itself or new compound generated thereof. The smoke is composed of a fine aerosol with a particle size distribution predominantly in the range to deposit in the airways and alveolar surface of lung and vapour phase. They include particles of smoke dust which disturb the function of respiratory airways, tars which exert an irritant effect upon bronchial epithelium (tar is the aggregate of particular matter after subtracting nicotine and moisture) and nicotine which increase heart rate and elevate systolic blood pressure. The tobacco smoke inhalation causes an immediate rise in the airway resistant which persist for at least an hour. This is due to vagally mediated smooth muscle constriction presumably by way of stimulating submucosal irritant receptors. Experimental studies have shown that prolong cigarette smoking impairs cilliary movements, inhibition of function of alveolar macrophages

leads to hypertrophy and hyperplasia of mucus secreting glands. It is probable that smoke also inhibits antiproteases and causes polymorphonuclear leucocytes to release proteolytic enzymes acutely.7 In smokers, changes occurs in respiratory system due to inflammation, and fibrosis. So all dynamic pulmonary parameters under consideration are significantly lower than normal values.4 Pulmonary function is a good test to describe the pattern of pulmonary disease. The decrease in FEV1,FEV1/FVC RATIO and other flow rates indicates obstructive lung changes and decrease in FVC indicates restrictive lung changes. 8

FVC

In our study the mean value of FVC-POST in group 1(0-10pack years) is 3.323+0.696; in group 2(11-20pack years) is 2.992+0.679 ;and in group 3 (21-30 pack years)is 2.741+0.632 respectively. We found that abnormal FVC post value in 2 subject of group 1, 6 subjects of group 2, 3 subject of group 3 respectively. Similar finding were reported by Bano R et al,1 Anang T,46 ANAND M,7 Saba Ibrahim,8 Hani A et al.9 The irritants present in the smoke cause release of elastase from alveolar macrophages, that degrades structural elements of the lung .which leads to loss of elastic recoil causing decrease in FVC%, FEV1, PEFR.3

FEV1

We found that, the mean values of FEV1, POST in group 1(0-10 pack years) is 2.76+0.631, Group 2 (11-20 pack years) is 2.359+0.623 and Group 3 (21-30pack years) is 1.920+0.513 respectively. This results are in agreement with studies done by Dwarakanath et al,3 S I Saba et al,8 Diane R et al, REXHIP et al F,2 Prasad S K.

In our study we also found that the reduction of FEV1 is directly associated with the number of pack years. A similar association is found in Isbel U et al study.

We found that abnormal FEV1 post value in 2 subject of group 1, 22 subjects of group 2, 34 subject of group 3. Decline in the FEV1 is strongly related to cumulative cigarette consumption and severity of pre-existent bronchial hyperresponsiveness in smokers with COPD. Decline in FEV1 is also related to the number of cigarettes smoked:heavy smokers with mild to moderate COPD showed a greater decline than light smokers and these heavy smokers showed greater FEV1 improvement after smoking cessation than light smokers.11

FEV1/FVC

In our study the mean value of FEV1/FVC POST IN Group 1(0-10pack years) is 0.831+0.575, In Group 2 (11-20pack years) is 0.784+0.075, and in Group 3 (21-30 pack years) is 0.696+0.079 respectively. Similar observations were reported by Dhand R et al, Fain S B et al, 12 Ritesh M K et al. Sumita N et al, Anand Kumar et al, Shireen J et al, Yasunga K et al.13 In contrast Harita et al observed that there is no significant change in FEV1 and FEV1/FVC ratio in smokers and non smokers.14 We found that abnormal FEV1/FVC post values in 4 subjects of group 1, 16 subjects of group 2, 39 subjects of group 3. It also showed that ratio of FEV1/FVC was decreased with increase in duration of smoking and also with increase in number of cigarette per day. Smoking may directly induce an arterial endothelial injury and an increased platelet consumption may reflect the adherence or the deposition of these cells to damage site was suggested by Hind C R.

FEF 25-75%

In our study, the mean value of FEF 25-75% post in group 1 (0-10pack years) is 3.197+1.153, Group 2 (11-20 pack years) is 2.397+1.162, and Group 3 (21-30 pack years) is 1.368+0.663 respectively. This suggests that as negative relationship with duration of smoking, as the pack years increases the FEF 25-75% value decreases. This results were in consistent with Jetty Jerusha et al,4 Rubeena Bano and Nadeem Ahmad et al,15 Mehmet Polath et al.16 The early changes in smokers are probably due to narrowing of the small airways.4

The present study illustrates the usefulness of the forced expiratory spirogram in evaluating the early changes in lung function in smokers. A progressive reduction in mean flow rates and an increase in the incidence of severe obstruction have been found with increasing pack-year exposure. However, only a small fraction of smokers will develop significant airway obstruction, a finding suggesting that other genetic and/or environmental factors are also operative in the production of airway obstruction. Smoke components likely to cause airway obstruction are not completely known but nicotine, irritants such as acrolein and free radicals might play a role. The manner of smoking is another factor influencing the lung's exposure to cigarette smoke; a considerable inter- and intra-subject variability has been documented in the inhaled volume and puff volume, After the first few cigarette puffs, an inflammatory response develops involving several cell types, especially neutrophils, alveolar macrophages, CD8þ T-lymphocytes, and possibly eosinophils. In susceptible subjects, a bronchiolitis develops which will progress with continuing smoking. After variable time, airway inflammation is followed by airway remodelling, a term defining the structural changes that occur in the airway wall due to acute inflammatory events and/or chronic inflammation and repair. At the same time, the antiprotease activity of the lung may be compromised by the oxidation, by cigarette smoke, of antiprotease protective mechanisms (e.g. a1 AT). Without opposition, the proteolytic activity may damage the lung parenchyma leading to destructive emphysema. This proteolytic lung destruction combines with airway inflammation and remodelling to produce decrease

lung recoil and increased peripheral airway resistance, the two main factors responsible for decreasing maximal expiratory flow from the lung in cigarette smoke- induced chronic airway obstruction.

All the parameters of pulmonary function tests like FVC,FEV1, FEV1/FVC ratio and FEF25-75% showed statistically significant dose response relationship between group 1 and group 2, 3(p value <0.001). Finally we conclude that smoking causes decline in pulmonary function test parameters especially obstructive type. So tobacco smoking control programme to be strengthened aimed to prevent the morbidity and mortality from tobacco smoking.

Summary

The study was designed as cross section study which included 449 subjects of which 224 were in group 1 (0-10 Pack Year), 139 were in group2 (11-20 Pack Years), and 87 were in group 3 (21-30 Pack Years).

During this period the subjects were selected from relatives, and friends of patients after fulfilling the inclusion criteria.

Subjects with history of cigarette smoking and no respiratory symptoms were subjected spirometry. After explaining the purpose of the study, subjects were included into the study.

The results of presenting study are

1) The mean value of FVC-POST in group 1 (0-10pack years) is 3.323+0.696, in group 2 (11-20pack years) is 2.992+0.679, and in group 3 (21-30 pack years) is 2.741+0.632 respectively.
2) The mean values of FEV1-POST in group 1(0-10 pack years) is 2.76+0.631, Group 2 (11-20 pack years) is 2.359+0.623 and Group 3 (21-30pack years) is 1.920+0.513 respectively.
3) The mean value of FEV1/FVC POST in Group 1(0-10pack years) is 0.831+0.575, In Group 2 (11-20pack years) is 0.784+0.075, and in Group 3 (21-30pack years) is 0.696+0.079 respectively.
4) The mean value of FEF 25-75% POST in group 1 (0-10pack years) is 3.197+1.153, Group 2 (11-20 pack years) is 2.397+1.162, and Group 3 (21-30 pack years) is 1.368+0.663 respectively.
5) There is a negative relationship with burden (pack years) of smoking and pulmonary function test parameters FVC, FEV1, FEV1/FVC, and FEF 25- 75%.

CONCLUSION

From the present, by comparing the Pulmonary Function Test parameters in group1 (0- 10 pack years), group2 (11-20 pack years), and group 3 (21- 30 pack years), we conclude that cigarette smoking was found to cause decrease in various Pulmonary Function Test parameters and leads to airway obstruction.

So tobacco smoking control programme to be strengthened to prevent morbidity and mortality from smoking.

List Of Abbreviations Used

BMI - Body Mass Index
COPD - Chronic Pulmonary Obstructive Disease
PFT - Pulmonary Function Test
FEV1 - Forced Expiratory Volume in 1 Sec FVC - Forced Vital Capacity
ATS - American Thoracic Society
Ap-1 - Activating protein 1
Erk - Extracellular signal-related kinas
Ikk - Inhibitor kb kinase
nk - n-Terminal kinase
nf-b - Nuclear factor b
p - Phosphate
α1-AT - α1-Antitrypsin
IL-8 - Interleukin 8
LTB4 - Leukotriene B4
TNF - Tumor necrosis factor
NEP - Neutral endopeptidase
MEF50 - Maximum Instantaneous Flow at 50% of Expired Vital Capacity
MEF75 - Maximum Instantaneous Flow at 75% of Expired Vital Capacity
mVC - Measured Vital Capacity
pFVC - Predicted Forced Vital Capacity MEP - Maximal Expiratory Pressure

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