STUDY OF FVC,FEV_1 & FEV_1/FVC% IN ADULT MALE SMOKERS

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Abstract

Background: Smoking is most common in East Asia, where two thirds of all adult male smoke tobacco; cigarette smoking is by far the most common. Smoking is the primary cause of chronic obstructive lung disease, chronic bronchitis and other respiratory symptoms. Many studies have shown a significant change of FVC,FEV_1 &FEV_1/FVC% in adult smokers. Objective: To assess the change of FVC,FEV_1 & FEV_1/FVC% in adult male smokers. Method: This cross-sectional comparative study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka and National institute of Diseases of Chest and Hospital, Dhaka during the period of 1st July, 2007 to 30th June, 2008. For this purpose, 160 adult male subjects ranging from 18 to 52 years were selected. The subjects were divided into two groups - A and B. Group A consisted of 40 apparently healthy adult male non-smokers. Group B consisted of 120 apparently healthy adult male smokers. The experimental group was again subdivided into group B_1 consisting of 40 smokers consuming 2-10 cigarettes/day for more than 5 years, group B_2 consisting of 40 smokers consuming 11-20 cigarettes/ day for more than 5 years and group B_3 consisting of 40 smokers consuming >20 cigarettes/day for more than 5 years. Analysis of data was done with the help of computer by SPSS 12.0 programmer and significant tests were done by unpaired student's "t" test. Results: There were no statistically significant differences of FVC,FEV_1 in group A vs. group B_1, group B_2 vs. group B_3. The mean FVC,FEV_1 were significantly lower (<0.05) in group A vs. group B, group A vs. group B_2, group A vs. group B_3, group B_1 vs. group B_2 & group B_1 vs. group B_3. There were no statistical significant differences of FEV_1/ FVC% among different groups. Conclusion: From the statistical analysis of the results obtained in the present study and their comparison with those of published reports, it may be concluded that smoking causes significant change of FVC,FEV_1 among the smokers and no significant change of FEV_1/FVC% who consumed more than 10 cigarettes per day for more than five years.

Key words: *FVC,FEV_1 & FEV_1/FVC% ,Smokers.*

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Introduction

Cigarettes, the most popular method of smoking, consist of finely shredded tobacco rolled in light-weight paper. Smoke from the average cigarette contains around four thousand chemicals, some of which are highly toxic and at least 43 of which cause cancer. Nicotine, a major constituent of tobacco smoke is both poisonous and highly addictive[1].

Measurement of ventilatory function consists of quantification of the gas volume contained in the lungs under certain circumstance and the rate at which gas can be expelled from the lungs[2]. Measurement of ventilatory function may be very useful in a diagnostic sense. The presence of ventilatory abnormality can be inferred if any of FVC, FEV_1 or FEV_1/ FVC% are outside the normal range. It should be part of the routine assessment of patients with respiratory disease[3].

World deaths from cigarettes are expected to increase from three millions currently to about ten millions by the year 2020. As the market for tobacco shrinks in the developed nations, the multinational tobacco companies are targeting developing countries[4].

It is estimated that 60 percent of men in Bangladesh are smoker[5]. Tobacco related illness accounts for 16% death in Bangladesh among people aged 30 years and above[6]. About 54% lung cancer patients are habituated with current smoking and 74.04% were ever smoker in Bangladesh[7].

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A few studies had been carried out in Bangladesh on the effect of smoking on lung function. This work will be done for finding out the risk of smoking-related morbidity and the findings may be helpful to control them increase efficiency and work output. So, the present study is designed to assess the FVC,FEV_1,FEV_1/FVC% of adult smokers and compare the results with that of non-smokers.

Materials and Methods

This present cross-sectional comparative study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka and National institute of Diseases of Chest and Hospital, Dhaka during the period of 1st July, 2007 to 30th June, 2008. Permission was taken from concerned departments and authorities. Informed written consent was taken from all the study subjects after full explanation of nature and purpose of the study. The present study has been designed to measure FVC,FEV_1 & FEV_1/FVC% in apparently healthy adult male smokers and non-smokers. For this purpose, 160 adult male subjects ranging from 18 to 52 years were selected. The subjects were divided into two groups - A and B. Group A consisted of 40 apparently healthy adult male non-smokers. Group B consisted of 120 apparently healthy adult male smokers. The experimental group was again subdivided into group B_1 consisting of 40 smokers consuming 2-10 cigarettes/day for more than 5 years, group B_2 consisting of 40 smokers consuming 11-20 cigarettes/day for more than 5 years and group B_3 consisting of 40 smokers consuming >20 cigarettes/day for more than 5 years. Analysis of data was done with the help of computer by SPSS 12.0 programmer and significant tests were done by unpaired student's "t" test.

Results:

The anthropometric data of study subjects are presented in table I, The mean (± SD) measured values of FVC in case & control is shown in figure I, The mean (± SD) measured values of FVC in different groups of subjects is shown in figure II,the mean (± SD) measured values of FEV1 in case & control is shown in figure III, The mean (± SD) measured values of FEV_1 in different groups of subjects is shown in figureIV, , The mean (± SD) measured values of FEV_1/ FVC% in case & control is shown in figure V, The mean (± SD) measured values of FEV_1/FVC% in different groups of subject is shown in figure VI. The mean (± SD) measured values of FVC & FEV_1 were significantly lower (<0.05) in group A vs. group B, group A vs. group B_2, group A vs. group B_3, group B_1 vs. group B_2 and group B_1 vs. group B_3.There were no statistically significant differences of FVC &FEV_1 in group A vs. group B_1, group B_2 vs. group B_3.There were also no statistically significant differences of FEV_1/FVC% among different groups.

Table-I

Mean (± SD) Age, Height, Weight, BMI in different groups of subjects

Group	N	Age (Years)	Height (cm)	Weight (kg)	BMI (kg/m^2)
A	40	30.15±6.98	161.82± 23.40	62.07±8.85	22.80±2.92
		(18-52)	(127-197)	(46-83)	(16.75-30.86)
B	120	31.69 ±8.08	164.14± 23.40	61.46±8.85	22.50±2.92
		(18.52)	(150-181)	(42-84)	(14.85-30.86)
B_1	40	29.46±6.05	165.46±6.36	61.74±9.85	22.53±3.24
		(18-52)	(150-181)	(44-82)	(14.85-29.76)
B_2	40	35.10±9.41	159.57±23.12	61.64±10.23	22.72±3.09
		(18-52)	(150-178)	(46-84)	(17.72-28.37)
B_3	40	30.95±8.08	160.00±1.41	48.00±2.82	18.76±1.43
		(18-52)	(159-161)	(46-50)	(17.75-19.78)

Group A : Control (Apparently healthy male nonsmoker)
Group B : Experimental(Apparently healthy male smoker).
Group B_I : Apparently healthy male smoker consuming 2-10 cigarettes/ day for .5 years
Group B_2 : Apparently healthy male smoker consuming 11- 20 cigarettes / day for >5 years.
Group B_3 : Apparently healthy male smoker consuming > 20 cigarette / day for >5 years
N : Number of participants
Values in parenthesis indicate ranges

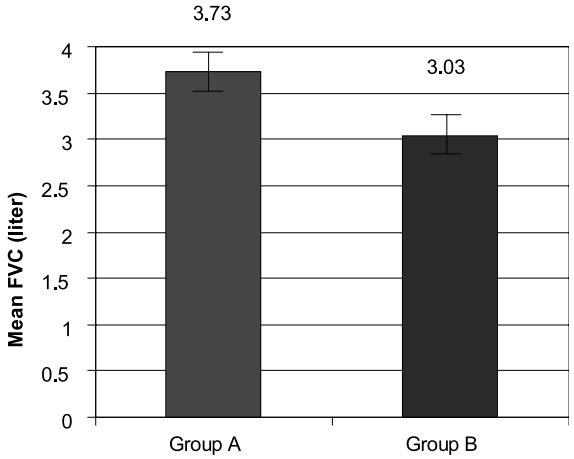

Fig.-1: *Mean (±SD) of FVC in case and control group.*
Group A : Control
Group B : Case

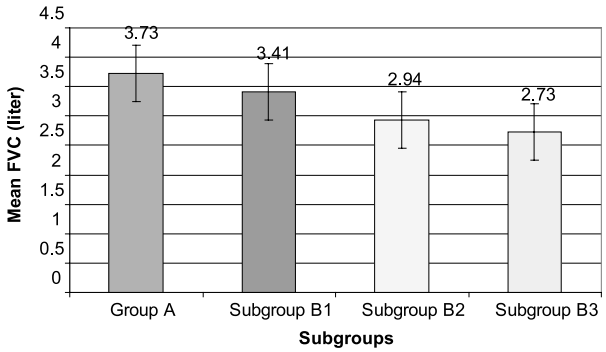

Fig.-2: *Mean (±SD) of calculated values of FVC in different groups of subjects*

Group A : Control (Apparently healthy male nonsmoker)
Group B_1 : Apparently healthy male smoker consuming 2-10 cigarettes/ day for >5 years.
Group B_2 : Apparently healthy male smoker consuming 11- 20 cigarettes / day for >5 years.
Group B_3 : Apparently healthy male smoker consuming > 20 cigarette / day for >5

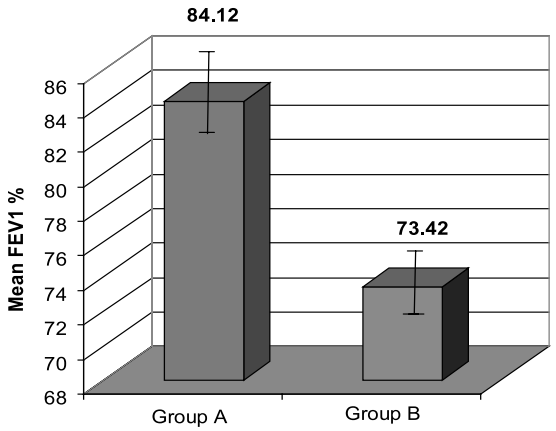

Fig.-3: *Mean (±SD) of FEV_1 in case and control.*
Group A : Control
Group B : Case

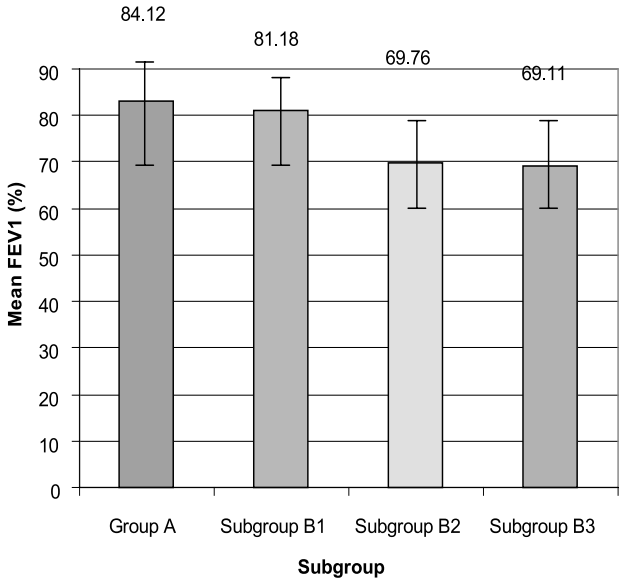

Fig.-4: *Mean (±SD) of calculated values of FEV_1 in different groups of subjects.*

Group A : Control (Apparently healthy male nonsmoker)
Group B_1 : Apparently healthy male smoker consuming 2-10 cigarettes/day for >5 years.
Group B_2 : Apparently healthy male smoker consuming 11- 20 cigarettes / day for >5 years.
Group B_3 : Apparently healthy male smoker consuming > 20 cigarette / day for >5 years

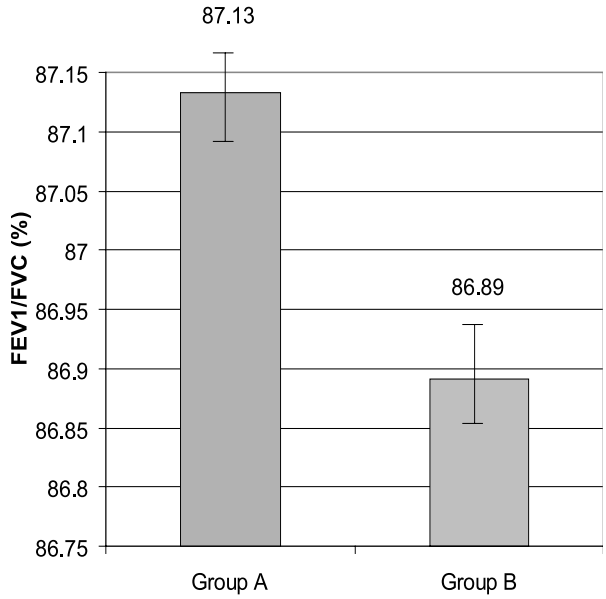

Fig-5: *Mean (±SD) of FEV_1/FVC (%) in case and control.*
Group A : Control
Group B : Case

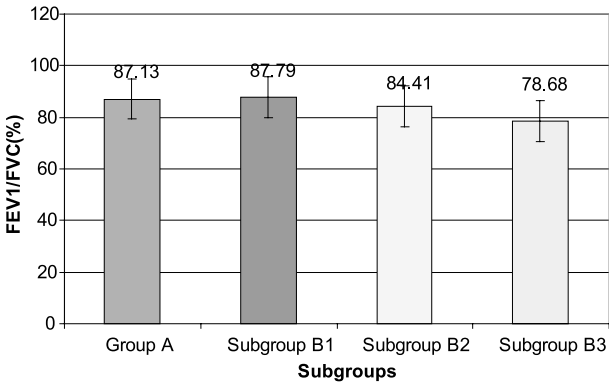

Fig.-6: *Mean (±SD) of calculated values of FEV_1 / FVC % on different groups of subjects.*

Group A : Control (Apparently healthy male nonsmoker)
Group B : Experimental (Apparently healthy male smoker).
Group B_1 : Apparently healthy male smoker consuming 2-10 cigarettes/ day for >5 years.
Group B_2 : Apparently healthy male smoker consuming 11-20 cigarettes / day for >5 years.
Group B_3 : Apparently healthy male smoker consuming > 20 cigarette / day for >5 years

Discussion

The present study has been undertaken to compare the FVC,FEV_1 & FEV_1/FVC% in apparently healthy adult male smokers and nonsmokers. For this purpose, total 160 subjects age ranged from 18-52 years were selected, of whom 40 were non smokers (control) and 120 were smokers (experimental) who smoked for more than 5 years. The smokers were again grouped according to the number of cigarettes they consumed per day into 3 groups as mentioned in materials and methods. The participants were apparently healthy and from the different socio-economic classes. Age, height, weight of non smokers (control group) was matched with that of smokers (experimental group). In this study, spirometry was measured in smokers and nonsmokers. The accuracy of the results depends on full cooperation of the subjects; care was taken to secure full cooperation of the subjects. Smoking history of smokers was recorded on a data collection sheet. Spirometry was recorded after the subjects were advised to put on loose clothes during experiment and abstain from smoking two hours prior to the test.

In this study the mean (± SD) of FVC were 3.73 (± 0.48) liters and 3.03 (± 0.60) liters in control and experimental group respectively. The difference of mean (± SD) of FVC were statistically significant (P<.001). This finding is consistent with many researchers.[8,9,10,11,12,13]

Progressive decrease in FVC (P<.001) with decrease in ventilatory capacities were observed in smokers than that of nonsmokers[8]. Forced expiratory volumes were declined considerably among smokers than nonsmokers[9]. FVC were lowered in smokers, living heavily polluted areas[11]. Some researchers were also observed poorer mean value of FVC among the smokers[12]. Lower FVC in smokers, was likely to be due to oxidant effects of smoking as well as poor knowledge about the food values of various dietary constituents[13].

In present study, the mean FVC between Group B_1 and Group-A was not statistically significant (P>.05). This finding is similar with the findings of other observer[14]. Smoking prevalence was high in men and no statistically significant difference in any of variables of ventilatory function was observed. There was no dose – response relation between the number of cigarette smoke and FVC. FVC was larger in smoker than nonsmokers, suggesting larger lungs in those who took up smoking. These observations may be due to age, vital status probably nearer to control group and number of cigarettes per day was less[14].

In present study FVC were not statistically significant (P>.05) in Group B_2 and group B_3. These results are comparable to those of other researchers[10,15]. FVC will be significant by different individuals who smokes more than 10 cigarettes per day[10]. Heavy smokers had more decline in forced vital capacity[15.] The mean (± SD) FEV_1, were 84.12 (± 11.05) and 73.42 (± 14.76) in control group and experimental group respectively. The difference of mean (± SD) of FEV_1 were statistically significant (P<.001). This finding is consistent with those reported by other researchers.[10,16,17,8]

Smoking is the primary cause of deterioration in forced expiratory volume in 1st second (FEV_1) and the development of chronic obstructive lung disease. These risks increased with increasing number of cigarettes smoked per day[10]. FEV_1 values less than 50% of predicted were found in continuing smokers, which attempted to identify individuals at risk for developing Chronic Obstructive Pulmonary Disease [16]. Cigarette smoke had a larger effect on lung function in men, smoking one pack of cigarette per day for a year, decline FEV_1 significantly [16]. There was consistent and progressive decrease in FEV_1 with increase of pack years were observed in smoker than that of nonsmokers[8]. In present study, the mean (± SD) of measured values of FEV_1 was not statically significant between Group A vs Group B_1 and Group B_2 vs B_3. These findings are in agreement with that of other researchers.[18,17,10].

Longitudinal association between regular physical activity and FEV_1 decline and COPD risk. Regular physical activity improved lung function decline and COPD risk among the smokers[18]. In our study, Group B_I may had regular physical activity so their FEV_1 was not reduced inspite of smoking.

There are association between FEV_1 and smoking after being adjusted for age, height, sex, geographical area, IgE and respiratory symptoms was related to the number of cigarettes per day. This was statistically significant for individual who smoked more than 10 cigarettes per day[10].

The effect of medium and heavy smoking were similar and no statistically significant difference were found in the magnitude of the association with the growth of lung function[17].

In present study, it may be concluded that FEV_1 were highly significant (P<.001) among smokers than that of nonsmokers. Smokers who smoke more than 10 cigarettes per day showed significant change in lung function.

In present study, the mean (± SD) FEV_1 / FVC% measured values were 87.13 ± 7.90 and 86.89 ± 11.25 among the control and experimental groups respectively. The difference of mean (± SD) of FEV_1 / FVC% were not statistically significant (P>0.05) among the different groups. This finding is in agreement with those reported by another scientist[19].

FEV_1 /FVC% in COPD and smokers without COPD were 50.1% and 80.4% respectively[19]. Cigarette smoking causes cytomorphological changes in sputum before causing any change in lung function test due to inflammation, hypersecretion and desquamation with hyperplasia in basal cells, metaplasia and increasing number of atypical cells are observed in the sputum of chronic smokers[19].

Conclusion

From the statistical analysis of the results obtained in the present study and their comparison with those of published reports, it may be concluded that smoking causes significant change of FVC,FEV_1 among the smokers who consumed more than 10 cigarettes per day for more than five years.

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