

FEV<sub>1</sub> % AND FEV<sub>1</sub>/FVC % IN SMOKERS WITH SPECIAL REFERENCE TO CHRONIC OBSTRUCTIVE PULMONARY DISEASES

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ABSTRACT

**Background and Objective:** It was observed that chronic obstructive pulmonary diseases (COPD) cases develop acute exacerbation of breathlessness leading initially to type I respiratory failure which may lead to type II respiratory failure. The present study was undertaken to find out the FEV<sub>1</sub> % and the ratio of FEV<sub>1</sub>/FVC % in chronic obstructive pulmonary disease conditions. **Materials and Methods:** The present study was conducted at Kasturba Medical College, Mangalore, after the institutional ethical clearance and informed consent from all the participants. Routine pulmonary function testing was done on them by using Patrick Morgan's Benchmark computerized spirometry. Students' t' test was used to find out the significance of difference using SPSS version 11. P values less than 0.05 was considered the level of significance. **Result:** COPD cases have the airway obstruction increases with passing of and increasing severity of the disease, which in turn characterized by deteriorating FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC%. **Conclusion:** FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC% have a definite role in defining various stages of COPD. Hence, it is an automatic choice for identifying and there by classifying various stages of COPD.

**Keywords:** Chronic Obstructive Pulmonary Disease, FEV<sub>1</sub> % and FEV<sub>1</sub>/FVC %

1. Introduction

With the coming in of individual revolution there has been a considerable rise in disorders of respiratory system, where habits too play major role in development of the same, and to be more particular smoking has been indicated as one of the chief causes of respiratory diseases ranging from chronic obstructive pulmonary diseases<sup>1</sup> to bronchogenic carcinoma. Chronic Obstructive Pulmonary Diseases is a terminology for chronic bronchitis and emphysema. This is a disease that causes expiratory obstruction while breathing<sup>2</sup>.

This conglomeration of diseases has ravaged the civilization over years. Considerable effort is being put to understand it and contain. Lots of research work has been analyzed in this study, which in turn is also an effort in the same direction. It has been seen that patients who smoke over year develop chronic bronchitis, which otherwise known as "blue bloater's"<sup>3</sup> as they bluish due to CO<sub>2</sub> retention. These patients have thick chest<sup>2</sup>. They are identified on the basis of symptomatology also. That is chronic cough with expectoration for most of the days for three months in 2 consecutive years<sup>2</sup>.

On examination they may show cyanotic bluish tinge in mucous membranes chiefly, along with that, the auscultatory findings like harsh vesicular/broncho-vesicular breath sounds with

course crepitations can be heard<sup>2</sup>. These patients have expiratory obstruction which is why they have been included in this loose conglomeration of respiratory diseases with expiratory obstruction called chronic obstructive pulmonary diseases (COPD), which is also known as chronic obstructive airway diseases (COAD) and chronic obstructive lung diseases (COLD). Now coming to another entity belonging to above mentioned same conglomerate, is the emphysema. It has been observed that quite a good number of patients develop this because of smoking (mainly). So this study is one of the efforts put in the direction of establishing the causes of COPD. One of the entities that is also known as "pink puffer"<sup>3</sup>because it causes secondary polycythaemia owing to chronic hypercarbia. Patients with emphysema mostly develop hypoxia. The patient will be lean and thin, with pinkish complexion. Mostly they may not complain of cough but will be having breathlessness.

On examination they will be having barrel shaped chest, with chest expansion less than approximately 5cm<sup>2</sup>. Auscultatory findings include diminished intensity of breath sounds with prolonged expiration with or without added sounds. In fact a world body known as Global Initiative against Obstructive Lung Diseases

[GOLD] <sup>4</sup> has clearly laid down guidelines in terms of spirometry values. Importantly they have stressed upon FEV<sub>1</sub>/FVC% that is the ratio of the volume of air brought out forcefully in the first second during forced expiratory manoeuvre after taking full inspiration to the volume of air expired out forcefully and completely from the end of complete and full inspiration. FEV<sub>1</sub>/FVC% should be approximately less than 70% of the predicted value for a case to be diagnosed as chronic obstructive pulmonary disease where as FEV<sub>1</sub>% can be >80% of the predicted value or less. FEV<sub>1</sub>% is used for assessing the stages of severity of airway obstruction.

It has been observed that COPD cases develop acute exacerbation of breathlessness leading initially to type I respiratory failure that is with hypoxia which may lead to type II respiratory failure, which in turn is further accompanied by a newer component that is hypercarbia. In type I respiratory failure the patient is hypoxic with partial pressure of oxygen in arterial blood (PaO<sub>2</sub>) less than 60mmHg, where as hypoxia in general, means PaO<sub>2</sub><88mmHg<sup>2</sup>. Whereas hypercarbia which intervenes in a case with prolonged type I respiratory failure is designated as type II respiratory failure with a partial pressure of carbon dioxide in arterial blood (PaCO<sub>2</sub>) of more than 50mmHg<sup>2</sup>. Normal levels of PaO<sub>2</sub> and PaCO<sub>2</sub> 88-100 mmHg and 33-44mmHg respectively<sup>2</sup>. No doubt, we have stressed upon a lot on associated changes in pulmonary function testing (PET), leading to the diagnosis and there after staging of COPD<sup>4</sup>. Hence the aim of the present study was to find out the FEV<sub>1</sub> % and the ratio of FEV<sub>1</sub>/FVC % in chronic obstructive pulmonary disease conditions.

## 2. Materials and Methods:

Patients attending the outpatient departments of Kasturba Medical College Hospital, Attavar, Mangalore were recruited for the study after the informed and written consent from all the participants.

The Non smokers, Non-pulmonary diseases/disorders leading to pulmonary derangement, Age group <30 years (As

significant numbers of smokers also belong to teenage group, who must have smoking history of approximately one decade<sup>5</sup> for the COPD to manifest. So we have taken 30 years<sup>1</sup> of age as cut-off point. That is why, even if cases belonging to the above mentioned age group attends O.P.D for vague upper respiratory tract-related complaints, they have been subjected to Pulmonary function testing for identifying COPD also, given the history of smoking and Females were exclude from the study. For COPD cases, FEV<sub>1</sub>/FVC% >70% and Peak Expiratory Flow Rate (P.E.F.R) variability > 15% after bronchodilator inhalation were excluded. Male adult smokers diagnosed for COPD other than the above mentioned criteria and hundred non-smoking adult males as controls were included in the study. Routine pulmonary function testing was done on them by using Patrick Morgan's Benchmark computerized spirometry and there by FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC% was recorded.

**2.1 Statistical Analysis:** The data were expressed as percentage. Students't' test was used to find out the significance of difference using SPSS version 11. P values less than 0.05 was considered the level of significance.

## 3. Results:

The number of smokers with and without obstruction and their spirometry values are represented in Table-1. This shows that the obstruction in smokers were significantly high (p=0.0001) but their FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC% were significantly less (p=0.0001) in smokers with obstruction. Figure -1 represents the distribution of COPD cases among various age groups and was found that, it was high in the age group of 30-39 years. The distribution of % of COPD cases on the basis of severity of COPD was given in Fig-2. It was found that among the mild, moderate and severe groups, the percentage of severe COPD patients were high.

The distribution of % of COPD cases of different age groups in various stages of COPD was shown in Table-2 and Fig-3. This indicates that the highest percentage of COPD cases were belongs to the age group of 55 to 65 years.

**Table-1: Shows distribution of smokers developing COPD.**

Groups →	Normal	Obstructed	P Value
No. of Smokers	48	52	0.0001
FEV <sub>1</sub> %	81.89 ± 11.87	48.09 ± 20.85	0.0001
FEV <sub>1</sub> /FVC%	75.47 ± 7.79	52.05 ± 5.94	0.0001

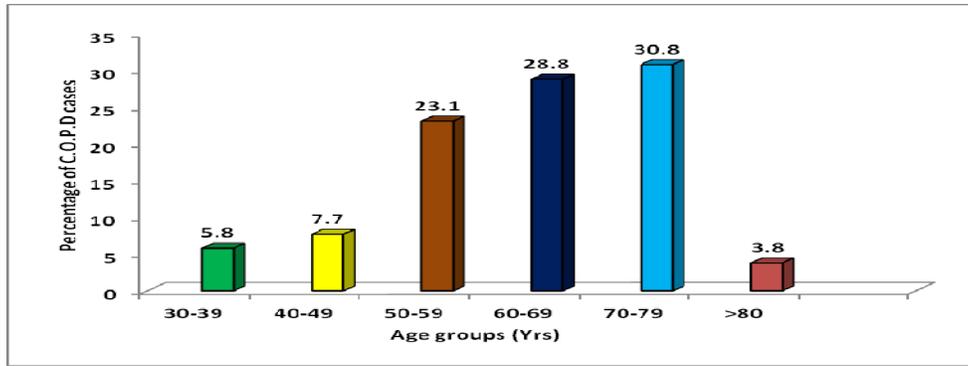


Fig-1: Distribution of % of COPD cases among various age groups

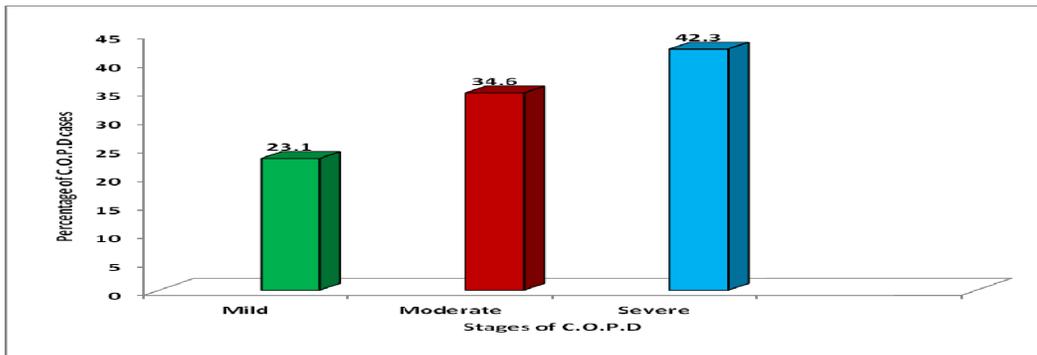


Fig-2: Distribution of % of COPD cases on the basis of severity of COPD.

Table-2: Distribution of % of COPD cases of different age groups in various stages of COPD.

Stages of COPD	% of COPD cases	Age groups (Yrs)
Mild	26.9	57.92 ± 13.59
Moderate	67.3	65.14 ± 11.10
Severe	5.8	71.67 ± 4.04

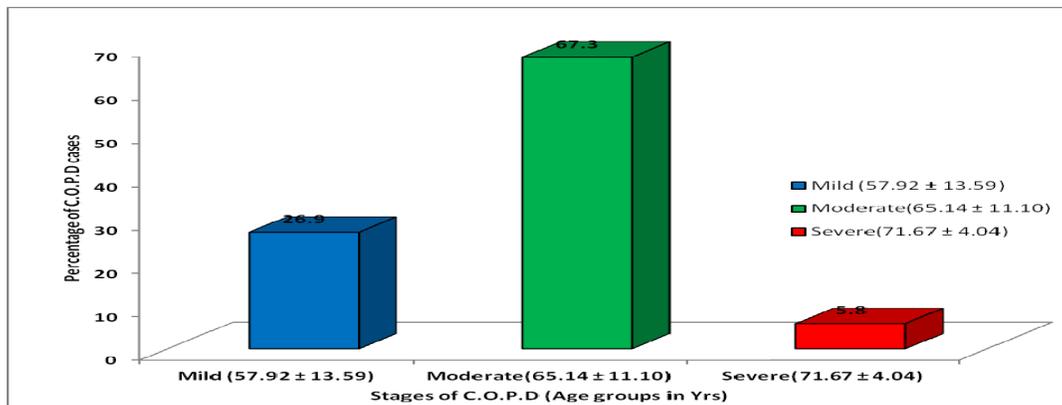


Fig-3: Distribution of % of COPD cases of different age groups in various stages of COPD.

**4. Discussion:**

Hundred smokers who have attended OPD in Kasturba Medical College Hospital, Attavar, Mangalore were recruited for the study. All were subjected to pulmonary function testing which

includes FEV<sub>1</sub>%, FEV<sub>1</sub>/FVC% and Peak expiratory Flow Rate (PEFR) variability to bronchodilators<sup>6</sup>. In the present study, maximum number of COPD cases was between 70-79 years of age groups, but least number of COPD cases

was observed in the age group of 80 years and above. The trends seen in table 4 are in accordance with the trends observed in results of the study conducted by K. J Mobb's et al<sup>7</sup>. This trend is due to a host of factors like, chronicity<sup>8</sup> of the diseases, prolonged use of steroids<sup>9</sup>, disinterest in taking prompt treatment<sup>10</sup> and survivability chances<sup>11</sup> (which is lowest in the age group of 80 years and above, when compared to other age groups), but, the % of distribution of COPD cases in 30-39 years of age group was relatively less, as the exposure duration to smoke was relatively least along with the chronicity of the disease, even though, they had the maximum survivability chances compared to the other age groups.

The COPD cases distributed in on the basis of severity of COPD were found to be, 23.1% and 34.6% in mild and moderate stages respectively. Whereas, 42.3% cases of COPD were in severe stage of COPD. This again is in conjunction with the results arrived at by the same authors<sup>12</sup>. This can be explained on the lines of chronic uncontrolled sub minimal infection<sup>13</sup> which affects most of the of COPD cases on steroid therapy<sup>14</sup> leading to fast progression of the disease process into later stages from mild stage. Not only that, there is relatively least number of COPD cases in mild of COPD stage, because of relatively lesser duration of exposure to smoke and relatively milder complains.

Our result has shown a rise in % of COPD cases as the age and the severity of the disease increases, and this in turn is in perfect tune with the findings of Joan. B. Soriano et al<sup>15</sup>, including the fact that the distribution of % of COPD cases in last age group is least because of least survivability chances.

### 5. Conclusion:

FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC% have a definite role in defining various stages of COPD because of the fact that, there is a good amount of difference in the distribution of COPD cases for different ranges of FEV<sub>1</sub>% and FEV<sub>1</sub>/FVC%, which can explain other associated findings comfortably. Therefore it is an automatic choice for identifying and there by classifying various stages of COPD.

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