ABSTRACT

Background: Cigarette smoking has extensive effects on respiratory function. Pulmonary function testing is a routine procedure for the assessment and monitoring of respiratory diseases.

Aims & Objectives: To compare the pulmonary function among smokers and non-smokers.

Materials and Methods: 100 subjects, 50 smokers and 50 non-smokers were included in a retrospective study conducted at Municipal corporation hospital by convenience sampling. Pulmonary function test procedure was explained to the subjects. Approximately 5 to 6 times manoeuvres were performed, and out of that, the best reading was taken, for FEV₁, FVC and FEV₁/FVC ratio.

Results: In the present study, there was a statistically significant difference in the FEV₁ value (p = 0.038) between smokers and non-smokers. While the difference in FVC (p = 0.119) and FEV₁/FVC ratio (p = 0.217) were not found to be statistically significant in both the groups.

Conclusion: The present study shows that the mean FEV₁ was significantly lower in smokers. Smoking has a deleterious effect on the health, mainly on pulmonary functions. Hence, the risk of respiratory mortality or morbidity is high with smoking.

Key Words: Smokers; Pulmonary Function Test (PFT); Non-Smokers; Respiratory Disease; Spirometer

Introduction

The World Health Organization (WHO) 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 also.[4]

Besides the direct consequences of smoking on smokers, passive smoking by non-smokers, who are exposed to tobacco smoke, also has shown an increased risk of respiratory and cardiovascular problems in children.[2] After inhalation of cigarette smoke, nicotine is quickly distributed to the brain, and it can affect the central nervous system instantaneously.[3] Tobacco smoke contains 4000 chemicals, out of which 60 are known carcinogens, which can lead to lung cancer.[4]

Tobacco has remained as one of the most important predisposing factors responsible for so many respiratory and cardiovascular diseases. Smoking leads to rapid decline in pulmonary function tests (PFTs).[5] Chronic Obstructive Pulmonary Diseases (COPD) has been recognized as one of the most important causes of morbidity and mortality in chronic tobacco smokers worldwide.[4] In COPD, small airways are less than 2mm in diameter. These obstructions in airways invariably affect the parameters of pulmonary function. E.g. Forced vital capacity (FVC) and Forced Expiratory Volume in the First Second (FEV₁). [6]

Pulmonary function testing is a routine procedure for the assessment and monitoring of respiratory diseases.[7] Tests are also useful because they are less expensive, non-invasive, reproducible, and cause minimum discomfort for the subjects. Spirometric values vary according to age, height, sex, and body size.[8,9]

Thus, cigarette smoking has extensive effects on respiratory function, which can be detected with pulmonary function test. So the aim of the study was to compare the pulmonary function among smokers and non-smokers.

Materials and Methods

The present study was a retrospective study; data was taken from the municipal corporation hospital, Ahmadabad. The study population included 100 subjects referred by the doctors of the hospital, for the pulmonary function test, from which the subjects were selected by convenience sampling, according to the selection criteria. They comprised of 50 smokers and 50 non-smokers. Individuals with a history of smoking were called as smokers, and control group were 50 non-smokers.

Subjects who had smoked any tobacco products either
daily or occasionally and more than 20 years of age were included in smokers group. And subjects who did not smoke at all were included in non-smokers group. Both the genders were included. First of all, the personal data was taken which included age, gender, history of smoking, weight, height.

Materials used were, Pulmonary function test machine (RMS-Helios), nose clip, mouthpiece, and spirometer. For evaluating the respiratory functions, the subjects were asked to sit comfortably on a chair. The complete procedure was explained and the subjects were instructed to breathe in fully, by deep inspiration with their nostrils closed with nose clip, and asked to seal their lips around the sterile mouthpiece of the spirometer and then to forcefully expire air out. They were given 1-2 trials, so that they understood the procedure. The best three reading was recorded and interpreted.

Spirometric measurements included, (i) FVC: Forced Vital Capacity; (ii) FEV1: Forced Expiratory Volume in first second; and (iii) FEV1/FVC: ratio of Forced Expiratory Volume in first second and Forced Vital Capacity. The terminology and abbreviations used for different lung function tests carried out are as in a study done by Harkirat Kaur.[10]

Statistical analysis was carried for all the parameters using SPSS version 16.0. Level of significance was kept at 5%. Independent sample t test was used for between groups comparison. 'p' value was determined. p>0.05 was considered as non-significant.

Results

Data was not normally distributed, so non-parametric test was applied. Independent sample t test was applied for smoker and non-smoker group. The physical parameters of the smokers and the non-smokers are shown in table 1. Age range of the subjects was 20 – 80 years with mean age of 54.01 ± 14.52. Mean age of smoker group was 56.54 years and of non-smoker group was 51.48 years.

From the result, the FEV1, FVC and FEV1/FVC ratio were noted. The mean difference in values for pulmonary function test for FEV1 was highly significant, while for the other parameters, viz. FVC and FEV1/FVC ratio, the differences were not found to be statistically significant between smokers and non-smokers group on applying independent sample t test. (Table 2)

### Table-1: Physical characteristics of smoker and non-smoker group

<table>
<thead>
<tr>
<th>Variables</th>
<th>Smoker group (Mean ± SD)</th>
<th>Non-smoker group (Mean ± SD)</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>56.54 ± 14.29</td>
<td>51.48 ± 14.45</td>
<td>0.038</td>
</tr>
<tr>
<td>Height (meters)</td>
<td>1.66 ± 0.07</td>
<td>1.56 ± 0.11</td>
<td></td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>56.88 ± 12.71</td>
<td>58.24 ± 15.11</td>
<td></td>
</tr>
<tr>
<td>BMI [kg/m²]</td>
<td>20.55 ± 4.31</td>
<td>23.91 ± 5.82</td>
<td></td>
</tr>
<tr>
<td>Gender (M/F)</td>
<td>50/0</td>
<td>20/30</td>
<td></td>
</tr>
</tbody>
</table>

### Table-2: Pulmonary function test among smoker and non-smoker group

<table>
<thead>
<tr>
<th>Pulmonary Function Test</th>
<th>Smoker group (Mean ± SD)</th>
<th>Non-smoker group (Mean ± SD)</th>
<th>Significance (p value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1</td>
<td>1.84 ± 0.76</td>
<td>1.52 ± 0.76</td>
<td>0.038</td>
</tr>
<tr>
<td>FVC</td>
<td>1.45 ± 0.69</td>
<td>1.23 ± 0.66</td>
<td>0.119</td>
</tr>
<tr>
<td>FEV1/FVC</td>
<td>77.47 ± 14.48</td>
<td>81.26 ± 15.95</td>
<td>0.217</td>
</tr>
</tbody>
</table>

### Discussion

Spirometry is a frequently performed lung function test, and is an important tool in medical surveillance examinations of pulmonary diseases. The interpretation of lung function relies on the comparison to reference values derived from a healthy population.[11] In the present study, there is a significant reduction in FEV1 value among the smokers compared to non-smokers. There was no statistically significant difference in the FVC and FEV1/FVC ratio among smokers and non-smokers.

In the present study, FEV1 was found to be significantly reduced in smokers. Cigarette smoking has extensive effect on respiratory functions and it has been clearly implicated in the etiology of a number of respiratory diseases.[12] Similar results were found by Nighute S and Awari A and Dhand R.[13] Smoking may directly induce an increased platelet consumption and may reflect the adherence or the deposition of these cells, to the damaged site as was suggested by Hind CR.[14]

In the present study, FVC was not found to be significantly different between both the groups. Gupta et al. and Mahajan et al. observed no changes in FVC in smokers.[15,16] Also in the present study, in the non-smoker group, females were more than males. In females the parameters are lower than the males, possibly because the size of female lung is different from male lung.[11] Boys tend to have larger lungs per unit of stature.[17] So it may be the reason, why difference in parameters, like FVC and FEV1/FVC ratio, was not found to be significant between both groups.

FEV1/FVC ratio was not found to be significantly different in this study which is not in accordance with studies done by Nwaufleh HA et al. and Nighute S and Awari A.[11,12] These authors have found obstructive lung dysfunction to be a common finding in smokers.
However in our study reduced FEV$_1$ in smokers is indicative of obstructive lung pathology. Limitations of the study were that age and height of the subjects in both the groups were not matched. Also there was more number of females in the non-smoker group.

**Conclusion**

Smoking has a deleterious effect on the health, mainly on pulmonary functions. Hence, the risk of respiratory mortality or morbidity is high with smoking. The study observed that spirometry was an effective and easy method for detection of COPD in risk group population like smokers, and thus promotes smoking cessation efforts to reduce the burden of COPD in the community.

**Abbreviations**


**References**


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