Effect of Smoking on FEF 25, FEF 50 & FEF 75 in Adult Male Smokers

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Abstract

Introduction: Smoking is most common in East Asia, where two thirds of all adult males 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 significant changes of Forced Expiratory Flow (FEF) as FEF 25, FEF 50 and FEF 75 (L/sec) in adult male smokers. Its objective is to assess the change of FEF 25, FEF 50 and FEF 75 (L/sec) in adult male smokers. Materials and Methods: This cross-sectional comparative study was carried out in the Department of Physiology, Dhaka Medical College, Dhaka during the period of July, 2007 to June, 2008. In the present study 30 adult male smokers consuming cigarettes for more than 5 years selected as study group (Group-B) and were matched with 30 adult males who were non-smokers considered as control group (Group-A) for comparison. FEF 25, FEF 50 and FEF 75 (L/sec) were estimated in both Groups. 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 statistically significant differences of FEF25, FEF50 and FEF75 (L/sec) in group A vs. group B. 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 FEF 25, FEF 50 and FEF 75 (L/sec) among the smokers that could be useful in early diagnosis of peripheral airway obstruction. Keywords: Forced Expiratory Flow, FEF 25, FEF 50, FEF 75, Smoking, Smoker.

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 addictive1.

FEF25, FEF50 and FEF75 (L/sec) is the average flow rate over the middle of vital capacity. This test indicates the patency of smaller airways less than 2 mm in diameter2.

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 countries3.

It is estimated that 60 percent of men in Bangladesh are smokers4. Tobacco related illness accounts for 16% death in Bangladesh among people aged 30 years and above5. About 54% lung cancer patients are habituated with current smoking and 74.04% were ever smoker in Bangladesh6.

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 FEF25, FEF50 and FEF75 (L/sec) of adult smokers and compare the results with that of non-smokers.

Materials and Methods

This present cross-sectional study was carried out in the Department of Physiology, Dhaka Medical College, during the period of July,
2007 to 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 FEF 25, FEF 50 and FEF 75
(L/sec) in apparently healthy adult male smokers and
nonsmokers. In the present study 30 adult male smokers
consuming cigarettes for more than 5 years selected as
study group (Group-B) and were matched with 30 adult
males who were non-smokers considered as control group
(Group-A) for comparison. FEF25, FEF50 and FEF75
(L/sec) were estimated in both Groups. 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 mean (±SD) age, height, weight and BMI in different
groups of subject are shown in table I and the results are
shown in table II. The mean (± SD) of measured values of
FEF 25 (L/sec) is shown in Figure 1, the mean (± SD) of
measured values of FEF 50 (L/sec) is shown in Figure 2
and the mean (± SD) of measured values of FEF 75
(L/sec) is shown in Figure 3. FEF25, FEF50 and FEF75
(L/sec) significantly lower (<0.05) in group A vs group B.

Table-I: Mean (± SD) Age, Height, Weight, BMI of both
subjects.

| Group N | Age (Years) | Height (cm) | Weight (kg) | BMI (kg/m²) |
|---------|-------------|-------------|-------------|-------------|
| A       | 30          | 30.15±6.98  | 161.82±23.40| 62.07±8.85  |
|         | (22-45)     | (127-197)   | (46-83)     | (16.75-30.86) |
| B       | 30          | 31.69±8.08  | 164.14±23.40| 61.46±8.85  |
|         | (22-45)     | (150-181)   | (42-84)     | (14.85-30.86) |

Table-II: Study parameters of the subjects in both groups
(n=30).

| Parameters | Nonsmoker | Smoker | p value |
|------------|-----------|--------|---------|
| FEF 25 (L/S) | 6.74±1.76  | 5.28±1.85 | 0.003*** |
| FEF 50 (L/S) | 4.85±1.53  | 3.27±1.58 | <0.001*** |
| FEF 75 (L/S) | 1.87±0.87  | 1.36±0.94 | 0.033*   |

Results are expressed as mean ± SD. Unpaired Student’s
‘t’ test was performed to compare between the groups.
The test of significance was calculated and p value < 0.05
was accepted as level of significance.
n = number of participants
Values in parenthesis indicate ranges

Discussion
The present study has been undertaken to compare the
FEF25, FEF50, FEF75 (L/sec) in apparently healthy adult
male smokers and nonsmokers. For this purpose, total 60
subjects age ranged from 22-45 years were selected. The
participants were apparently healthy and from the different
socio-economic classes. Age, height and weight of non
smokers (control group) were matched with those 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 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 present study, the mean (± SD) FEF25 (L/sec) measured values were 6.74±1.76 liter/sec and 5.28±1.85 liter/sec in control and experimental group respectively. The difference of mean (± SD) of FEF25 (L/sec) was statistically significant (p<0.001). This result is in agreement with that of Jenith Berlin Raj T, Manikandan S D, D I DeMeo9. Jenith Berlin Raj T observed significant lower of FEF25 (L/sec) in apparently healthy male smoker’s vs nonsmokers. FEF25 (L/sec) was reduced in smoking group. It is mostly the smaller airways than the larger airways which is affected due to smoking7. Manikandan S observed lower FEF25 (L/sec) in smoker causes both restrictive and obstructive pulmonary impairment. In the smoker’s inflammation leads to permanent changes in the lungs8. D L DeMeo9 considered that FEF25 (L/sec) have been as evidence for small airway disease.

In present study, the mean (± SD) FEF50 (L/sec) measured values were 4.85±1.53 liter/sec and 3.27±1.58 liter/sec in control and experimental group respectively. The difference of mean (± SD) of FEF50 (L/sec) was statistically significant (p<0.001).This result is in agreement with that of Senthil Kumar Elumalai10 and Anik Sukmawati11. Senthil Kumar Elumalai observed significant difference of FEF50 (L/sec) among non-symptomatic smokers & nonsmokers. Senthil Kumar Elumalai stated that FEF50 (L/sec) appear to have its greatest utility in the diagnosis and monitoring of early, moderate disease & has less value in following the case of severe disease10. Anik Sukmawati11 explained that reduction in FEF50 (L/sec) is associated with chronic cigarette smoking can be loss of lung recoil pressure which reduces the force driving air out of the lung11.

The mean (± SD) FEF75 (L/sec) measured values were 1.87±0.87 liter/sec and 1.36±0.94 liter/sec in control and experimental group respectively. The difference of mean (± SD) of FEF75 (L/sec) was statistically significant (p<0.001). This result is consistent with that of Anand Mistry12 and Ajay K T. Anand Mistry12 stated that decreased in FEF75 (L/sec) in smokers with increased duration of smoking & increase in number of cigarettes smoked per day12. Ajay K T13 suggested 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 smoking13. Meo SA14 concluded that tobacco smoking for 5 minutes causes an increase in impedance, peripheral airway flow resistance and oxidative stress.

Tantisuwat A15 stated that smoking habits and the number of cigarettes smoked per day were associated with the reduction in FEF25-75%. Wafy S16 suggested that the most affected age group in significant reduction of FEF25-75% was found in 36-55 years old adult male smokers. Coppeta L17 observed significant worsening of FEF25-75% & this parameter shown to be more sensitive than FEV1, FEV1/FVC ratio. They hypothesized that the decrease in the air flow is attributable to the acute increase of airflow resistance due to small airway narrowing depending on mucosal oedema, smooth muscle contraction & local secretion. Malerba M18 suggested that abnormal FEF25-75% considered a reliable marker of early airflow limitation. They pointed out that abnormal FEF25-75% had a high probability of being bronchial hyperresponsiveness, is probably due to eosinophilic airway inflammation.

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 deterioration of lung function which can easily detected by using a spirometer. FEF25, FEF50 and FEF75 (L/sec) are simple tests those could be useful in early diagnosis of peripheral airway obstruction and its treatment, thereby improving the quality of life.

Conflict of Interest: None.

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