Int J Biol Med Res. 2012; 3(3): 2046-2049

BioMedSciDirect Publications

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International Journal of Biological & Medical Research

Journal homepage: www.biomedscidirect.com

Original article

A Comparative study of Fev $_1$, Fef$_{25-75}$ and Pefr in early Adult smokers and Non smokers

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ARTICLE INFO

Keywords:
Lung functions
Smoking

ABSTRACT

ABSTRACT: **Introduction :** Cigarette smoking remains the leading cause of preventable premature morbidity and mortality in both developed and developing countries around the world. Cigarette smoking directly affects lungs whose normal functioning is essential for our survival. It is responsible for 90% of chronic obstructive pulmonary diseases, chronic bronchitis, emphysema and lung cancer. This study is undertaken to highlight the effect of smoking on lung functions of early adults and thereby help them in abstaining from smoking. Objectives : To compare the lung functions(FEV1, FEF25-75 and PEFR) of early adult smokers with that of nonsmokers. **Methods :** A total 200 healthy young adult subjects (100 non smokers and 100 smokers) of age group 20-40 years were selected randomly among the general population in Davangere. Forced expiratory spirograms were recorded by RMS medspiror. Parameters such as Forced expiratory volume in 1st second, Forced Expiratory Flow in the middle half of FVC and Peak Expiratory Flow Rate were assessed and analyzed using the paired t-test and ANOVA. **Results :** Smoking had a negative impact on lung functions when compared to non smokers and smokers showed a significantly greater percentage decline in FEV1, FEF25-75% and PEFR **Conclusion :** Our results suggest that young smokers within few years of starting to smoke developed changes in pulmonary functions indicating early peripheral airway narrowing and that these effects worsen progressively with continued smoking.

1.Introduction:

Cigarette smoking remains the leading cause of preventable premature morbidity and mortality in many countries around the world [1]. It is predicted that in next 20 years, the yearly death rate from tobacco use will be more than 10 million people[2]. Because of the long delay between the cause and full effect, people tend to misjudge the hazards of tobacco. About half of those killed by tobacco were still in middle age (35-55yrs) and thereby, they have lost twenty five years of non smoker life expectancy[3].

According to WHO estimation, 194 million men and 45 million women use tobacco in smoke or smokeless form in India [4].

In a fast moving society, to catch up with the pace and also to get rid of the stress, smoking is found as an answer by a considerable bulk of population. Experimenting smoking is common in adolescence, as a symbol of "adult behaviour". Factors responsible for smoking are peer pressure, following example of siblings and parents [3]. The media, especially the movies glamourise smoking. The youngsters feel it is fashionable to smoke. Hence the present study was taken to study the lung functions of early adult smokers in terms of Forced Expiratory Volume in the first second (FEV1), Forced Expiratory Flow in the middle half of FVC (FEF25-75) and Peak Expiratory Flow Rate (PEFR).

2.Methodology:

The present study was conducted in the Department of Physiology, J.J.M. Medical College, Davangere. The study was undertaken to observe the effects of cigarette smoking on the lung functions . This is done by comparing the lung functions of non smoking adult male subjects with the lung functions of smoking adult male subjects. The duration of smoking in years and the number of cigarettes smoked per day is also considered to see the dose response relationship.

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100 healthy, early adult male, non smoking subjects aged between 20-40 years (control) and 100 healthy early adult smoking subjects aged between 20-40 years (cases) were selected randomly from the general population of Davangere.

The inclusion criteria for this study in the control group was healthy adult male subjects with no past history or present history of smoking and who are in the age group of 20-40 years. Healthy adult male subjects with a history of smoking for more than one year and who smoke more than 5 cigarettes per day were included as cases in this study.

The exclusion criteria for this study were

- Female subjects
- Male subjects of less than 20 years or above 40 years
- Male subjects of age group 20-40 years with a history of smoking less than one year.
- Male subjects between 20-40 years of age who were suffering from any diseases which directly or indirectly affects the lung functions of the subject.

All the subjects gave an informed consent after detailed procedure of the non-invasive technique was explained to them. A brief personal history, smoking history and a clinical examination of all the systems were done to exclude medical problems and to prevent confounding of result.

The lung functions of all the subject were done in the morning session (Between 11 am to 1 pm) of the college hours. The physical characters such as height in centimeters and weight in kilograms of all the subjects were recorded. All these personal information like Age, Sex and a brief history were entered in the patient information chart giving a separate ID for each subject.

We used an RMS MEDSPIROR for measuring the lung functions.

The test was performed over 3 maneuvers. The tests with the best maneuver was selected. The machine gives us the comparison of various parameters between 3 maneuvers and we accepted the best maneuver. The results for each parameter were compared between the smokers and the non smokers group and statistically analysed. The results were given as Mean Standard Deviation and range values. Comparisons were performed using students t-test for 2 group comparisons and one way ANOVA (Analysis Of Variance) for multiple groups.

3.Results:

The Actual Value of FEV1 (L) in nonsmokers was 2.89 0.35 (98.3 6.6% of percentage predicted). The Actual Value of FEV1 (L) in smokers was 1.99 0.36 (68.7 6.8% of percentage predicted). There was statistically significant decrease in the level of FEV1 in smokers compared to non smokers ($P < 0.001$) (Table 1).

Statistical analysis was done by Students 't' test.

Table 1 : Comparison of FEV_1 between Non smokers and Smokers

Groups	n	Actual value (L)		% Predicted	
		Range	Mean SD	Range	Mean SD
Non smokers	100	2.12 – 4.10	2.89± 0.35	82.7 – 111.0	98.3 ± 6.6
Smokers	100	1.09 – 2.59	1.99 ± 0.36	55.3 – 81.7	68.7 ± 6.8
Mean difference	Mean difference	0.90		29.4	
Significance	t	18.0		31.0	
	p	< 0.001 HS		< 0.001 HS	

All values expressed as mean SD
Analysis of all parameters done by unpaired t-test
HS – Highly Significant, S- Significant, NS – Not Significant

3.1.$FEV_{25 - 75\%}$:

The Actual Value of FEV25-75% (L/Sec) in non smokers was 4.33 0.47 (99.5 8.8% of percentage predicted). The Actual Value of FEV25-75% (L/Sec) in smokers was 2.97 0.50 (69.1 6.6% of percentage predicted). There was statistically significant decrease in the level of FEV25-75% in smokers when compared to non smokers (P < 0.001) (Table 2).

Statistical analysis was done by Students 't' test.

Table 2 : Comparison of Fef 25-75% between Non smokers and Smokers

Groups	n	Actual value (L)		% Predicted	
		Range	Mean SD	Range	Mean SD
Non smokers	100	3.04 – 5.40	4.33 0.47	82.7 – 111.0	99.5 8.8
Smokers	100	2.04 – 4.35	2.97 0.50	55.3 – 81.7	69.1 6.6
Mean difference	Mean difference	1.36		30.4	
Significance	t	19.7		27.8	
	p	< 0.001 HS		< 0.001 HS	

All values expressed as mean SD
Analysis of all parameters done by unpaired t-test
HS – Highly Significant, S- Significant, NS – Not Significant

3.2.PEFR :

The Actual Value of PEFR (L/Sec) in non smokers was 8.23 0.90 (91.4 6.6% of percentage predicted). The Actual Value of PEFR (L/Sec) in smokers was 5.83 0.81 (65.3 6.9% of percentage predicted). There was statistically significant decrease in the level of PEFR in smokers compared to non smokers (P < 0.001) (Table 3).

Statistical analysis was done by Students 't' test.

Table 3 : Comparison of Pefr between Non smokers and Smokers

Groups	n	Actual value (L)		% Predicted	
		Range	Mean SD	Range	Mean SD
Non smokers	100	5.40 – 10.6	8.23 ± 0.90	79.2 – 110.4	91.4 6.6
Smokers	100	4.17 – 7.68	5.83 ± 0.81	53.4 – 82.3	65.3 6.9
Mean difference	Mean difference	2.40		26.1	
Significance	t	19.9		27.3	
	p	< 0.001 HS		< 0.001 HS	

All values expressed as mean SD
Analysis of all parameters done by unpaired t-test
HS – Highly Significant, S- Significant, NS – Not Significant

It was also absorbed that all the valves(FEV1, FEF25%-75% & PEFR)decreased progressively along with the duration of smoking (Table 4)

Table 4: Comparison of Lung function parameters with relation to duration of Smoking.

Duration (yrs)	n	FEV_1 (% Pred.)	$FEF_{25-75\%}$ (% Pred.)	PEFR (% Pred.)
1-5	24	77.4± 2.5	75.5 ± 5.1	74 ± 4.2
6-10	29	70.6 ± 4.4	72.1± 3.7	64.6 ± 2.8
11-15	8	68.3 ± 1.6	68.5 ±1.9	63.6 ± 3.8
16-20	24	64.0 ± 3.0	64.2 ± 4.7	60.5± 2.0
21-25	15	59.9 ± 1.7	61.4 ±2.1	58.9± 2.1
ANOVA	F	89.6	40.7	99.4
	P	< 0.001, HS	< 0.001, HS	< 0.001, HS

All values expressed as mean SD

Analysis of all parameters done by ANOVA

HS – Highly Significant, S- Significant, NS – Not Significant.

4.Discussion

The study there was a statistically significant decrease in the level of FEV1 in smokers compared to non smokers. There was 29.4% (0.9 L) decrease in % predicted of FEV1. It was observed that FEV1 decreases more with increase in duration of smoking Similar findings were also reported from Tashkin DP et al [5], Camilli AE et al[6], Hogg CJ et al[7], Kerstjens et al[8], and Apostol GG et al[9].

The reduction in FEV1 associated with chronic cigarette smoking can be partially explained by loss of lung elastic recoil pressure which reduces the force required to drive air out of the lung. This loss of elastic recoil pressure is attributed to microscopic enlargement of air spaces rather than to grossly visible emphysema [7]. It was shown that, the bronchial reactivity increases in smokers, resulting in increase in IgE. This may also affect the FEV1 in smokers [10].

In our study the level of forced expiratory flow between 25% and 75% of FVC or average forced expiratory flow was reduced by 1.36 L/sec in smokers compared to non smokers. This reduction is statistically significant. It was also observed that level of FEF25-75% decreased more with increase in duration of smoking. Similar findings were also reported from Nancy NR et al [11] , Tashkin PO et al[12], and Mhase VT et al [13].

The major cause of the reduction in FEF25-75% is an inflammatory process in small conducting airways, that causes them to narrow and close prematurely [7]. This reduction in FEF25-75% is because of inflammation of small airway, where disease of chronic air flow obstruction is thought to originate [14].

Our study has shown a statistically significant decrease in the level of PEFR (27.3% of percentage predicted). It has also shown that, the PEFR decreases more with increase in duration of smoking. These findings were similar to those reported by Nancy et al [11] and Prasad BK et al[8].

This results because, smoking causes inflammation and narrowing of airways which results in increase in resistance to airflow and a decrease in elastic recoil pressure of the lungs [11].

5.Conclusion

The following conclusion can be drawn from the results of the present study.

· The actual values of FEV1, FEF25-75% and PEFR are decreased in smokers compared to non smokers and all the values are more decreased with increase in duration of smoking. Thus showing a dose response relationship.

· Among all the parameters, value of FEF25-75% has decreased more, showing that smoking has affected the small conducting airway more, where disease of chronic airflow obstruction is thought to originate.

· Young smokers within few years of starting of smoking, develop changes in pulmonary functions indicating early peripheral airway narrowing and these effects worsen progressively with continued smoking.

· Though our study is by no means exhaustive, it does provide a glimpse into the variety of adaptations/alterations in airway structure of the lungs and pulmonary functions, even in the absence of overt disease. Although we understand to some extent the pathophysiology of respiratory diseases in smoking. Further research is recommended to study the effects of cessation of smoking on lung functions.

· Health education on hazards of smoking and legislation on Banning of smoking in public places to be encouraged.

6.References:

[1] Bencuitz NL, Brunetta PG. Smoking Hazards and cessation. In : Murray JF, Nadel JA, eds. Text book of Respiratory Medicine, (Vol.2), 4th edn. Philadelphia (US): Elsevier Saunders; 2005; p453-66.

[2] Russel J. June Russel's Health facts. (online). 2004 [as accessed on May 21st 2007] Available from URL:http://www.jrussellshealth.org/smoking.

[3] Park K. Park's text book of Preventive and social medicine, 18th edn. Jabalpur: M/s Banarsidas Bhanot; 2004;p.638.

[4] Sinha DN, Gupta PC, Pednekar MS. Tobacco use in a rural area of Bihar. Indian J Community Med. 2003;28(4): 10-12.

[5] Higgins TT. Tobacco smoking respiratory symptoms and ventilatory capacity. Br Medical J. 1959; 7:335-29.

[6] Camilli AE, Burrows B, Knudson RJ, Lyle SK, Lebowitz MD. Longitudinal changes in Forced Expiratory Volume in One Second in Adults-Effect of smoking and smoking cessation. Am Rev Respir Dis. 1987; 135:794-99.

[7] Hogg JC, Wright JL, Wiggs BR, Coxson HO, Saez AO, Pare PD. Lung structure and function in cigarette smokers. Thorax. 1994; 49:473-78.

[8] Kerstjens HAM, Rijcken B, Schouten JP, Postma DS. Decline of FEV1 by age and smoking status: facts, figures, and fallacies. Thorax 1997; 52:820-21.

[9] Apostol GG, Jacobs DR, Tsai AW, Crow RS, Williams OD, Townsend MC, Beckett WS. Early life factors contribute to the decrease in lung function between Ages 18 and 40. Am J Respir Crit Care Med. 2002; 166:166-72.

[10] Jensen EJ, Dahl R, Steffensen F. Bronchial reactivity to cigarette smoke; relation to lung function, respiratory symptoms, serum immunoglobulin E and blood eosinophil and leukocyte counts. Respir Med. 2000; 94:119-27.

[11] Nancy NR, Rai UC. A study of forced expiratory spirogram in south Indian beedi smokers and cigarette smokers. Ind J Chest Diseases & Allied Sci. 1981; 31:25-30.

[12] Tashkin DP, Clark VA, Coulson AH, Simmons M, Bourque B, Reems C et al. The UCLA Population Studies of Chronic Obstructive Respiratory Disease- Effect of smoking on lung function: A prospective study of a free living population. Am Rev Respir Dis. 1984; 130:707-15.

[13] Mhase VT, Reddy PSN. Effect of smoking on lung functions of workers exposed to dust and fumes. Indian J Com Med. 2002; 27(1):26-29.

[14] Gold WM. Pulmonary function testing. In : Murray JF, Anadez J. eds. Textbook of Respiratory Medicine. (vol I). 4th edn. Philadelphia (US); Elsevier Saunders: 2005;p.671.