FVC, FEV₁ and FEV₁% in Male Tobacco Industry Workers

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Abstract

Background: Tobacco industry workers are exposed to tobacco dust and smoke in their work places. Usually they have varying degree of impaired pulmonary functions, but the level of awareness about this occupational hazard among the tobacco industry workers and authorities are limited. Objective: The present study was conducted to observe the effects of exposure to tobacco dust and smoking on FVC, FEV₁ and FEV₁%. Methods: This cross-sectional study was carried out in the Department of Physiology, Rangpur Medical College, Rangpur, from July 2008 to June 2009 on 50 apparently healthy male smoker (Group B) and 40 non-smoker (Group C) tobacco industry workers with age range 20 to 45 years. For comparison, 50 age and body surface area matched apparently healthy male non-smoker non-tobacco workers were also studied as Control (group A). The study groups were selected from different tobacco industries of Rangpur district and control group were selected from the surrounding community who belonged to lower socioeconomic condition. Pulmonary function parameters were measured by digital spirometer. Statistical analysis was done by unpaired 't' test. Results: Smoker tobacco workers had significantly lower percentage of predicted values of FVC, FEV₁ and FEV₁% than control subjects (p <0.001). In addition, they had significantly lower values of FEV₁ and FEV₁% than non-smoker tobacco workers (p <0.01). Conclusion: Pulmonary functions may be impaired in smoker tobacco workers.

Keywords: FVC, FEV₁ and FEV₁%.

Introduction

Tobacco industries provide livelihood to tobacco workers who are engaged in tobacco cultivation, processing and rolling of bidis /cigarettes. Environment of tobacco industries are usually polluted by tobacco dust. Inspirable dust concentration is about 150-fold higher in tobacco factories. Endotoxin concentration also increased in the air of tobacco factories. Workers of tobacco industries are chronically and predominantly exposed to tobacco dust and majority workers of tobacco industries are smokers non-smoker tobacco workers are also exposed to passive smoking at their work places. Inhalation is the common route of absorption of air borne contaminants caused by tobacco dust and smoke and deterioration of lung functions is related to inhalation of dust. Tobacco dust exposure induces oxidative stress among tobacco workers that leads to impairment of lung functions and lung diseases. Tobacco smoke is a bioaerosol that contains endotoxin, peptidoglycan fragments, lypopolysaccharide, various fungal...
Tobacco smoke also contains a large number of free radicals, including peroxyl radicals, superoxide anion and nitrogen oxide. Active and passive or environmental smoking has an adverse effect on lung functions. Tobacco dust contains agents that cause nonimmunologically mediated bronchoconstriction. Several investigators reported decreased lung functions in workers who work in tobacco industries. There are many tobacco factories in many parts of Bangladesh and in Rangpur district a remarkable population engaged in tobacco industrial activities. But unfortunately they are not aware that they are at the risk of impaired lung functions. To the best of our knowledge, assessment of tobacco workers lung functions status has not been studied in our country. From the public health point of view it is urgent to protect their lung health. Considering this the present work was carried out to study the status of lung functions in tobacco industry workers by measuring Forced Vital Capacity, Forced Vital Capacity in first second and Percentage of Forced Vital Capacity in 1st Second (FVC, FEV₁ and FEV₁%). The outcome of this study would help to create awareness among the tobacco workers and authorities and they may take appropriate measures to protect lung health against tobacco hazards.

Methods
This cross-sectional study was carried out in the Department of Physiology, Rangpur Medical College, Rangpur, from July 2008 to June 2009. A total number of 140 apparently healthy male subjects of 20 to 45 years age were included in this study. Among them 50 were male smoker workers of tobacco industry (Group B) who smokes at least five Bidi per day for at least last two years (up to 15 years), 40 were male non-smoker tobacco industry workers (Group C) and 50 were non-smoker non-tobacco workers (control group A). Tobacco workers are engaged eight hours per day in the tobacco factory for at least two years. All the study subjects were selected from different tobacco factories of Rangpur district and control subjects were selected from the surrounding community. Significantly disabled subjects who unable to perform spirometric procedures and subjects with respiratory diseases like asthma, chronic obstructive pulmonary diseases, pulmonary tuberculosis or any form of acute illness were excluded from the study. Study protocol was approved by ethical committee of Rangpur Medical College, Rangpur. After selection of the subjects, objectives and benefits of this study were explained to each subject and an informed written consent was taken. A detail personal, medical, family, socioeconomic, smoking and working history were recorded in a preformed questionnaire and thorough physical examinations were done and were documented. Height and weight of the subject were measured for the calculation of the body surface area. Then measured and percentage of predicted value of FVC, FEV₁ and FEV₁% were recorded by a digital spirometer. Data were expressed as mean ± SD. Statistical analysis was done by using SPSS version 12. and unpaired ‘t’ test were used for statistical analysis.

Results
FVC, FEV₁, were significantly (<0.001) lower in smoker and in non smoker tobacco worker than those of control but no significant difference in FVC was found between smoker and non smoker tobacco worker. Again, FEV₁ were significantly (<0.001) lower in smoker tobacco worker compared to non smoker tobacco worker. FEV₁%, was significantly lower in smoker than those of control and non smoker tobacco worker but the difference of this parameter between nonsmoker tobacco worker and control was not statistically significant.
In the present study FVC, FEV\textsubscript{1}, and FEV\textsubscript{1}% were assessed in male smoker and non-smoker tobacco industry workers and compared with those of age and body surface area matched controls. In this study, values of FVC, FEV\textsubscript{1}, and FEV\textsubscript{1}% of control subjects were within normal limit. Smoker tobacco workers had significantly lower percentage of predicted values of FVC, FEV\textsubscript{1}, and FEV\textsubscript{1}% than control subjects. In addition, they had significantly lower of these values of FEV\textsubscript{1} and FEV\textsubscript{1}% than non-smoker tobacco workers but no significant difference in FVC between smoker and nonsmoker tobacco workers was observed. Again nonsmoker tobacco workers also had significantly lower percentage of predicted values of FVC and FEV\textsubscript{1} than control subjects. Similar findings were also reported by some researchers of other countries\textsuperscript{17-20}.

Various mechanisms have been proposed by different investigators for the impairment of lung functions of smoker and non-smoker tobacco industry workers. It has been suggested that tobacco dust contains various immunologically active as well as toxic substances. Chronic inhalation of these substances produce increased airway reactivity and increased airway resistance and decreased elastic recoil of lung tissue. All these factors are responsible for decreased FVC, FEV\textsubscript{1}, and FEV\textsubscript{1}%\textsuperscript{17-20}.

In the present study it is difficult to comment on exact mechanisms of impaired ventilation on tobacco workers. Chronic exposure to tobacco dust causes its accumulation in the airways and lung parenchyma of these tobacco workers. Dust activates alveolar macrophages which might induce some inflammatory changes causing fibrosis of lung parenchyma\textsuperscript{21}.

In addition, chronic allergic effects of tobacco dust decreased lung functions including vasodilatation increased vascular permeability producing inflammatory edema and tissue destruction may be linked to the reduced ventilation in tobacco workers.

Again, the adverse effects of nicotine in addition to tobacco dust on the lung function are evident in the smoker tobacco workers as they had lower volumes air flow than their non-smoker colleagues.

**Conclusion**

The result of this study concludes that impairment of pulmonary functions may occur in workers in tobacco industry which may even be more decreased in Bidi smokers.
Acknowledgement
Authors of this study are thankful to the authority of Rangpur Medical College and authorities of those Tobacco Factories of Haragach, Rangpur whose cooperation makes this study successful. The authors also acknowledge the partial financial support from the research grant of Directorate General of Health Service of Bangladesh.

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References

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