



## STUDY OF CORRELATION OF SPIROMETRY WITH SYMPTOMS OF PATIENTS WITH COPD

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### ABSTRACT:

**Aims & Objective:** To study and correlate the clinical symptoms with spirometry abnormalities in COPD patients.

**Methodology:** This study was carried out in 175 patients who presented with symptoms of COPD. In all patients PFT, CHEST X-RAY, ECG, 2D-Echo were done. Additional investigations required for further diagnosis and management were also done.

**Results:** Out of 175 patients of COPD, mean age of patient was  $58.73 \pm 8.68$  years with male preponderance of 5.73:1. Mean FEV1 was  $45.32 \pm 12.56\%$  of predicted, range 17 to 77 % of predicted. Maximum number of patients (52%) had severe airflow obstruction at the time of presentation and only (10.28%) had very severe airflow obstruction. Mean FEV1/FVC% was  $49.67 \pm 12.51\%$  of predicted, range 22 to 70 % of predicted. The majority cases 26.28% had FEV1/FVC ratio in  $< 40\%$  followed by 25.71% had FEV1/FVC between 41- 50%. Marked ECG changes are there with severity of the disease stage having prevalence of 65.71% with P pulmonale. The prevalence of 2D ECHO findings increases with the severity of the disease stage with findings of PAH 53.19% patients.

**Conclusion:** Computerized spirometry is very much a useful investigation in the management of chronic obstructive pulmonary disease. FEV1 values can be used as diagnostic, as well as to assess the severity of the disease. Now that in upcoming era HRCT is also being used for grading the severity of the disease.

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**INTRODUCTION:**

Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. Many people suffer from this disease for years and die prematurely from it or its complications. COPD is the fourth leading cause of death in the world and further increases in its prevalence and mortality can be predicted in the coming decades.<sup>1</sup>

In the definition of COPD, the phrase—preventable and treatable has been incorporated following the ATS/ERS recommendations to recognize the need to present a positive outlook for patients, to encourage the health care community to take a more active role in developing programs for COPD prevention and to stimulate effective management programs to treat those with the disease.<sup>1,2</sup>

The chronic airflow limitation characteristic of COPD is caused by a mixture of small airway disease (obstructive bronchiolitis) and parenchymal destruction (emphysema), the relative contributions of which vary from person to person.<sup>1</sup> COPD has a variable natural history and not all individuals follow the same course.<sup>3</sup> However, COPD is generally a progressive disease, especially if a patient's exposure to noxious agents continues.<sup>1</sup> The impact of COPD on an individual patient depends on the severity of symptoms (especially breathlessness and decreased exercise capacity) systemic effects, and any comorbidities the patient may have not just on the degree of airflow limitation.

Worldwide, cigarette smoking is the most commonly encountered risk factor for COPD, although in many countries, air pollution resulting from the burning of wood and other biomass fuels has also been identified as a COPD risk factor.<sup>1</sup>

The prevalence of COPD reported in different population based studies from India is highly variable.<sup>3</sup> The prevalence rates in male subjects of 2.12% to 9.4% in studies reported from North are generally higher than 1.4% to 4.08% reported from South India. The respective ranges for female subjects vary from 1.33% to 4.9% from North and from 2.55% to 2.7% from South India. For epidemiological assessment, the rounded-off median prevalence rates were assessed as 5 percent for male and 2.7 percent for female subjects of over 30 years of age. The disease is distinctly more common in males. The male to female ratio had varied from 1.32:1 to 2.6:1 in different studies with a median ratio of 1.6:1.<sup>7</sup>

Spirometry provides quick assessment of expiratory functions that correlate with FEV1 & also enable us to differentiate between restrictive, obstructive & proximal air way disease<sup>5</sup>. The

combination of Pulse oximetry & Spirometry give valuable information about patient's status. Long standing COPD disease can lead to exertional & nocturnal hypoxemia. Frequent Hypoxic episodes & nocturnal hypoxemia leads to the development of secondary polycythemia & its consequences.<sup>4</sup>

**METHODOLOGY:**

This study was an hospital based descriptive cross-sectional study. It was done at Dhiraj Hospital which is a teaching hospital attached to SBKS MI & RC, Sumandeep Vidyapeeth, Piparia. The hospital has 1360 beds with a high-dependency unit and an emergency department open 24 hrs. a day. The outpatient department of medicine reviews approximately 500-600 patients per day, 6 days per week; the hospital has state of art ICU having 20 beds. It was done between December 2022 to November 2023. All 175 adults who presented with symptoms of COPD fulfilling inclusion criteria admitted in hospital and presented as outdoor patients were included in the study. Following inclusion and exclusion criteria were consider for this study.

**4.A. Inclusion criteria:**

Consenting adult patients with

- 1) Symptoms suggestive of chronic bronchitis i.e. history of cough with expectoration of at least 3 months duration in 2 consecutive years.
- 2) Findings of COPD on physical examination and/or radiographic investigation and/or in PFT in patients with above symptoms
- 3) As per definition of GOLD criteria

**4.B. Exclusion criteria:**

- 1) Patients less than 18 years age.
- 2) Patients with pregnancy
- 3) Having history of Bronchial asthma,
- 4) Pulmonary tuberculosis,
- 5) Bronchiectasis,
- 6) Known congenital or acquired heart diseases,
- 7) Diabetes mellitus
- 8) Hypertension,
- 9) Thyroid disease,
- 10) Pneumoconiosis
- 11) Critically ill patients admitted in ICU
- 12) Patients not able to perform the test
- 13) Post bronchodilation reversibility no significant improvement
- 14) LV dysfunction

**4.C. Data collection:**

The patients attending to medicine OPD and admitted as known case of COPD in Dhiraj Hospital were screened for eligibility. Informed consent was taken from the eligible patients and

enrolled in the present study. The patients were interviewed and underwent thorough physical examination. Their Data comprising of name, age, sex, personal, occupational and proper history was recorded on the proforma.

**4.D. History and examination**

A detailed history was elicited from all patients with emphasis on symptomatology of COPD

- 1) Detailed History.
- 2) Smoking History.
  - i) Age at which smoking was started.
  - ii) Pack – years was calculated by formula.  
 No. of Cigarettes smoked / day  
 Pack Year =-----x No. of years of smoking
- 3) General examination and examination of Respiratory system and other systems.
- 4) Examination specifically for signs of right heart failure like raised JVP, congestive hepatomegaly and pedal edema.
- 5) Conventional 12 lead Electro-cardiography was taken for ECG changes of COPD and Right Heart failure.
- 6) X-ray chest PA view
- 7) Spirometry: Spirometry was performed when the patient was clinically stable. Spirometry as a method of pulmonary function tests, was carried out in 175 cases suffering from COPD. After explanation all patients were cooperative

in performing the spirometer examination.

In this study electronic clinical spirometer was used for measuring FEV1, FVC, and FEV1/FVC ratio.

**4.E. Procedure of spirometry:**

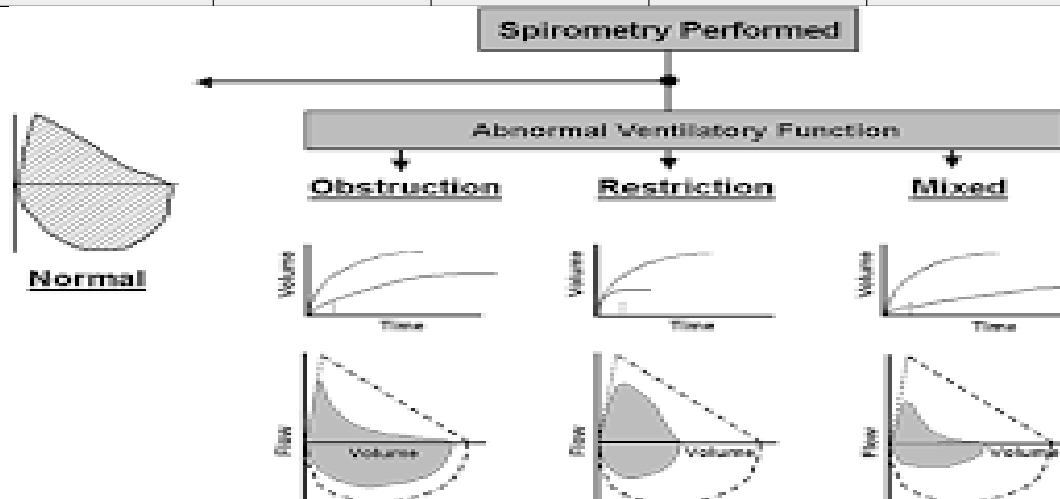
Each patient was asked to inhale through mouth and nose without hurry until lungs were filled completely with air. After that patient was asked to blow into the mouth piece with lips tightly fitted around it, until maximum expiration was completed. As air passed into the mouthpiece, it began to rotate the turbine inside it. whose speed and number of rotations were calibrated inside the instrument to directly give the values of FEV1 and FVC and PEFR.

In obstructive airway disease forced vital capacity decreases or remains normal so that the ratio of FEV1/FVC is less than 80%. There is parallel reduction of FEV1 and FVC in restrictive lung disease with ratio of FEV1 to FVC greater than 80%.

All the patients were interviewed with proper interview sheet, which was designed especially for this study and was filled by the author. Data was analysed using the student t-test, percentages, mean values in SPSS Software 22.0 version.

**4.E. Interpretation of spirometry:**

	Normal	Obstruction	Restriction	Mixed/combined
FEV <sub>1</sub>	>80% predicted	> or <80% predicted	<80% predicted	<80% predicted
FVC	>80% predicted	>80% predicted	<80% predicted	<80% predicted
FEV <sub>1</sub> /FVC or FEV <sub>1</sub> /VC (depending on which is higher, FVC or VC)	>70%	<70%	>70%	<70%



**RESULTS:****1. AGE WISE DISTRIBUTION**

Age (in years)	No of patients (n=175)
≤50	21 (12%)
51-60	56 (32%)
61-70	78 (44.51%)
> 70	20 (11.43%)
<b>Total</b>	<b>175 (100%)</b>
<b>Mean Age</b>	<b>58.73 ± 8.68</b>

In this study, no patient was of less than 40 years. The mean age was 58.73 ± 8.68 years, range 41-75 years. Maximum incidence of COPD in this study was among the age group older patients from > 60 years (56%).

**2. GENDER WISE DISTRIBUTION**

Gender	No of patients (n=175)
Male	149 (85.14%)
Female	26 (14.85%)
<b>Total</b>	<b>175 (100%)</b>

In the present study, 85.14% of the patients were males and 14.85% were females. The male: female ratio was 5.73:1.

**3. HISTORY OF SMOKING HABBIT IN COPD**

History of smoking habit	No of patients(n=175)
Smokers	144 (82.28%)
Non-Smokers	31 (17.71%)
<b>Total</b>	<b>175 (100%)</b>

In our study, majority 144 (82.28%) had history of smoking at the present in contrast none of female were smokers. All female patients' exposure to smoke of burnt fuels.

**4. DURATION OF PACK YEARS WISE DISTRIBUTION**

Duration of pack years	No of patients(n=175)
Nil	31 (17.71%)
<10 Years	12 (6.85%)
10-19 Years	82 (46.85%)
≥ 20 Years	50 (28.57%)
<b>Total</b>	<b>380 (100%)</b>
<b>Mean Age</b>	<b>16.44 ± 8.02</b>

In our study, majority 82 (46.85%) had history of smoking exposure of at least 10-19 pack years. Mean duration was 16.44 pack years. 12 (6.85%) patients had less than 10 pack year of smoking exposure. 31(17.71%) patients were non-smokers.

**5. SYMPTOMS WISE DISTRIBUTION**

Symptoms	No of patients (n=175)
Breathlessness	175 (100%)
Cough with Expectoration	168 (96%)
Swelling in legs	77 (44%)
Fever	33 (18.85%)

As per the table, acidosis was found in total 8 patients of sickle cell disease whereas only 3 patient of sickle cell trait had acidosis. pH was normal in 24 patients of sickle cell disease and 13 patient of sickle cell trait. Alkalosis was found in 45 patients of sickle cell disease and 17 patients of sickle cell trait.

**6. PHYSICAL EXAMINATIONS WISE DISTRIBUTION**

Physical examinations	No of patients (n=175)
Tachypnea	127 (72.57%)
Barrel Shaped chest	101 (57.71%)
Pedal Edema	74 (42.28%)
Loud P2	72 (41.14%)
Parasternal leave	66 (37.71%)
Cyanosis	60 (34.28%)
Clubbing	57 (32.57%)
Wheeze	45 (25.71%)

Above table and Figure shows that the most common sign at presentation was tachypnea with numbers of 127 patients (72.57%) followed by Barrel Shaped chest with numbers of 101 patients (57.71%). Least common sign was wheeze with numbers of 45 patients (25.71%).

**7. CHEST X-RAY WISE DISTRIBUTION**

Chest X-ray	No of patients (n=175)
Emphysema	145 (82.85%)
Bronco vascular marking	113 (64.57%)
Prominent right descending pulmonary artery	52 (29.71%)
Cardiomegaly	31 (17.71%)

In the present study, commonest x-ray finding was Emphysema 145 (82.85%) followed by Increased bronchovascular markings 113 (64.57%) and least common finding was Cardiomegaly 31 (17.71%).

**8. SEVERITY OF COPD DISEASE**

GOLD Stage	No of Patients
Stage –I (Mild- FEV <sub>1</sub> >80%)	-
Stage –II (Moderate - FEV <sub>1</sub> -50-80%)	66 (37.71%)
Stage –III (Severe - FEV <sub>1</sub> -30-50%)	91 (52%)
Stage –IV (Very Severe - FEV <sub>1</sub> <30%)	18 (10.28%)
<b>Total</b>	<b>175 (100%)</b>

In the present study, PFT Shows that all patients had FEV<sub>1</sub>/FVC was < 80%. Mean FEV<sub>1</sub> was 45.32 ± 12.56% of predicted, range 17 to 77 % of predicted. Maximum number of patients 91 (52%) had severe airflow obstruction at the time of presentation and only 18 (10.28%) had very severe airflow obstruction.

**9. FEV<sub>1</sub>/FVC RATIO IN PATIENTS OF COPD**

FEV <sub>1</sub> /FVC Ratio	No of Patients
<40%	46 (26.28%)
41%-50 %	45 (25.71%)
51%-60%	43 (24.57%)
61%-70%	41 (23.42%)
>70%	0
<b>Total</b>	<b>175 (100%)</b>

All patients had FEV<sub>1</sub>/FVC < 70%. Out of 175 patients, 46 patients (26.28%) had FEV<sub>1</sub>/FVC <40%, 45 patients (25.71%) had FEV<sub>1</sub>/FVC between 41-50%, 43 patients (24.57%) had FEV<sub>1</sub>/FVC between 51-60% and 41 patients (23.42%) had FEV<sub>1</sub>/FVC between 61- 70%. Mean FEV<sub>1</sub>/FVC% was 49.67 ± 12.51% of predicted, range 22 to 70 % of predicted.

**10. AGE WISE GOLD STAGING OF COPD PATIENTS**

AGE	Mild(n=0)	Moderate(n=66)	Severe(n=91)	Very Severe(n=18)
<50(n=21)	0	7(10.61%)	11(12.09%)	3(16.67%)
51-60(n=56)	0	22(33.33%)	30(32.97%)	4(22.22%)
61-70(n=78)	0	31(46.97%)	38(41.76%)	9(50%)
>70(n=20)	0	6(9.09%)	12(13.18%)	2(11.11%)

In the present study, PFT shows that maximum number of patients from moderate , severe and very severe stage were in age group of 61 to 70 years. Minimum number of patients in all severity group was of more than 70 years.

**11. GENDER WISE GOLD STAGING OF COPD PATIENTS**

Gender	Mild	Moderate(n=66)	Severe(n=91)	Very severe(n=18)
Male(n=149)	0	57(86.36%)	75(82.42%)	17(94.44%)
Female(n=26)	0	9(13.64%)	16(17.58%)	1(5.56%)

In present study in all stages of severity males are predominant with in moderate stage males being 86.36% , severe stage male being 82.42% and in very severe stage males being 94.44% .

**12. SMOKING HABIT WISE GOLD STAGING OF COPD PATIENTS**

Smoking habit	Mild(n=0)	Moderate(n=66)	Severe(n=91)	Very severe(n=18)
Smokers(n=144)	0	55(38.19%)	72(50%)	17(11.81%)
Non-smokers(n=31)	0	11(35.48%)	19(61.30%)	1(3.22%)

In present study, maximum smokers (50%) and non-smokers (61.30%) were under severe stage of COPD.

**13. SYMPTOMS WISE GOLD STAGING IN COPD PATIENTS**

GOLD staging	Breathlessness (n=175)	Cough expectoration (n=168)	with Swelling legs(n=77)	in Fever(n=33)
Mild(n=0)	0	0	0	0
Moderate(n=66)	66(100%)	63(95.45%)	23(34.85%)	12(18.18%)
Severe(n=91)	91(100%)	87(95.61%)	46(50.55%)	20(36.26%)
Very severe(n=18)	18(100%)	18(100%)	5(27.78%)	1(5.56%)

In present study the most common symptom being breathlessness in all the stages of severity as the severity increases symptoms of cough with expectoration and swelling in leg also increases with the fever being the least common symptom.

**14.2D ECHOCARDIOGRAPHIC FINDINGS ACCORDING TO SEVERITY OF COPD**

2D ECHO findings	Mild(n=0)	Moderate (n=66)	Severe(n=91)	Very severe. (n=18)
PAH(n=93)	0	15(22.73%)	60(66.67%)	18(100%)
Functional TR(n=93)	0	15(22.73%)	60(66.67%)	18(100%)
RV Dilation(n=93)	0	15(22.73%)	60(66.67%)	18(100%)

In moderate COPD group, 15 patients (22.73%) had PAH, functional TR, and RV dilatation. In severe COPD group, 60 patients (66.67%) had PAH, functional TR, and RV dilatation. In very severe COPD group, 18 patients (100%) had PAH, functional TR, and RV dilatation. As the severity of COPD increases, the prevalence of cardiac dysfunction on 2D Echo also increases.



**15. ELECTROCARDIOGRAPHIC FINDINGS ACCORDING TO SEVERITY OF COPD**

ECG	Moderate(n=66)	Severe(n=91)	Very severe(n=18)
P- pulmonale(n=115)	33(50%)	64(70%)	18(100%)
RVH(n=108)	30(45.46%)	60(65.93%)	18(100%)
RAD(n=108)	30(45.46%)	60(65.93%)	18(100%)

In moderate COPD group, 33 patients (50%) had P pulmonale. 30 patients (45.46%) had RAD and RVH. In severe COPD group, 64 patients (70%) had P pulmonale. 60 patients (65.93%) had RAD and RVH. In very severe COPD group, 18 patients (100%) had P pulmonale and RVH and RAD. As the severity of COPD increases, with development of cor pulmonale ECG changes become significant.

**OBSERVATIONS:**

Chronic obstructive pulmonary disease is one of the leading causes of chronic morbidity and mortality world wide.

**1. AGE WISE DISTRIBUTION**

Study name	Mean Age years
Khillare KV et al <sup>6</sup>	62.17 ± 10.76
Dhadke VN et al <sup>7</sup>	62.19 ± 9
Parasuramalu BG et al <sup>8</sup>	47.39 ± 10.28
Sinha T et al <sup>9</sup>	57.13 ± 11.14
Present study	58.73 ± 8.68

The maximum numbers of COPD patients in the present study were in 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> decades (88.17%) with the mean age 58.73 ± 8.68 years. This observation is comparable to previous studies in above table. Possible explanation is longer duration of tobacco exposure and repeated respiratory tract infections, which would have compromised their quality of life in this age group.

**2. GENDER WISE DISTRIBUTION**

Study name	Male patients %	Females patients %
Jain MK et al <sup>10</sup>	64%	36%
Kane S et al <sup>11</sup>	72%	28%
Gudagunti AK et al <sup>12</sup>	71%	29%
Dhadke VN et al <sup>7</sup>	80%	20%
Khillare KV et al <sup>6</sup>	92%	8%
Present study	85.14%	14.85%

In the present study, 85.14% of the patients were males and 14.85% were females. The male: female ratio was 5.73:1. Males: Females ratio of present study is comparable with other studies. This higher incidence of COPD in males can be attributed to smoking. In our study none of the females were smokers but all of them had history of cooking with dried cow dung or dried wood fuel.

**3. HISTORY OF SMOKING**

Study name	Smoker %	Non Smoker %
Kamdar DJ et al <sup>13</sup>	74%	26%
Gudagunti AK et al <sup>12</sup>	64%	34%
Dhadke VN et al <sup>7</sup>	75%	25%
Khillare KV et al <sup>6</sup>	85%	15%
Present study	82.28%	17.71%

There were 82.28% patients of the COPD who were smokers at the time of the study and 17.71% patients of the COPD who were not smokers. Thus, it has been found out that the smokers were more compared to the non-smokers with other studies which were described in above table.

**4. DURATION OF PACK YEARS**

In our study, no females' patients (n=26) had history of smoking with 5 patients of male. From remaining 144

male patients, majority (46.85%) had history of smoking exposure of at least 10-19 pack years. Mean duration was 16.44 pack years. 6.85% patients had less than 10 pack year of smoking exposure. According to BTS guidelines most patients with COPD have at least in 20 pack years of smoking history. **Parasuramalu BG et al<sup>8</sup>** also have mean of 25.06 pack years and 28.79 pack years of smoking history was found.

## 5. SYMPTOMS

Symptoms	Kane S et al <sup>11</sup>	Sinha T et al <sup>9</sup>	Kamdar DJ et al <sup>13</sup>	Presentstudy
Breathlessness	76%	100%	100%	100%
Cough with Expectoration	68%	74.66%	88%	96%
Swelling in Legs	32%	17.33%	-	44%
Fever	-	-	30%	18.85%
Reduced urine output	-	-	-	4.75%

All patients (100%) had history of breathlessness at presentation was followed by cough with Expectoration (95.79%). Least common symptom was reduced urine output (3.95%). Comparison with other studies shows above table have observed that Breathlessness that commonly causes patient to seek medical attention, is usually the most disabling symptom.

## 6. PHYSICAL SIGN FINDING

Sign	Gudagunti AK et al <sup>12</sup>	Jain MK et al <sup>10</sup>	DhadkeVN et al <sup>7</sup>	Presentstudy
Tachypnea	-	-	-	72.57%
Barrel Shaped chest	-	18%	40%	57.71%
Pedal Edema	18%	-	20%	42.28%
Loud P2	-	26%	30%	41.14%
Parasternal heave	-	24%	-	37.71%
Cyanosis	1%	-	2%	34.28%
Clubbing	11%	-	2%	32.57%
Wheeze	-	28%	70%	25.71%

In the present study, the most common sign at presentation was tachypnea, (70%) followed by Barrel Shaped chest (58%). **Gudagunti AK et al<sup>12</sup>**, **Jain MK et al<sup>10</sup>** and **VN Dhadke et al<sup>7</sup>** also show comparable results with present study.

## 7. CHEST X-RAY FINDING

X- ray Finding	DhadkeVN et al <sup>7</sup>	Suma KR et al <sup>14</sup>	Presentstudy
Emphysema	36%	80%	82.85%
Increased bronchovascular markings	39%	64%	64.57%
Cardiomegaly	30%	20%	29.71%
Prominent right descending pulmonary artery	30%	-	17.71%

In the present study, commonest x-ray finding was Emphysema (82.85%) followed by increased bronchovascular markings (64.57%) and least common finding was Cardiomegaly (29.71%). The present study results were comparable with **Dhadke VN et al<sup>7</sup>** and **Suma KR et al<sup>14</sup>**.



## 8. SPIROMETRY OF COPD DISEASE

GOLD Stage	Dhadke VN et al <sup>7</sup>	Kamdar DJ et al <sup>13</sup>	Bajpai J et al <sup>15</sup>	Presentstudy
Stage –I (Mild- FEV <sub>1</sub> >80%)	15%	4%	10%	-
Stage –II (Moderate - FEV <sub>1</sub> -50-80%)	37%	22%	29.44%	37.71%
Stage –III (Severe - FEV <sub>1</sub> -30-50%)	28%	44%	35.27%	52%
Stage –IV (Very Severe - FEV <sub>1</sub> <30%)	20%	34%	25.27%	10.28%

In the present study PFT Shows that all patients had FEV<sub>1</sub>/FVC was < 80%. Mean FEV<sub>1</sub> was 42.57 ± 13.72% of predicted, range 17 to 79% of predicted. Maximum number of patients (54.21%) had severe airflow obstruction at the time of presentation and only 11.31% had mild disease. According to Gold criteria, patients usually experience worsening breathlessness when the patient has FEV<sub>1</sub> < 50% of predicted. Thus, they tend to seek medical attention during this stage, accounting for the majority of patients who have severe obstructive defect. Bajpai J et al<sup>15</sup> and Kamdar DJ et al<sup>13</sup> also shows comparable result with present study while in contrast with Dhadke VN et al<sup>7</sup>.

FEV <sub>1</sub> /FVC Ratio	Khillare KV et al <sup>6</sup>	Present study
<40%	30%	46 (26.28%)
41%-50 %	20%	45 (25.71%)
51%-60%	22%	43 (24.57%)
61%-70%	28%	41 (23.42%)
Total		175 (100%)

In the present study, Mean FEV<sub>1</sub>/FVC% was 49.67 ± 12.51% of predicted, range 22 to 70 % of predicted. The majority cases 26.28% had FEV<sub>1</sub>/FVC ratio in < 40% followed by (25.71%) had FEV<sub>1</sub>/FVC between 41-50%. Similar study, Khillare KV et al<sup>6</sup> found Average FEV<sub>1</sub>/FVC were 49.3 ± 14.59, ranged from 19 to 70. The majority cases 30% had FEV<sub>1</sub>/FVC ratio in <40%, followed by 28% in 61-70% as shown in above table.

## 9. ECG CHANGES IN PATIENTS WITH DIFFERENT COPD SEVERITY GROUPS

- In present study, ECG changes were present in 115 patients 65.71% of the COPD patients. Out of 175 patients, P pulmonale was present in 115 (65.71%) patients, right ventricular hypertrophy was present in 108 (61.71%) patients, right axis deviation was present in 108 (61.71%) patients.
- In a study done by Agarwal et al. (2008)<sup>16</sup> ECG changes were present in 35.7% and P pulmonale was present in 35.7% patients of COPD.
- In a study by Chappell (1966)<sup>17</sup>, P pulmonale was found in 10% of COPD patients and right ventricular hypertrophy in 10%.
- Ursa Bones et al. (2011)<sup>18</sup> found right ventricular hypertrophy in 17% patients, right axis deviation.

## 10.2D ECHOCARDIOGRAPHY IN PATIENTS OF COPD WITH DIFFERENT SEVERITY GROUPS

GOLD stage	Gupta et al <sup>19</sup> (2011)	Thabut et al. <sup>20</sup> (2005)	Highamet al. <sup>21</sup> (2001)	Adil Shujaat et al. (2007)	Presentstudy
Mild	16.67%	-	-	-	0 %
Moderate	54.55%	-	-	-	22.73%
Severe	60%	-	-	-	66.67%
Very severe	83.33%	-	-	-	100%
Prevalence	42.5%	50.2%	55%	20.95%	53.19%

- In present study, out of 175 patients of COPD, 93 patients (53.14%) had pulmonary hypertension,

functional tricuspid regurgitation and right ventricular dilatation i.e Cor Pulmonale.

- The presence of pulmonary hypertension, functional tricuspid regurgitation and right ventricular dilatation in mild, moderate, severe, and very severe COPD was 0%, 22.73%, 66.67%, 100% respectively.
- Chi-square test was applied and the p value was  $< 0.0001$  indicating statistically significant correlation between severity of COPD (which is based on spirometry evaluation of FEV1 and FVC based on GOLD criteria for COPD severity) and presence of pulmonary hypertension and right ventricular enlargement on 2D Echocardiography and color Doppler study.
- According to Gupta et al. (2011)<sup>19</sup> pulmonary hypertension was observed in 42.5% of COPD patients in their study. PAH in mild, moderate, severe, and very severe COPD was present in 16.67%, 54.55%, 60%, 83.33%, respectively thus indicating good correlation between the frequency of PH and severity of COPD.
- In a study by Thabut et al. (2005)<sup>20</sup> pulmonary hypertension was present in 50.2% of COPD patients.
- In a study by Highamet et al. (2001)<sup>21</sup> pulmonary hypertension was present in 55% of COPD patients and pulmonary hypertension correlated with FEV1.
- According to Adil Shujaat et al. (2007) the reported prevalence of pulmonary hypertension and cor pulmonale varies considerably from 20%–91%.
- Thus, present study correlates with above mentioned studies.

### SUMMARY:

175 patients of COPD were studied clinically, by chest X-ray, spirometry, electrocardiography and echocardiography.

- Mean age of patient was  $58.73 \pm 8.68$  years with male preponderance of 5.73:1.
- 82.28% had history of smoking at the present in contrast none of female with smoking. They had history of cooking with dried cow dung or dried wood fuel.
- Most of the patients (46.85%) had a smoking history of 10-19 packyears with mean duration of 16.44 pack years.
- Commonest symptoms on presentation was Breathlessness (100%) and cough with expectoration (96%).
- Commonest signs of physical examination were Tachypnea (72.57%) followed by Barrel shaped chest (57.71%) and Pedal Edema (42.28%).
- Evidence of emphysema was commonest (82.85%) followed by chronic bronchitis (64.57%) on x-ray chest.
- Mean FEV1 was  $45.32 \pm 12.56\%$  of predicted, range 17 to 77 % of predicted. Maximum number of patients (52%) had severe airflow obstruction at the time of presentation and only (10.28%) had very severe airflow obstruction.
- Mean FEV1/FVC% was  $49.67 \pm 12.51\%$  of predicted, range 22 to 70 % of predicted. The majority cases 26.28% had FEV1/FVC ratio in  $< 40\%$  followed by 25.71% had FEV1/FVC between 41- 50%.
- In present study the most common symptom being breathlessness in all the stages of severity as the severity increases symptoms of cough with expectoration and swelling in leg also increases with the fever being the least common symptom.
- Marked ECG changes are there with severity of the disease stage having prevalence of 65.71% with P pulmonale.
- The prevalence of 2D ECHO findings increases with the severity of the disease stage with findings of PAH 53.19% patients.

### CONCLUSION:

Etiologies like exposure to indoor, outdoor smoke, environmental factors etc. are also equally common and important risk factors which should be taken care of, although smoking is commonest etiology of COPD, Computerized spirometry is very much a useful investigation in the management of chronic obstructive pulmonary disease. FEV1 values can be used as diagnostic, as well as to assess the severity of the disease. Further severity of the disease can be offered by the imaging modalities like the 2D ECHO. Severity of Chronic Obstructive Pulmonary Diseases has direct relation with incidence of ECG changes in Chronic Obstructive Pulmonary Diseases. Clinical signs of right heart failure in Chronic Obstructive Pulmonary Diseases were effective in screening the patients for cor-pulmonale. Now that in upcoming era HRCT is also being used for grading the severity of the disease.

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