Lung Function Variables in Chronic Obstructive Pulmonary Diseases in Rural Population of Karachi

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Abstract

OBJECTIVES: To evaluate patients of Chronic Obstructive Pulmonary Diseases (COPD) by spirometry in adult rural population of Karachi.

PATIENTS AND METHODS: 53 patients of COPD were subjected to spirometry when they presented with dyspnoea in Emergency / Out Patient Department of Fatima hospital. Forced Vital Capacity (FVC), Forced Expiratory Volume in first second (FEV₁), Peak expiratory flow rate (PEFR) and Percentage ratio (FEV₁/FVC) were recorded. The variables were compared with control group comprising healthy individuals.

RESULTS: 25 out of 53 patients were female between the ages of 16-70 years with mean age 46.24 ± 5.56 and 28 males between the ages of 16-70 years with mean age 39.5±5.43 were included in the study. FVC ranged between 0.61 to 3.0L with mean 1.80±0.84 SD in patients and 1.85 to 5.67L with mean 3.22 ± 1.03 SD in control group (p<0.05). FEV1 ranged between 0.4L to 3.82L with mean 1.22±0.75SD in patients and 1.81L to 4.03L with mean 2.85±0.65SD in control group (p<0.5). PEFR ranged between 0.55 L/min with mean 2.99±0.81SD in control group (p<0.01). FEV₁/FVC ranged between 23 to 98% with mean 66±18.01SD in patients and 70 to 99% with mean 88±9.70SD in control group.

Conclusion: Pulmonary function testing is a useful objective parameter in the evaluation and progress of COPD patients.

Key Words: Spirometry, COPD, Rural Population.

Introduction:

Dyspnoea is an unpleasant sensation of labored breathing [1]. It may be the chief presenting complain of patients with underlying respiratory, cardiac, hematological and functional disorders [2]. Chronic Obstructive Pulmonary Diseases including pulmonary emphysema, chronic bronchitis and bronchial asthma are characterized by airway obstruction; consequently their clinical manifestations overlap [3]. The main methods to assess dyspnoea are either indirect when an attempt is made to clinically define severity in terms of the disability brought on by the symptoms, or direct, which quantify the perceived intensity of the sensation that include the visual scales and non-invasive procedures like spirometry and pulse oximetry. A diagnosis of COPD is suggested by history and physical examination and is confirmed by spirometry that is one of the most common pulmonary function tests [4]. Early detection and accurate diagnosis are necessary steps to improve the management and prevention of COPD [5]. Spirometry is the basic and most frequently performed test in measuring lung function which can easily be done in a ward or in a clinic. Spirometry is essential in monitoring the course of respiratory diseases [6]. There are different primary spirometry parameters like Forced Vital Capacity (FVC), Residual Volume (RV), Total Lung Capacity (TLC) and Vital Capacity (VC). FVC may be reduced by airflow obstruction as well as restriction. In airflow obstruction RV is increased and TLC is normal or high depending on the elasticity of the lungs. Obstruction and restriction may coexist. Obstruction increase RV and restriction increases TLC [7]. Laszlo defined and described the primary spirometric parameters that included peak flow rate (PEFR), forced vital capacity (FVC), residual volume (RV) total lung capacity (TLC), vital capacity (VC) and forced expiratory volume in first second (FEV₁) [8]. Measurement of vital capacity is an excellent means of detecting respiratory muscles weakness [9]. Spirometry can also be used as screening test for early detection of COPD in susceptible smokers [10]. Forced expiratory tests including FEV₁, FVC and Peak expiratory flow rate are simple, easily repeated and inexpensive. Results from tests based on spirometric maneuvers can have an important effect on a person’s life style, standard of living,

PATIENTS AND METHODS: This study was carried out in emergency/ out patient department of Fatima Hospital at Baqai Medical University, Karachi from May 2002 to December 2002. A written or verbal consent was taken from the patients before their inclusion in the study. 53 patients of COPD having ages ranging from 16 to 70 years comprising 25 males and 28 females who presented with dyspnoea and were able to perform spirometry at the time of evaluation were included in the study. All the patients who suffered from dyspnoea due to any cause other than COPD like pneumothorax, pneumonia, pleural effusion, anemia, cardiac failure and functional disorders were excluded from the study. A calibration of the spirometer with a 3 liter syringe prior to commencement of the study was done according to the recommendations of the National Asthma Education Program [12]. A daily calibration of the spirometer was not required in our study. Spirometric variables were measured for a series of at least 3 acceptable forced expiratory readings. The best values were selected. There was no advantage in five compared to three maneuvers or in using mean rather than largest value in terms of reproducibility [13]. Patients were given a rest of 2-3 minutes between the tests. Similarly patients performing the test for the first time were asked to make two or three practice blows to develop a correct technique. Thereafter three technically satisfactory blows were recorded [14]. A very slow start with a low peak flow would result in a greater than allowable extrapolated volume [15]. In addition, the FEV1 from a sub-maximal effort can be either smaller than those obtained when a maximal effort was performed. Likewise it was important that subjects be verbally exhorted to continue to exhale air at the end of the maneuver, “keep blowing, blow hard” etc. Spirometric variables including forced vital capacity (FVC), Forced expiratory volume in first second (FEV1), Percentage ratio (FEV1/FVC) and Peak expiratory flow (PEF) were recorded.

### Table 1: No. of patients by age group

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Male No. of pts.</th>
<th>%age</th>
<th>Female No. of pts</th>
<th>%age</th>
</tr>
</thead>
<tbody>
<tr>
<td>16-25</td>
<td>6</td>
<td>21</td>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>26-40</td>
<td>9</td>
<td>32</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>41-55</td>
<td>9</td>
<td>32</td>
<td>7</td>
<td>28</td>
</tr>
<tr>
<td>56-70</td>
<td>4</td>
<td>14</td>
<td>9</td>
<td>36</td>
</tr>
</tbody>
</table>

The spirometric variables FVC, FEV1, PEFR and Percentage ratio were evaluated for patients and healthy controls respectively.

In patients FVC ranged between 0.61 to 3.0L with mean 1.80±0.84 SD and 1.85 to 5.67 L with mean 3.22±1.03SD in control group (p<0.05).

In patients FEV1 ranged between 0.4 to 3.22L with mean 1.22± 0.75 SD and Between 1.81 to 4.03L with mean 2.85±0.65 SD in control group (p<0.01).

In patients PEFR ranged between 0.55 to 5.89 L/min mean 1.66±1.06 SD and 1.47to 4.90 L/min with mean 2.99±0.81 SD in control group (p<0.1).

In patients FEV1/FVC ranged betwee 23 to 98% with mean 66±18.01 SD and 70.72 to 99 L/ min with mean 88±9.70 SD in control group. see (Table-2).

### Table 2: Comparison of Forced Vital Capacity Forced Expiratory Volume in First Second, Peak Expiratory Flow Rate and Percentage of FEV1 and FVC

<table>
<thead>
<tr>
<th>GROUP</th>
<th>FVC (L)</th>
<th>FVC (L)</th>
<th>FVC (L)</th>
<th>FVC (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
<td>Mean ± SD</td>
</tr>
<tr>
<td>CONTROL</td>
<td>3.22±1.03</td>
<td>3.22±1.03</td>
<td>3.22±1.03</td>
<td>3.22±1.03</td>
</tr>
<tr>
<td>PATIENTS</td>
<td>1.80±0.84</td>
<td>1.80±0.84</td>
<td>1.80±0.84</td>
<td>1.80±0.84</td>
</tr>
</tbody>
</table>

DISCUSSION:
A diagnosis of COPD is suggested by history and physical examination and is confirmed by spirometry [10]. Patients suffering from chronic obstructive pulmonary diseases experience exacerbations of dyspnoea from time to time during the course of illness. The intensity of discomfort not only changes in the patients but it also varies from patient
to patient. Both asthma and chronic obstructive pulmonary diseases including emphysema and chronic bronchitis are characterized by airway obstruction, consequently their clinical manifestations overlap [11]. Spirometry is essential in monitoring the course of respiratory diseases [13]. 53 patients of COPD, twenty-five females and twenty-eight males were evaluated for dyspnoea. Only those patients whose presenting complain was dyspnoea were included in the study. Measurement of dyspnoea in acute asthma is difficult. The need for rating of shortness of breath arises in emergency room or outpatient department when patient presents with dyspnoea facing difficulties in expressing his discomfort [14]. Lung function testing is crucial for the diagnosis of COPD as reversible airway obstruction is the main feature of chronic airway inflammation [16]. It is not possible in acute severe shortness of breath to always perform spirometry. We should only those patients who were able to perform spirometry. They were statistically significant differences between spirometric variables amongst patients and control.

The prevalence of COPD when using spirometry data lies between 4% and 10% however health statistics do not fully account for COPD patients either, given the under diagnosis of this disease reported between 30% and 50% [17] however in this study the comparison of spirometry between normal controls and COPD patients showed 44%, 57% and 44% difference with p value 0.05, 0.5 and 0.01 for FVC, FEV1 and PEFR respectively. Early detection and intervention during unexpected hypoxia can have better prognosis using arterial saturation (18,19). Similarly spirometry can be used to make an appropriate management plan for COPD patients. Long term oxygen therapy in COPD showed beneficial effects monitored by pulse oximetry, basic spirometry, health related quality of life by the St. George’s Hospital respiratory questionnaire instrument and assessment by dyspnoea severity by the Modified Borg Scale done prior to and after oxygen therapy [20]. Similarly this study was conducted with the intention that spirometry has role in monitoring progress of COPD patients after management. Therefore spirometry should possibly be done in every patient for confirming the diagnosis on one hand and making appropriate management plan on the other and also for estimation of prognosis of COPD.

**Conclusion:**

Pulmonary function testing is a useful objective parameter in the evaluation of COPD patients.

The test should possibly be applied to all the patients who present with dyspnoea.

**References:**


