A comparative study of spirometry in healthy smokers and healthy non smokers

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ABSTRACT

BACKGROUND: Tobacco smoking is a common habit and major public health problem. Many respiratory diseases like chronic bronchitis, emphysema, lung cancer are caused by smoking. The current study was performed (1) to determine the effect of smoking on spirometry parameter. (2) To highlight role of effect of cigarette smoking on ventilator function before symptomatic disease develops. Hence spirometry can be used as an invaluable modality of investigation for early detection of deteriorating lung function so that appropriate steps for smoking cessation can be taken. MATERIALS AND METHODS: In this study pulmonary function study was carried out in 30 healthy smokers and 30 healthy non smokers using computerised spirometer. RESULTS: All pulmonary function parameter like FEV1, FVC, FEF 25-75, FEF25%, FEF50%, FEF75% were significantly reduced in healthy smokers as compared to healthy non smokers. FEF 25-75 FEF25%, FEF50%, FEF75% are parameters which reflect function of small airways of lung. CONCLUSION: As spirometry was carried out in healthy subjects and it showed that all pulmonary functions parameters were significantly reduced in healthy smokers as compared to healthy non smokers, by doing spirometry in healthy smokers, we can effectively emphasis on smoking cessation before symptomatic lung disease develop.

Keywords: Smoking, Pulmonary function test, Spirometer, healthy smokers, healthy non smokers

INTRODUCTION

Today, tobacco use causes 1 in 10 deaths among adults worldwide-more than five million people a year. By 2030, unless urgent action is taken, tobacco’s annual death toll will rise to more than eight million1. There are almost 275 million tobacco users in India. More than one-third of adults (age 15+) use some form of tobacco, including almost half of men (48 percent) and 20 percent of women. Among youth (age 13-15), 4 percent smoke cigarettes and almost 12 percent use other types of tobacco products. Bidis, cheap hand-rolled cigarettes, are the most popular tobacco product used in India. Bidis comprise 48 percent of the tobacco market, chewing tobacco 38 percent and cigarettes 14 percent. About 1 million Indians die from tobacco-related diseases each year in India. Among youth (age 13-15), 27 percent are exposed to secondhand smoke at home and 40 percent are exposed to secondhand smoke in public places2. Smoking can cause disease through a myriad of effect. Cigarette smoke contains in excess of 6000 compounds. Tobacco smoke is associated with an increased mortality from atherosclerosis vascular disease, cancer, chronic obstructive pulmonary disease and is associated with number of other adverse health effect as well3. Smoking is the single most significant risk factor contributing to the development of COPD. The WHO estimates that 75% of COPD globally is directly attributed to smoking4. On average, cigarette smokers have a high annual rate of decline in FEV1 of about 50 ml, which is nearly double the average value of 30 ml annually present in non smokers. However, there is considerable variation in the decline in FEV1, with some smokers showing very rapid rate of decline. In non smokers the FEV1 begins to decline at 30-35 years of age, and this may occur earlier in smokers5. Major effect of cigarette smoking on lung function decline involves the premature onset of a "normal" rate of decline in function and, to a lesser extent, more rapid rates of decline later in life and that the pattern and magnitude of decline is similar in males and females6. The current study was performed to determine the effect of smoking on spitometry parameter and to highlight role of effect of cigarette smoking on ventilator function before symptomatic disease develops.

MATERIALS AND METHODS

The present study was carried out at dept. of pulmonary medicine at B.J. Medical College, Ahmedabad from 2008 to 2010. In the present study only males were included considering low prevalence of tobacco smoking among female. Total 30 healthy smokers were selected randomly and 30 healthy non smokers with comparable variables (height, weight, age) were included in this study. Individual with history of smoking bidi or cigarette daily for at least one year was considered as

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smokers. The subjects were selected voluntarily from patients’ relatives, students or hospital staff with the following inclusion criteria.

1. No history of cardiopulmonary & chest wall disease.
2. Negative answer to each of the following questions:-Do you get short of breath hurrying on the level of or going up a slight hill. -Do you usually cough. -Do you usually bring up phlegm from your chest. -Do you wheeze
3. Normal Chest X-ray
4. Normal ECG
5. Normal Haemogram

Smokers were defined as the subject who used to consume tobacco in inhaled tobacco form. They were quantified for their smoking consumption. Quantification was done in no. of pack year as well as smoking index as per following formula.

A) Smoking index(SI): No. of cigarette per day x total duration in year

B) Pack Year: No. of packet of cigarette per day X no. of year (1 packet: 20 cigarettes) Non smokers were classified as the subjects who never consumed tobacco in inhaled tobacco form. However passive smoking, occupational and environmental exposure could not be avoided. Ex-smokers were excluded from study. Spirometry was done by RMS Helios and Spiro excel spirometer with following standardization.

1. The height was recorded without shoes, with feet together standing as tall as possible.
2. Subject should avoid: (i) Smoking for 24 hrs prior to the test (ii) Alcohol 4 hrs prior to the test (iii) Meal 2 hrs prior to the test (iv) Vigorous exercise 30 mins prior to the test
3. Subjects were made to relax and sitting 5-10 mins prior to the test.
4. The best obtained value was selected as final result.

The obtained data was analyzed in Microsoft excel by using standard statistical methods.

RESULTS
In present study bidi smokers (80%) were more than cigarette smokers as shown in table-1. The physical parameter of the smokers and non-smokers are shown in table-2. The age range of subjects was 21 to 75 years with mean age 39 years for healthy smokers and mean age of 41 years for healthy non smokers. The mean height of smokers and non smokers was 163.23cm and 165.87cm respectively. The mean weight was 57.8kg and 59.96kg for smokers and non smokers respectively. Table 3 showed pulmonary function test parameter like FEV1, FVC, FEF 25-75, FEF 25%, FEF 50%, FEF 75%. It was shown that mean value of pulmonary functions were reduced in the smokers as compared to non smokers. Association of impaired PFT in smokers was found to be statistically highly significant by applying unpaired t test of significant.

Table 1: Patterns of Smoking:

<table>
<thead>
<tr>
<th>Type of smoke</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bidi</td>
<td>24</td>
<td>80</td>
</tr>
<tr>
<td>Cigarette</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Bidi +chalam</td>
<td>1</td>
<td>3.3</td>
</tr>
</tbody>
</table>

Table 2: Physical parameters in healthy smokers and non smokers.

<table>
<thead>
<tr>
<th>Physical Parameters</th>
<th>Smoker (n=30) Mean±2SD</th>
<th>Non-Smokers (n=30) Mean±2SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age(year)</td>
<td>39±13</td>
<td>41±14</td>
<td>0.568</td>
</tr>
<tr>
<td>Mean height(cm)</td>
<td>163.23±7.486</td>
<td>165.87±5.2898</td>
<td>0.125</td>
</tr>
<tr>
<td>Mean weight(kg)</td>
<td>57.8±8.4503</td>
<td>59.96±10.257</td>
<td>0.235</td>
</tr>
</tbody>
</table>

Table 3: Pulmonary Function Tests among Smokers and Non Smokers.

<table>
<thead>
<tr>
<th>Pulmonary Function Tests</th>
<th>Smokers (n=30) Mean±2SD</th>
<th>Non-Smokers (n=30) Mean±2SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>FEV1(L)</td>
<td>1.91±0.44</td>
<td>2.38±0.5</td>
<td>0.003</td>
</tr>
<tr>
<td>FVC(L)</td>
<td>2.28±0.5</td>
<td>2.60±0.5</td>
<td>0.021</td>
</tr>
<tr>
<td>FEF25-75(L)</td>
<td>2.81±1.120</td>
<td>3.441±1.085</td>
<td>0.030</td>
</tr>
<tr>
<td>FEF 25%</td>
<td>5.074±1.45</td>
<td>6.309±1.763</td>
<td>0.003</td>
</tr>
<tr>
<td>FEF 50%</td>
<td>4.625±1.185</td>
<td>5.408±1.256</td>
<td>0.015</td>
</tr>
<tr>
<td>FEF 75%</td>
<td>4.243±1.044</td>
<td>4.373±0.832</td>
<td>0.0594</td>
</tr>
</tbody>
</table>

DISCUSSION
There was no significant differences in the mean physical parameters like age, weight and height of smokers and non smokers. In this study bidi smokers were more as compared to cigarette smokers as bidi is cheap and easily available. All the pulmonary function parameters like FEV1, FVC, FEF 25-75, FEF 25%, FEF 50% and FEF 75% showed association between smokers and non smokers. (p <0.05). Mean value of all pulmonary functions were significantly reduced in the smokers as compared to non smokers. FEF 25-75, FEF 25%, FEF 50%, FEF 75% are parameters which reflects declining ventilator function due to smoking related small airway damages. Similar observations showing lung function impairment in smokers were reported by Rubeena Bano et al and Sunita nighute and Abhijit awari. Ideally, Spirometry should be done in every smoker and should be repeated annually in patient with abnormal report & every 3 years in a patient with normal report. Progressive reduction in FEV1 is the earliest indication of COPD in smokers. Spirometry assisted counseling in an excellent tool for encouraging patient to stop smoking with quit rate as high 40%.

CONCLUSION
Spirometry is an easily available noninvasive and inexpensive mean for early detection of smoking related decline in pulmonary function so that appropriate steps for smoking cessation can be taken.

REFERENCES
2. URL: http://global.tobaccofreekids.org/en/global_epidemic/india