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COMPARATIVE STUDY OF LUNG VOLUMES AND CAPACITIES IN SMOKERS AND NON-SMOKERS OF 5 YEARS DURATION

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Abstract

Background: Smoking is a common habit prevalent in both urban and rural areas of India. Cigarette smoking has extensive effects on respiratory function and is clearly implicated in the etiology of a number of respiratory diseases, particularly chronic bronchitis, emphysema, and bronchial carcinoma. An attempt has been made to study the pulmonary function tests among the smoking and non-smoking population in the urban area of Secunderabad, Telangana, South India.

Objective: The primary objective of this research was to study the influence of smoking on pulmonary functions.

Design: This was a cross-sectional study.

Duration: One year i.e. from November 2014 to October 2015.

Setting: Gandhi Hospital, Secunderabad, Telangana, South India.

Participants: 80 patients attending the Medicine Out Patient Department, Gandhi Hospital.

Methods: The study subjects were classified as smokers or non-smokers based on WHO suggested classification criteria. After recording detailed history, smoking index was calculated for smokers to evaluate dose-duration response relationship. Spirometry was performed to assess the pulmonary function of the subjects. The results are given as Mean ± Standard deviation and Standard error values. Comparison performed using student's t-test for 2 groups. The P value of 0.05 or less was considered significant.

Results: 57.5% of smokers were light smokers, 27.5% were moderate and 15% heavy smokers. FVC was significantly lower in smokers compared with non-smokers($p<0.05$), Also this decrease was significantly higher as the no. of cigarettes smoked per day increased($p<0.05$). $FEF_{25-75\%}$ was also found to be significantly reduced in smokers compared with non-smokers. PEFR was significantly reduced in smokers and even this parameter showed a comparable fall($p<0.05$) with intensity and duration of smoking. FEV_1 also showed a significant decrease in smokers especially those with greater duration and amount of smoking ($p<0.05$). FEV1/FVC ratio showed a significant fall in smokers compared with non-smokers($p<0.05$), but this fall was not so significant as the no. of cigarettes smoked per day increased($p>0.05$), however like other indices FEV1/FVC showed a significant decrease($p<0.05$) as the duration of smoking increased.

Conclusion: It may be concluded that smoking causes definite pulmonary function impairments, especially the obstructive type.

Keywords: Lung Volumes, Lung Capacities, Comparision, Smokers, Non-Smokers.

INTRODUCTION

Cigarettes kill an estimated 5 million people annually worldwide[1]. The World Health Organization (WHO) 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[2]. By the early 2030, tobacco related death would increase to about 10 million a year[3]. Tobacco smoking rates have decreased in industrialized countries since 1975, but there has been a corresponding 50% increase in smoking rates in low-income countries[4]. The WHO estimates that there are about 1 billion smokers in the world, one-third in the age group of 20-40.

In India smoking is a common habit prevalent in both urban and rural areas irrespective of mode of smoking i.e. cigarettes, pipes, cigar, hookah etc. The cigarette/smoke is a heterogeneous aerosol produced by the incomplete combustion of the tobacco leaf. In India, tobacco is consumed mainly in the form of (54%), followed by smokeless tobacco(27%) and cigarettes(9%)[5].

Smoke may be injurious because it contains unrefined form of tobacco as compared to cigarettes which was proved experimentally[6]. It is also required to be puffed more frequently per minute to keep it burning[7]. It has been shown that smoke at 2 puffs/minute produces similar amounts of steam-volatile phenols, hydrogen cyanide and benzopyrene as unfiltered cigarette at 1 puff/minute.

Cigarette smoking has extensive effects on respiratory function and is clearly implicated in the etiology if a number of respiratory diseases, particularly chronic bronchitis, emphysema, and bronchial carcinoma.

MATERIALS AND METHODS

Place of Study: Gandhi Hospital, Secunderabad, Telangana, South India.

Type of Study: This was a cross-sectional study.

Sample Collection: 80 patients attending the Medicine Out Patient Department, Gandhi Hospital.

Sampling Methods: The study subjects were classified as smokers or non-smokers based on WHO suggested classification criteria. Smoking index was calculated for smokers to evaluate dose-duration response relationship.

Smoking Index = Average No. of cigarettes smoked per day × Duration (in years) of cigarette smoking.

Inclusion Criteria:

1. Males of 20-40 years of age.
2. Minimum of 10 cigarettes/day for 5 years.
3. Gandhi Hospital area.
4. Schiller/Spandan Spirometer with laptop.
5. Control group are non-smokers of same age.

Exclusion Criteria:

1. Females
2. Athletes.
3. Males having diseases of lung/any chronic medication.
4. Guthka or pan chewing or any other types of nicotine intake.
5. Males < 10 cigarettes/day.

Statistical Methods: Data was inserted in MS Excel, graphs were drawn using MS Word and MS Excel. Data was analysed using Graphpad Instat software. The results are given as Mean ± Standard deviation and Standard error values. Comparison performed using student's t-test for 2 groups. The P value of 0.05 or less was considered significant.

OBSERVATIONS AND RESULTS

GRADING OF SMOKERS

Table 1: Grading Of Smokers

Grade of smokers	Number of smokers	Percentage (%)
Light smokers	23	57.5
Moderate smokers	11	27.5
Heavy smokers	6	15
Total	40	100.0

According to the criteria of smoking index 57.5% of the smokers were light smokers, 27.5% were moderate and 15% were heavy smokers as depicted in table number 1.

COMPARISION OF VARIOUS PULMONARY FUNCTION TESTS BETWEEN SMOKERS AND NON-SMOKERS

Table 2: Comparison of Various Pulmonary Function Tests between Smokers and Non-Smokers

Sr. No.	Pulmonary Function Tests		Non Smokers	Smokers	P Value
1.	FVC (L)	Mean	2.85	1.71	P<0.05
		S.D.	0.57	0.60	
2.	FEF 25-75 (L/S)	Mean	2.77	1.27	P<0.05
		S.D.	1.05	0.52	
3.	PEFR (L/S)	Mean	5.93	3.07	P<0.05
		S.D.	1.92	1.68	
4.	FEV 1 (L)	Mean	2.40	1.20	P<0.05
		S.D.	0.51	0.39	
5.	FEV_1 /FVC (%)	Mean	84.64	72.15	P<0.05
		S.D.	9.35	14.28	

The difference in the values of FVC, FEF, PEFR, FEV and FEV_1/FVC ratio observed into two groups was significant (plus less than 0.05).

EFFECT OF NO. OF CIGARETTE SMOKED PER DAY ON PULMONARY FUNCTION TESTS

Table 3: Effect of No. of Cigarette Smoked Per Day on Pulmonary Function Tests

Sr. No.	Pulmonary Function Tests		Cigarette per day			P Value
1.	FVC (L)	Mean	10-20	21-30	>=31	P<0.05
		S.D.	0.63	0.56	0.33	
2.	FEF 25-75 (L/S)	Mean	1.27	0.87	0.80	P<0.05
		S.D.	0.60	0.39	0.41	
3.	PEFR (L/S)	Mean	3.16	3.10	2.79	P<0.05
		S.D.	1.30	2.26	1.02	
4.	FEV 1 (L)	Mean	1.40	1.09	0.99	P<0.05
		S.D.	0.41	0.32	0.31	
5.	FEV_1 /FVC (%)	Mean	73.57	69.76	73.94	P<0.05
		S.D.	17.14	13.15	9.69	

The values of FVC, $FEF_{25-75\%}$, PEFR, FEV_1 were significantly reduced with increase in no. of cigarettes smoked per day (P value less than 0.05) while FEV_1/FVC ratio did not show much difference (P>0.05).

EFFECT OF DURATION SINCE SMOKING ON PULMONARY FUNCTION TESTS

Table 4: Effect of Duration since Smoking on Pulmonary Function Tests

Sr. No.	Pulmonary Function Tests		Duration of smoking (years)			P Value
			5-10	11-15	16-20	
1.	FVC (L)	Mean	1.91	1.75	1.50	P<0.05
		S.D.	0.40	0.71	0.53	
2.	FEF 25-75 (L/S)	Mean	1.19	1.01	0.93	P<0.05
		S.D.	0.45	0.44	0.65	
3.	PEFR (L/S)	Mean	4.05	2.74	2.87	P<0.05
		S.D.	2.00	1.46	1.58	
4.	FEV 1 (L)	Mean	1.39	1.23	1.05	P<0.05
		S.D.	0.26	0.42	0.38	
5.	FEV_1 /FVC (%)	Mean	74.48	72.16	70.70	P<0.05
		S.D.	15.14	12.76	16.05	

Significant decrease in pulmonary function test values was found with increased duration since smoking (P<0.05).

COMPARISION OF VARIOUS PULMONARY FUNCTION TESTS AMONG SMOKERS AND NON-SMOKERS IN RELATION TO DIFFERENT AGE GROUPS

Table 5: Comparison of Various Pulmonary Function Tests among Smokers and Non-Smokers In Relation To Different Age Groups

Sr. No.	Variable	Age Group In Years	Cigarette per day				P Value
			Mean	S.D.	Mean	S.D.	
1.	FVC (L)	21-30	2.87	0.47	1.0	0.46	<0.05
		31-40	2.86	0.43	1.66	0.43	
2.	FEF 25-75 (L/S)	21-30	2.80	0.89	1.04	0.43	<0.05
		31-40	2.75	0.86	1.03	0.42	
3.	PEFR (L/S)	21-30	5.97	1.59	3.05	1.22	<0.05
		31-40	5.90	1.52	3.04	1.20	
4.	FEV 1 (L)	21-30	2.42	0.38	1.20	0.33	<0.05
		31-40	2.41	0.36	1.18	0.33	
5.	FEV_1 /FVC (%)	21-30	84.78	8.08	72.31	11.76	<0.05
		31-40	84.46	8.03	72.73	11.39	

Comparing mean observed forced vital capacity, FVC, $FEF_{25-75\%}$, PEFR, FEV_1, FEV_1/FVC ratio of smokers and non-smokers in different age groups, a significant difference in values of all PFTs was observed in smokers (P<0.05).

DISCUSSION

The hazards of smoking are well known, yet persisting of this habit has been interest of this study, This study intends to compare the lung function tests of smokers with those of non-smokers. For this study 40 male smokers were compared with 40 healthy non-smokers. Smokers group included the subjects who smoke at least 1 pack of cigarettes for a minimum of 5 years. Quantification of tobacco smoking was done by calculating smoking index for smokers. 42.5% of smokers were in the age group of 20-30 years and 57.5% were in the age group of 31-40 years. According to the criteria of smoking index 57.5% of the smokers were light smokers, 27.5% were moderate and 15% were heavy smokers. Spirometry was done in both smokers and non-smokers to evaluate the pulmonary function tests. It was observed that FVC was significantly lower in smokers compared with non-smokers (p<0.05). Also, this decrease was significantly higher as the no. of cigarettes smoked per day increased (p<0.05). A significantly greater fall of FVC was observed with increase in duration of smoking. $FEF_{25-75\%}$ was also found to be significantly reduced (p<0.05) in smokers compared with non-smokers. Similar to FVC the decrease was greater with increase in no. of cigarettes smoked per day and increase in duration of smoking. PEFR was significantly reduced in smokers (p<0.05) and even this parameter showed a comparable fall (p<0.05) in intensity and duration of smoking. FEV_1 also showed a significant decrease in smokers especially those with greater duration and amount of smoking (p<0.05). In contrast though FEV_1/FVC ratio showed a significant fall in smokers compared with non-smokers (p<0.05), this fall was not so significant as the no. of cigarettes smoked per day increased. But like other indices FEV_1/FVC showed a significant decrease (p<0.05) as the duration of smoking increased. These results are in consistency with the previous studies done. Recent studies conducted by kumar et al[8] made a similar conclusion that the above given parameter of FVC, $FEF_{25-75\%}$, FEV_1, FEV_1/FVC are decreased in smokers compared with non-smokers and this decrease is significantly associated with increase in intensity and duration of smoking. The values of different

parameters of pulmonary function tests in smokers were compared with non-smokers i.e. the control group. The results showed statistically highly significant decrease in FVC, $FEF_{25-75\%}$, FEV_1, FEV_1/FVC ratio and PEFR in smokers compared with non-smokers. In the present study the effect of quantity and duration of smoking on various PFT's were also examined which showed strong correlation between impairment of pulmonary function tests and duration smoking and no. of cigarettes smoked per day. Studies have reported that the lung function tests show uniform tendency of deterioration with increased tobacco consumption. In recent time Anand Kumar et al conducted study among smokers and non-smokers and concluded that the actual values of FVC, $FEF_{25-75\%}$, FEV_1, FEV_1/FVC ratio and PEFR are decreased in smokers compared to non-smokers and all the values are more decreased with increase in duration of smoking and increase in no. of cigarettes smoked per day. This showed a dose response relationship. Hani A et al[9] conclude in their study of pulmonary function tests among smokers and non-smokers of same age group and BMI was not significantly associated with the most of spirometric values.

CONCLUSIONS

Finally it may be concluded that smoking causes definite pulmonary function impairments, especially the obstructive type. From the above study, it is understood that cigarette smoking is harmful to body causing various hazardous effects like bladder cancer, kidney cancer, mouth cancer, bowel cancer etc.

REFERENCES

1. Bulletin of the who, International journal of public Health, June 2006, Vol. 2006: 84(6) ; 495.
2. WHO report; Tobacco could kill one billion by 2100, science daily; Aug 2008; 24:71.
3. Yach D. Partnering for better lung health: improving tobacco and tuberculosis control. Int J Tuberc Lung Dis 2000; 4 : 693-7.
4. Yu JJ, Shopland DR. Cigarette smoking behavior and consumption characteristics for the Asia-Pacific region. World smoking health 1989; 14: 7-9.
5. Anonymus. IULTD: The world tobacco situation. IULTD news bull tobacco health 1998: 11: 19-21.
6. World Health organization. Health situation in the south East Asia region 1999; 12:83.
7. Pakhale SS, Jayant K, Bhide SV. Chemical analysis of smoke of Indian cigarettes and other indigenous forms of smoking, levels of phenol, hydrogen cyanide and benzopyrine. Indian J Chest Dis Allied Sci 1990; 32: 75-81.
8. Robiscke 1978, p-30.
9. Marihuana and medicine, p-3.
10. Gately, lain. 2001. A cultural history of how an exotic plant seduced civilization, NY : Grove press.
11. Yang SC. Relationship between smoking habits and lung function changes. J formos med assoc. 1993 Dec; 92 suppl 4: s225-31.
12. C Griffiths, G Feder. Early detection COPD in ahigh risk population using spirometric screening.
13. Jan Zielinski, Michal Bednmarek. Early detection COPD in ahigh risk population using spirometric screening. Chest 2001; 119: 731-736.
14. WHO; Guidelines for controlling and monitoring the tobacco epidemic. Geneva 1998.
15. SK Guptha. Respiratory disorders among workers in railway workshop; Ind J Tuber, 1995, 42, 161.
16. Ezzati M, Lopez AD. Estimates of global mortality attributable to smoking in 2000. Lancet. 2003; 362; 847-852. CrossRefMedicine.
17. Dollery CM, MC Ewan JR. Matrix metalloprotinases and cardiovascular disese. Circ res. 1995; 77 : 863-868.
18. Ross R. Atherosclerosis is an inflammatory disease. Am Heart J. 1999; 138: s419-s420. crossRefMedicine.