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Original Research Paper

Pulmonary Medicine

STUDY OF VARIOUS LUNG FUNCTION PARAMETERS IN ASYMPTOMATIC SMOKERS

Dr Rahul Lokhande Associate Professor ,Department of Pulmonary Medicine B.J.G.M.C , Sassoon Hospital Pune .

Dr Avinash Babu* Senior Resident , Department of Pulmonary Medicine B.J.G.M.C
*Corresponding Author

ABSTRACT

BACK GROUND :- Smokers increase their risk of lung disease ,including lung cancer, But they also increase their risk of other illnesses such as heart disease, stroke and mouth(oral) cancer .

Smoking has long been linked to adverse effects on the respiratory system ,causing malignant ad non-malignant diseases ,exacerbating chronic lung diseases, and increasing the risk for respiratory infections .(1) .

METHODOLOGY :- An Observational study performed in 30 asymptomatic smokers in the Pulmonary Function Test lab of Department of Pulmonary Medicine, BJGMC and Sassoon Hospital .

RESULTS :- Based on Spirotmetery there is decrease in mean values of FEV1% and FEF25-75% in relation to increase smoking index which was proved to be statistically significant . Based on Osillometery there is significant increase in mean values of X5 and R5-R19 values in relation to increasing smoking index . There was significant increase in residual volume (RV) according to body plethysmographic method in relation to increasing intensity of smoking .

KEYWORDS : Lung Functions, Asymptomatic smokers , Smokers

INDTRODUCTION :-

According to the Centers for Disease Control and Prevention , disease caused by smoking kill more than 48000 people in the U>S> each year. In fact smoking is directly responsible for almost 90% of lung cancer and COPD deaths (1) , Even with antismoking campaigns and health warnings, many people continue to smoke or start to smoke every year .Smokers increase their risk of lung disease , including lung cancer , But they also increase their risk of other illnesses such as heart disease , stroke and muth (oral) cancer.

Chronic obstructive pulmonary disease (COPD) is major cause of morbidity and mortality across the globe . According to World Health Organization estimates , 65 million people have moderate to sever COPD. More than 3 million people died of COPD in 2005 corresponding to 5% of all deaths globally and it is estimated to be the third leading cause of death by 2030.

In India , Non communicable diseases were estimated to have accounted for 53% of all deaths and 44% of disability adjusted life years (DALYs) lost. Crude estimates suggest that there are 30 million COPD patients in India (2). India contributes a significant and growing percentage of COPD mortality which is estimated to be amongst the highest in the world.

Smoking is recognized to be the most important risk factor for development of COPD . Smoking behaviours in India are peculiar with large number of people using non conventional form of tobacco like hookah, bedi , or chillum . Screening might increase detection of COPD in early states (3).Early diagnosis may not motivate smoking cessation, which is known to slow down the loss of lung function associated with COPD, Most of the studies for screening included symptomatic subjects, non-smokers or patients with a known prior history of obstructive lung disease .Thus, the potential value of screening for early diagnosis of COPD in asymptomatic smokers to investigate the prevalence of airway obstruction and help them in improvement of lung fuction and smoking cessation.

MATERIAL AND METHODS :-

The study was an observational study performed in the Pulmonary Function Test Lab of the Department of Pulmonary Medicine , BJMGC and Sassoon Hospital Pune . The study was conducted among 30 subjects who were regular smokers for the last two years and above . Subjects were asymptomatic healthy current male smokers who are free of respiratory , haematological and acute or chronic symptoms or disease and were selected voluntarily from among employees, resident doctors and patients coming to IOD of Sassoon General Hospital for non – respiratory ailments .

In total 30 subjects were selected who met the inclusion criteria and were subjected to Spirometry , impulse oscillometry,body plehysmongraphy and DLCO. Female participants were excluded due to low prevalence of smoking among them. The rest of the subjects who were not able to perform the test correctly or did not meet the inclusion criteria were excluded.

The quantum of smoking exposure was calculated based on smoking exposure was calculated based on smoking index(4). Which was calculated as the product of average number of cigarettes or bidi smoked per day and the duration of smoking in years . In a country like ours where a pack of cigarette contains either ten or twenty cigarettes and the smoking habits include either cigarette or bidi smoking, smoking index is more appropriate than pack years . In comparative terms, 10 pack years is equivalent to smoking index of 200.(Smoking index= Pack years X 20).

Smoking Index = (Frequency X Duration)

Non –Smokers - 0 ,Light Smokers 1-100 , Moderate smokers more than 200 .

Inclusion Criteria – Age 18-70 yrs, Regular male Smokers for the las one year and above without any repiratory symptoms .

Exclusion Criteria – Age <18 ,>70 yrs , Acute and Chronic heart diseases , Acute or Chronic respiratory diseases, Patient with past history of tuberculosis ,Poor subject co-operation .

The study was conducted by Platinum Elite series body Plethysmography which is used to perform pulmonary function test in our studies . The machine is capable of performing spirometery , Thoracic gas volume and diffusion capacity of lung for carbon monoxide.

Gas requirement for model was , Calibration gas (6-8psi) :5% CO2, 12% O2, balance N2DLCO mix (135psi):0.3%CO,

0.3%CH4, 21%O2, balance N2.

Impulse oscillometry was conducted by the Resmon Pro oscillometer which uses the forced oscillation technique (FOT) to measure the mechanical properties of the lung and airways. Standard protocol , preparation and consent was taken to every patient.

Data analysis done by using statistical package for version 2.0, Quantitative data variables. expressed by using mean ,standard deviation etc. Qualitative data variables expressed by using frequency and percentage,(%) Chi-square test or Fischer's exact test used to find the association between smoking indexes with various qualitative data variables . Pearson's correlation Coefficient between smoking index with FEV1 , smoking index with FEv25-75%,FEV1 with X5 and FEF25-75% with R5-R19, P value <0.05 is considered as significant

RESULTS :-

Table -1 Smoking index in study population

Smoking Index	Number of Subjects	Percentage (%)
< 100	18	60
100-200	9	30
> 200	3	10

In our study 18 subjects (60%) had a smoking index of <100 , 9(30%) had as smoking index of 200 and 3(10%) had a smoking of >200 .

Table 2 – Mean FEF25-75 and smoking Index.

Smoking Index	Number of Patients	FEV25-75		P-Value
		Mean	SD	
< 100	18	75.94	14.48	0.047
100-200	9	70.33	23.19	
> 200	3	78.00	8.19	

By using Fisher's exact test P-value <0.05 (0.047) therefore there is significant association between FEV25-75 with respect of smoking index.

Table 3- Mean of FEV1% and smoking index

Smoking Index	Number of Patients	FEV1%		P-Value
		Mean	SD	
< 100	18	85.28	10.00	0.036
100-200	9	77.56	11.22	
> 200	3	73.33	8.50	

In study using Kruskal Wallis Test there is significant decrease in mean of FEV1% (p-value 0.036) with increasing smoking index

Table -4 Mean RV% and smoking index

Smoking Index	Number of Patients	FEV1%		P-Value
		Mean	SD	
< 100	18	86.11	13.34	0.027
100-200	9	95.22	9.97	
> 200	3	108.33	15.31	

In the study using Kruskal Wallis Test there is a significant increase in mean of residual volume% (p value 0.027) with increase in smoking index.

Table-5 Mean DLCO and smoking Index

Smoking Index	Number of Patients	DLCO	
		Mean	SD
< 100	18	99.22	12.19
100-200	9	90.44	9.15
> 200	3	101.00	20.52

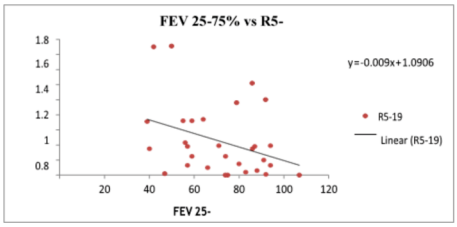
27 subjects (90%) in the study had DLCO corrected in the >0.05 therefore there is no significant association between DLCO with respect to smoking Index .(7)

Table -6 Mean Values (R5-R9) And Smoking Index

Smoking Index	Number of Patients	FEV1%		P-Value
		Mean	SD	
< 100	18	0.22	0.43	0.017
100-200	9	0.33	0.71	
> 200	3	1.33	0.58	

By using Kruskal Wallis test P-value <0.05 (0.017) therefore there is significant correlation between R5-R19 with respect to smoking index .

Figure -1 Correlation between FEV25-75% and R5-R19



Pearson's Correlation coefficient (r) = -0.386 p-value 0.35 by using Pearson's correlation

P-value <0.05(0.035} therefore there is significant poor negative correlation between FEV25-75%

DISCUSSION:-

Smoking related lung diseases are a major cause of mortality and morbidity in our country, There are approximately 120 million smokers in India. India is home to 12% of the world's smokers (1) Approximately 900,000 people die every year in India due to smoking as of 2009.As of 2015 , the number of men smoking tobacco is rose to 108millon , an increase of 36% between 1998 to 2015 .(3).

Cigarette smoke exposure , either directly or indirectly, as been highly correlated with the development of COPD and COPD mortality (8).

The purpose of the study was to measure various parameter of lung function which will help in early detection extent and severity of airways involvement in symptomatic smoker. The study was conducted over a period of 2 years among 30 subjects who where regular smokers for the last one year and above. Subjects were asymptomatic healthy current male smoker who were free of respiratory , haematological and acute or chronic symptoms or disease and were selected voluntarily from among employees , resident doctors dose and duration response relationship , quantification of tobacco smoking was performed by calculating smoking Index . Since countries like India smoking of tobacco varies from person to person . It may be either cigarette or bidi . So quantum of smoking pack years is not applicable to our country . 18 subjects (60%) had smoking index of <100, 9(30%) had smoking index of 101-200 and 3(10%)had a smoking index of >200 as in pervious studies S Gupta (5).

Smoking index and FEV% ,In our study there was a decrement in FEV1 with increasing smoking index observed in previous studies conducted by Khan A(20). 7 subjects (38.89%) were smoking index of <100 had FEV1 <80% ,6 subjects (66.67%) with smoking index 101-200 had FEV1<80% and 2 subjects (66.67%) with smoking index >200 had FEV1 ,80%. In the study using Kruskal Wallis Test there is a significant decrease in mean of FEV1% (p value 0.036) with increasing smoking index. Also there is strong negative correlation betweenFEV1 and smoking index using Pearson Correlation (p value < 0.05) that is as smoking index increases , FEV1 decreases.

Smoking index and FVC%- In our study 6 subject (33.33%) with

smoking index of <100 had FVC <80% and 2 subjects (66.67%) with smoking index >200 had FVC <80%. Though there was a decline in FVC with increase in smoking index .By using Fisher's exact test P value>0.05, no significant association was observed FVC and smoking index seen in previous studies by Safaa wafy (9).where it was found to be significant , but in a study conducted by Jaya mary George (11) , there was no significant association between smoking and FVC%.

Smoking index and FEF 25-75% in our study 5 subjects with smoking index < 100 had abnormal FEF25 -75% and 4 subjects with smoking index 101-200 had abnormal value of FEF25-75% .whereas subjects (100%) who smoking index had abnormal values . In the study using Kruskal wallis Test (p value 0.042) fisher Test (pvalue 0.047) there is also significant decrease in mean of FEF25-75% with increasing smoking index . Similar results obtained in a study conducted by Bano et.al ,yasunaga et.al (12) There is strong negative correlation between FEF 25-75 and smoking Index using Pearson's Correlation (p value 0.047).

Smoking index and RV: In the study using Kruskal Wallis Test there is a significant increase in mean of residual volume % (p value 0.027) with increase in smoking index as consistent with other previous studies by Yasunaga et.al (12).

Smoking and TLC 27 subjects in our study population had normal TLC . By using Fisher's exact test p valve >0.05 therefore there is no significant association between TLC with respect to smoking index , as seen previous study conducted by Yasunaga k et al (13).

Smoking index and DLCO . In the study by using Fisher's exact test p-valve > 0.05 therefore there is significant association between DLCO with respect to smoking index as in studies conducted by Yasunaga k et al (13)

SUMMARY :-

In this hospital based observational study 30 asymptomatic smoker fulfilling the inclusion criteria underwent spirometry oscillometry body plethysmography and DLCO for detection of early deterioration in lung function in relation to smoking .Majority of the subjects in the present study was in the age group of 21-30 years with a mean age of 34.5 years

Based on spirometry there is decrease in mean value of FEV1% and FEF25-75% in relation to increasing smoking index which was proved to be statistically significant.(14).

Based on oscillometry there in residual volume (RV) according to body plethysmographic method in relation to increase smoking index .

There was significant increase in residual volume (RV) according to body pelthysmographic method in relation to increasing intensity of smoking . But there was no association found between smoking index and Diffusion capacity of lung.

There was a significant negative correlation found between FEF25-75% and R5-R19.

Smoking index and X5 In our study by using Kruskal wallis test there is a significant increase in mean value X5 (p value 0.017) with increasing smoking index as shown in previous studies of . Kohlhauf (15).

Smoking index and R5-R19. In our study using Kruskal Wallis Test there is significant increase in value X5 (P value 0.017) with increasing smoking index as shown in previous studies by S Frantz (16).

FEF25-75%and R5-R19 In our study there is significant poor negative correlation between FEF25-75% Vs R5-R19 (p value0.035) which means as R5-R19 (peripheral airway resistance) increase FEF25-75 % decrease as observed in previous studies by WJ Anderson ,BJ Lipworth(17)

FEV1% and X5 By using Pearson's correlation coefficient P-value >0.05 there is no significant correlation between FEV1% with X 5 , though in study conducted by WJ Anderson, BJ Lipworth (17) there was positive .

Correlation between these two variables shows R5-R19, (peripheral airway resistance) increase and FEF25-75% decrease .

CONCLUSION:-

Tobacco smoking has significantly deleterious effects on the pulmonary functions . Almost all the pulmonary function parameters were significantly reduced with increased intensity of smoking, more pronounced in the peripheral airways. Thus we conclude that PFT's should be performed early to rule out reduction in lung volumes and cessation of smoking should be encouraged in countries like India where tobacco is smoked in large scale (6). From the study it was found that earliest effect as a result of smoking is on the peripheral airways though individual may remain asymptomatic as evident by spirometry and osillometry. Since both these methods can detect airway involvement, oscillometry can be used mire widely as a screening tool as it is easier to perform and applicable to all age groups .(18). Although we highlighted significantly declined values of lung functions in young asymptomatic smokers, there were certain limitation of this study . We had smaller sample size ;exclusion of female subjects and majority were light smokers . Still it can be suggested that both spirometeric and osillometry parameter ca decline earlier , and screening can be used to reinforce anti tobacco campaign (19) . TI warrants further study in this regard to reinforce the observation of our study.

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