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A Study of Pulmonary Function Tests Among Smokers In Rural Areas

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Abstract: *The World Health Organization reported that tobacco smoking killed 100 million people worldwide in the 20th century. Tobacco smoking rates have decreased in industrialized countries. In India smoking is a common habit prevalent in both urban and rural areas irrespective of mode of smoking. Pulmonary function tests is a generic term used to indicate a battery of studies or maneuvers that may be performed using standardized equipment to measure lung function. The tests provide an assessment of respiratory system in terms of its function. The aim of our present study was to assess the pulmonary efficiency parameters of smokers in rural areas. The study population included 100 male subjects comprising of 50 smokers and 50 non smoker controls aged between 20-40 years. The pulmonary function tests were performed with the help of computerized RMS Med-spirometer. Spirometric measurements included, FVC (Forced Vital Capacity), FEV1 (Forced Expiratory Volume in first second), FEV1/FVC (ratio of Forced Expiratory Volume in first second), FVC (Forced Vital Capacity), PEFR (Peak expiratory flow rate), FEF25-75% Forced expiratory flow between 25% and 70% of vital capacity and MVV (Maximum voluntary ventilation). The results were evaluated using Student's t-test. Pulmonary function parameters like FVC, FEV1, FEV1/FVC, PEFR, FEF and MVV showed statistically significant association between smokers and non-smokers. The present study concluded that tobacco smoking in any form, bidi or cigarette or both, has significantly deleterious effects on the pulmonary functions. Cigarette smoking has extensive effect on respiratory functions and it has been clearly implicated in the aetiology of a number of respiratory diseases.*

Keywords: *Tobacco smoking, Pulmonary function test*

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I. Introduction

Cigarettes kill an estimated 5 million people annualy worldwide. The World Health Organization 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 (1). 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. In India smoking is a common habit prevalent in both urban and rural areas irrespective of mode of smoking i.e. cigarettes, bidis, pipes, cigar, hookah etc. In India, tobacco is consumed mainly in the form of bidis (54%), followed by smokeless tobacco (27%) and cigarettes (9%) (2). In India smoking is a common habit prevalent in both urban and rural areas irrespective of mode of smoking i.e. cigarettes, bidis, pipes, cigar, hookah etc. In India, tobacco is consumed mainly in the form of bidis (54%), followed by smokeless tobacco (27%) and cigarettes (9%) (2). Bidi smoke may be more injurious because bidi contains unrefined form of tobacco as compared to cigarettes (3,4). Cigarette smoking has extensive effects on respiratory function and is clearly implicated in the etiology of a number of respiratory diseases.

Cigarettes kill an estimated 5 million people annually world wide1 (5). The World Health Organization 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 (1). By the early 2030, tobacco related death would increase to about 10 million a year (6). 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 (7).Pulmonary function tests is a generic term used to indicate a battery of studies or maneuvers that may be performed using standardized equipment to measure lung function. Evaluates one or more aspects of the respiratory system such as respiratory mechanics, Lung parenchymal function, Gas exchange and

cardiopulmonary interaction. Spirometric values vary according to age, height, sex, and body size (8, 9). Lung function tests how well our lung works. The tests provide an assessment of respiratory system in terms of its function. Spirometric investigation is seen as a gold standard for diagnosing airway obstruction. Therefore spirometry is increasingly seen as a quality standard test in general practice (10). The aim was our present study was to assess the pulmonary efficiency parameters of smokers in rural areas.

II. Materials And Methods

The present study was conducted in division of Phsiology, Rajah Muthiah Medical College, Annamalai University, Annamalai Nagar. The study population included 100 male subjects comprising of 50 smokers and 50 non smoker controls aged between 20-40 years. This study was undertaken after approval by the institutional ethical committee overseeing human studies.

Experiments were done in accordance with Helsinki declaration of 1975. In the present study a detailed record of smoking habit with reference to duration of smoking and number of cigarettes / bidis smoked per day was taken. Ex-smokers or past smokers were excluded from the study. Females were not included in this study. Individuals with history of smoking cigarettes / bidis daily for at least one year were considered as smokers. The smokers and non smokers were selected voluntarily from OPD of Rajah Muthiah Medical College Hospital. It was ensured that none of them had any significant present or past history sickness, particularly those of the respiratory system.

2.1Spirometry

The subjects were asked to sit comfortably in a chair. The complete procedure was explained. Subjects were instructed to breathe in fully by deep inspiration with nostrils closed. The lips around the sterile mouthpiece of spirometer was sealed and instructed the subjects to forcefully expire the air out, as fast and as far as possible. Best of three readings was recorded and interpreted. The lung function tests were performed with the help of computerized RMS Med-spirometer. Spirometric measurements included, FVC (Forced Vital Capacity), FEV1 (Forced Expiratory Volume in first second), FEV1/FVC (ratio of Forced Expiratory Volume in first second), FVC (Forced Vital Capacity), PEFR (Peak expiratory flow rate), FEF25-75% Forced expiratory flow between 25% and 70% of vital capacity and MVV (Maximum voluntary ventilation).

2.2 Statistical analysis:

All results were shown as mean ± SD. The results were evaluated using Student's t-test. P-value < 0.05 was considered statistically significant. Statistical analysis was performed using SPSS software17.0.

III. Results

Data from 50 smokers and 50 non smokers was analyzed. The anthropometric parameters in control and study group were shown in table 1. There was no significant difference in the mean of age, height, body mass index, body surface area in study and control group. The type tobacco of smoking was shown in figure 1. In the present study bidi smoking was common (66%). Pulmonary function parameters like FVC, FEV1, FEV1/FVC, PEFR, FEF and MVV showed statistically significant association between smokers and non-smokers by applying student t test ($P < 0.001$). The results of pulmonary function tests were shown in figure 2. The obstructive lung changes were predominantly observed in bidi smokers.

Table 1: Physical Characteristics of Smokers and Non-Smokers.

Variables	Smokers Mean ± SD	Non smokers ± SD
Age (years)	39.58 ± 2.36	39.82 ± 2.38
Height (M)	1.69 ± 0.12	1.70 ± 0.13
Weight (Kg)	67 ± 7.8	68 ± 9.4
Body Mass Index (BMI)	24.67 ± 4.21	24.71 ± 4.34
Body Surface area (m^2)	24.67 ± 4.21	24.71 ± 4.34

Figure 1: Type of Tobacco smoking

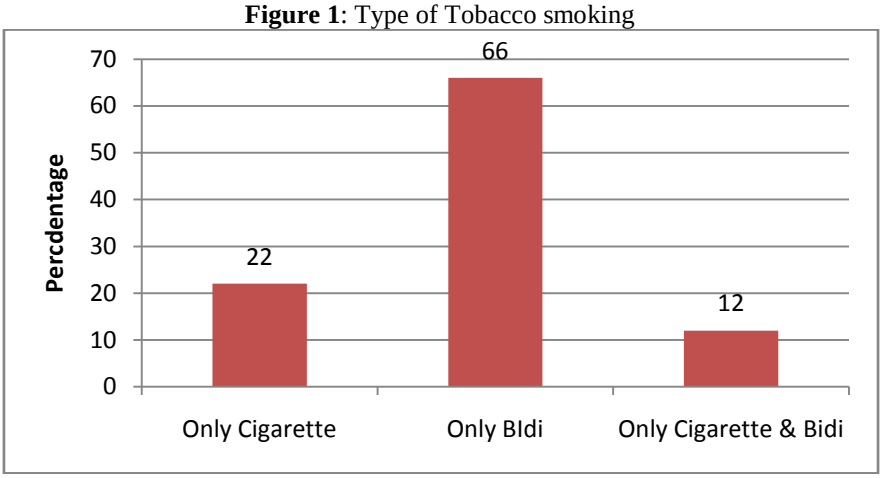
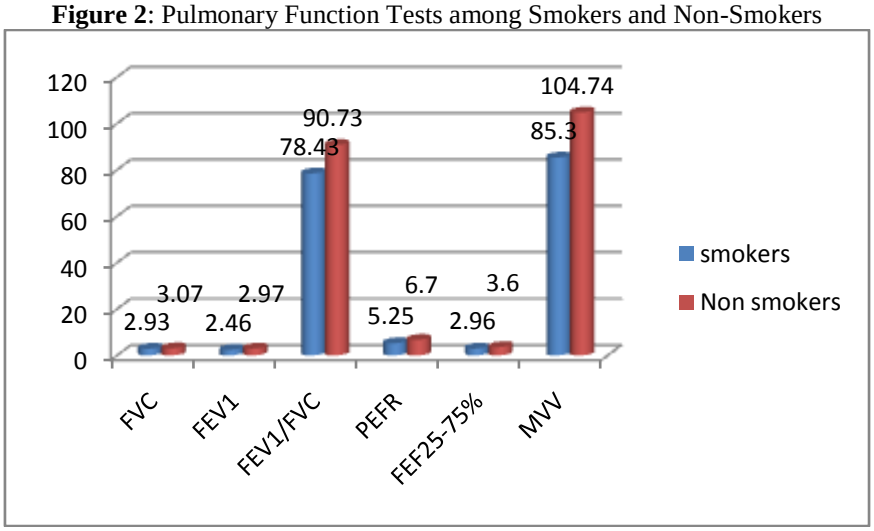


Figure 2: Pulmonary Function Tests among Smokers and Non-Smokers



IV. Discussion

Cigarettes smoking produce many changes in body especially in lungs. Some of these effects are acute but some are chronic. It affects lungs by changing mucous production and consistency, paralysis of cilia, inflammation and irritation in lungs. Spirometry is a medical test that measures the volume of air an individual inhales or exhales as a function of time. It is a frequently performed lung function test and an important tool in medical examinations of lung diseases. The interpretation of lung function relies on the comparison to reference values derived from a healthy population. In the present study it was observed that there was no significant difference in the mean anthropometric parameters like age, height, body mass index and body surface area between control and study group. In the present study most smokers were bidi smokers. Bidi smoking is common in low income people. The mean value of FVC is significantly reduced in study group. In a study done by M.S. Islam (11) found changes of ventilator functions among smokers and non-smokers and found fall in FVC amongst the smokers. We observed that FEV 1 values were reduced in smokers. This shows some degree of restriction is present in the respiratory tract of smokers. The changes might be in the tissue of the lungs due to chemicals in tobacco. FEV1 was the fraction of the vital capacity expired during the first second of a forced expiration. It indicates the capacity of expiratory muscles.

FEV 1/FVC is the ratio of FEV to FVC. In healthy adults this should be approximately 70-85% (declining with age). In obstructive diseases (asthma, COPD, chronic bronchitis, emphysema) FEV_1 was diminished because of increased airway resistance to expiratory flow; the FVC may be decreased as well, due to the premature closure of airway in expiration. In the present study our reports shows features of obstructive lung disease (12, 13). Walter et al. (14) showed significant changes in lung function in young smokers. Our study is in agreement with his statement. The Peak expiratory flow rate (PEFR), also called peak expiratory flow (PEF) is a person's maximum speed of expiration. Peak flow readings are higher when patients are well and lower when the airways are constricted. In the present study PEFR is significantly reduced in smokers when compare to non smokers. It was in agreement with Burrows et al (15), Pandya et al (16), Dhand et al (17), Gosavi et al

(18), The fall in FEV1, PEFR and other flow rates indicate obstructive lung changes and fall in FVC indicates restrictive lung changes. In the present study, obstructive lung dysfunction was commonly seen in smokers most probably it was observed in bidi smokers. It was in agreement with Padmavathy (19). In the he present study FEF 25-75% was found to be the most sensitive indicator to detect early lung function changes in smokers. Whereas FEV1, FEV1%, FEF also appeared to be sensitive but not to the extent of FEF25-75%. The significant reduction of flow rates was in agreement with Gold.D.R.Wangx, ,Wypi.D. et al (21), Millat.W.A.Elganon.F.M.(22) also showed the significant lower values FEF25-75%. Maximum voluntary ventilation (MVV) is a measure of the maximum amount of air that can be inhaled and exhaled within one minute. In the present study it was significantly reduced in smokers when compare to non smokers. It was in line with Burrows et al (15). the present study indicates that obstructive lung abnormality is a common finding in smokers (Nighute S and Awari A et al) (23).

V. Conclusion

The present study concluded that tobacco smoking in any form, bidi or cigarette or both, has significantly deleterious effects on the pulmonary functions. Cigarette smoking has extensive effect on respiratory functions and it has been clearly implicated in the aetiology of a number of respiratory diseases.

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