Original article

A comparative study of pulmonary function variables in young smokers in a tertiary care centre, North Kerala, India.

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ARTICLE INFO

Keywords:
Young smokers,
Pulmonary function tests,
India

ABSTRACT

Smoking has been indicated as one of the chief causes of respiratory diseases ranging from chronic obstructive pulmonary diseases to bronchial carcinoma. Spirometry has a pivotal role in screening, diagnosing and monitoring respiratory disease. The present study was undertaken to compare the pulmonary function variables between young asymptomatic smokers and non-smokers (20-30 years). The study participants were selected randomly from healthy bystanders and students of Academy of Medical Sciences, Kannur, Kerala. The pulmonary function parameters Forced Vital Capacity (FVC), Forced Expiratory Volume in one second (FEV1), Peak Expiratory Flow Rate (PEFR) and Maximum Voluntary Ventilation (MVV) were measured using computerized spirometer. Smokers were healthy asymptomatic subjects who smoked more than or equal to 5 cigarettes/day. Non-smokers were subjects who have not smoked even a single cigarette during life time. The mean ± standard deviation for test value in non-smokers (control group) for lung function parameters were FVC = 3.81 ± 0.59 L, FEV1 = 3.65 ± 0.59 L, PEFR = 8.99 ± 1.03L/s, MVV = 128.33 ± 8.81L/m whereas for smokers (study group) it was FVC = 3.38 ± 0.78 L, FEV1 = 3.10±0.66 L, PEFR = 8.05 ± 1.24L/s, MVV = 116.64 ± 14.89L/m. There was a significant difference between smokers and non-smokers for all the pulmonary function parameters and it was higher for non-smokers compared to smokers.

1. Introduction

Tobacco use is the single most important preventable risk to human health in developed countries and an important cause of premature death worldwide. Cigarette smoking is probably one of the most addictive and dependence-producing self gratifications known to man. Smoking has an extensive effect on respiratory function and has been clearly implicated in the etiology of chronic respiratory disease. Though smoking has been banned in the society yet teens and youngsters continue to use tobacco in various forms. WHO estimates that smoking kills more than four million people a year. This figure may rise to ten million/year by 2030 because of surging tobacco use in developing countries. There is hardly any system, which has not been affected directly or indirectly by smoking, no matter however significant or insignificant it might be. The relationship between smoking and ill health became conspicuous only after cigarette consumption reached the great heights it did following the Second World War. Tobacco was brought to India by the Portugese 400 years ago. India ranks third in tobacco production. Chronic obstructive pulmonary disease (COPD), also known as chronic obstructive lung disease (COLD), chronic obstructive airway disease (COAD), chronic airflow limitation (CAL) and chronic obstructive respiratory disease (CORD), is the occurrence of chronic bronchitis or emphysema, a pair of commonly co-existing diseases of the lungs in which the airways become narrowed. This leads to a limitation of the flow of air to and from the lungs, causing shortness of breath that is dyspnoea. In clinical practice, COPD is defined by its characteristically low airflow on lung function tests.

With the important advances in pulmonary physiology and medical instrumentation that have occurred during the past 40 years, Pulmonary Function Tests (PFT) have come to assume a central place in the practice of pulmonary medicine. The term PFT is a generic term used to indicate a battery of studies /maneuvers that may be performed using standardised equipment to measure lung functions. Lung function parameters measured at an early age is a predictor of lung function at middle age, which later are predictors of chronic lung diseases. In view of the considerable increase in smoking among younger adults, determining the impact of smoking on this sector of the population is of great importance to public health. Numerous studies conducted inside and outside India have demonstrated the deleterious effects of smoking on health. However, only few have been reported from North Kerala, done in young asymptomatic smokers. In a study conducted by Jayakumari et al in various schools in Kannur, Kerala to assess the prevalence and type of tobacco use among adolescents and the reasons for the initiation of tobacco, observed an overall prevalence of 5.5%. The prevalence observed among boys were 12% and none of the girls were tobacco users. The present study was undertaken to compare the spirometric
variables in young healthy smokers with nonsmokers of the same age group in a co-operative medical college in North Kerala. The college has a well established antismoking clinic where they initiate de addiction measures. In addition, our study with a large sample provides a comprehensive knowledge on the effects of smoking on lung function of asymptomatic subjects.

MATERIALS AND METHODS

The present study is a descriptive study conducted at Academy of Medical Sciences, Pariyaram, Kannur during the year 2011-2012. The study group comprised of 210 smokers and 210 non-smokers. Subjects were randomly selected from healthy male bystanders accompanying the patients in various outpatient departments of the medical college hospital, undergraduate and postgraduate students of various disciplines of the college. Smokers were healthy asymptomatic subjects who smoked more than or equal to 5 cigarettes/day in the past one year. Non-smokers were those who have not smoked even a single cigarette during their life time. Subjects were recruited after obtaining consent and a per forma was used to collect information regarding the subjects. Main outcome variables tested were FVC, FEV1, PEFR, MVV. Standing height was measured using an anthropometric rod measuring two metres with an accuracy of 0.1 cm graduations and a sliding head piece. The measurement was taken without the shoes.

Statistical analysis was performed using SPSS (version13) software for windows. Descriptive statistical tools like mean, standard deviation, 95% confidence interval were used in the study. Independent variables were tested by unpaired students-t test. Medicaid spiroexcel computerised portable spirometer was used for studying the pulmonary function variables.

RESULT

The age group of the participants ranged from 20 to 31 years with a mean of 24.51 years and a standard deviation of 3.196 years. The body surface area (BSA) in smokers ranged from 1.3 to 2.1 m2 with a mean of 1.781 m2 and standard deviation of 0.136. The BSA in nonsmokers ranged from 1.5 to 2.1 m2 with a mean of 1.75 m2 and a standard deviation of 0.13. The baseline characteristics of the participants are shown in Table 1.

Forced Vital Capacity in the smokers ranged from 1.92 to 5.46 L, with a mean of 3.37 L and standard deviation of 0.78 in smokers. In nonsmokers FVC ranged from 2.25 to 5.01 L with a mean of 3.8 L and standard deviation of 0.59. The mean FVC of the two groups were found to be significantly different (t-test for difference in means between two independent groups, p<0.001). The 95% confidence interval (0.3, 0.6) for the mean FVC in the two groups are depicted in Figure 1. So, from Figure 1 we can conclude that the mean FVC of non-smokers is significantly higher than that of smokers.

Forced Expiratory Volume in one second (FEV1) in the smokers ranged from 1.49 to 4.85 L with a mean of 3.11 L and standard deviation of 0.59. The mean FEV1 of the two groups were found to be significantly different (t-test for difference in means between two independent groups, p<0.001). The 95% confidence interval (0.43, 0.67) for the mean FEV1 in the two groups are depicted in Figure 2. So, from Figure 2 we can conclude that the mean FEV1 of non-smokers is significantly higher than that of smokers.

Maximum voluntary ventilation (MVV) in the smokers ranged from 70 to 171 L/m, with a mean of 116.64 L/m and a standard deviation of 8.81. The mean MVV of the two groups were found to be significantly different (t-test for difference in means between two independent groups, p<0.001). The 95% confidence interval (9.35, 14.04) for the mean MVV in the two groups are depicted in Figure 4. So, from Figure 4 we can conclude that the mean MVV of non-smokers is significantly higher than that of smokers.

Table 1: Baseline characteristics of the participants

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>SMOKERS (Mean ± S.D.)</th>
<th>NON SMOKERS (Mean ± S.D.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AGE (years)</td>
<td>25.46 ± 3.28</td>
<td>23.57 ± 2.81</td>
</tr>
<tr>
<td>HEIGHT (cm)</td>
<td>169.44 ± 6.04</td>
<td>171.71 ± 6.73</td>
</tr>
<tr>
<td>WEIGHT (kg)</td>
<td>65.33 ± 7.34</td>
<td>67.53 ± 6.33</td>
</tr>
<tr>
<td>BSA (m²)</td>
<td>1.72 ± 0.14</td>
<td>1.76 ± 0.13</td>
</tr>
</tbody>
</table>

Figure 1: 95% confidence interval for mean FVC of smokers and non-smokers.

Figure 2: 95% confidence interval for mean FEV1 of smokers and non-smokers.
maximum or peak level of PEFR is achieved. In the present study asymptomatic smokers with a history of one year smoking also showed a significant reduction in PEFR. Peak Expiratory Flow Rate is an effort dependent parameter emerging from the larger airways within about 100-120ms of the start of the forced expiration. Even in normal subjects the values may be variable as the parameter is entirely effort dependent resulting in a high intra subject variability. Nevertheless, it remains an effective tool for assessing a limited aspect of ventilatory function. In the study by Dixit MB et al 15 on the factors affecting PFT, smokers were found to have lower PEFR over all age ranges. The results were similar to the present study in that smokers had a significantly lower PEFR than non-smokers.

Padmavathy K M 16 in a study on beedi smokers and nonsmokers and found that MVV and FVC of beedi smokers are lower than those of nonsmokers possibly due to weakness of respiratory muscle strength and reduction in respiratory reserve. The present study showed a significantly higher MVV in non-smokers than smokers who are apparently healthy. In the present study young adult smokers with no clinical symptoms were found to have significant reduction in lung function. This information can be used to illustrate the harm of smoking and to encourage young people to quit cigarette smoking.

CONCLUSION

The prevalence of undetected persistent airflow limitation is high. Targeted screening therefore, especially in smokers needs to be considered. Since lung function declines with time, the best time to prevent morbidity and mortality from smoking-related illness should be early in life. The values of spirometric variables presented in this study for the smokers, non-smokers might be helpful for the estimation of lung function, for the assessment of severity of disease, and for the assessment of degree of pulmonary dysfunction as a result of influence of smoking.

Reducing smoking is a winnable battle with known, effective strategies for success. Educating young adult smokers who are apparently healthy to refrain from smoking at an early stage, will improve the lung function as well as prolong the years of life.

REFERENCES:


