Assessment of Severity of Pulmonary Hypertension in Copd Patients with 2d Echo as a Diagnostic Tool

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ABSTRACT:
Chronic obstructive pulmonary disease (COPD), a common preventable and treatable disease, is characterized by persistent airflow limitation that is usually progressive and associated with enhanced chronic inflammatory response in the airways and lung to noxious particles or gases.Cigarette smoking is a well known risk factor for COPD.Impaired endothelial function as a result of endothelial injury by cigarette smoke products and decreased endothelial expression of nitric oxide, prostacyclin synthase are being proposed as the initial mechanism in the natural pathway of pulmonary hypertension in COPD[12]. Measuring pulmonary artery pressure by right heart catheterization has been the gold standard technique. Due to invasive nature of the procedure and associated complications, it is not routinely performed.The estimate of pulmonary artery pressure by echocardiography has been shown to have goodcorrelation to that of invasive measurement. Echocardiography provides a rapid, noninvasive, portable, and accurate method to evaluate the cardiac changes secondary to severe COPD.

I.   INTRODUCTION:
Chronic obstructive pulmonary disease (COPD), a common preventable and treatable disease, is characterised by persistent airflow limitation that is usually progressive and associated with enhanced chronic inflammatory response in the airways and lung to noxious particles or gases. Exacerbations and comorbidities contribute to overall severity in individual Patients. Emphysema, a pathological term often used incorrectly to describe COPD. It specifies one of the structural abnormality(alveolar wall destruction) occurring in COPD and does not emphasis on the changes occurring in airways and pulmonary vasculature. Chronic bronchitis is a clinical diagnosis described as production of sputum for minimum of three months in 2 successive years. The airflow limitation may follow or precede it, so spirometry can be normal.

II.   AIMS AND OBJECTIVES:
1. To assess the cardiovascular changes secondary to COPD by echocardiography.
2. To evaluate pulmonary hypertension secondary to COPD severity as per GOLD guidelines by echocardiography

III.   MATERIALS AND METHODOLOGY
Type of study - Prospective cross sectional study
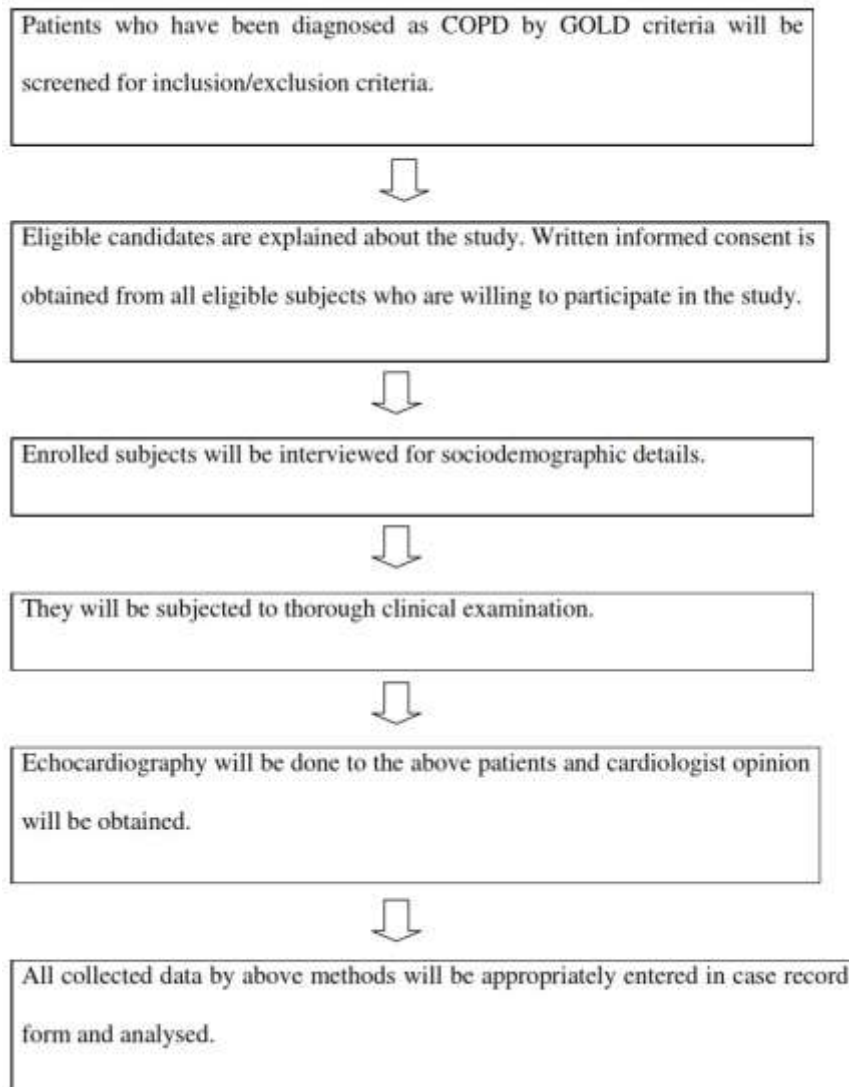Place - Kanachur institute of medical sciences, MANGALORE
Duration - Over a period of 4 months (May 2023 - August 2023)
Sample Size - 40 COPD patients
Selection Criteria - Patients diagnosed with COPD by GOLD criteria who neither has other lung disease which alters spirometry nor has primary cardiac disease

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FLOW DIAGRAM OF STUDY DESIGN:

Patients who have been diagnosed as COPD by GOLD criteria will be screened for inclusion/exclusion criteria.

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Eligible candidates are explained about the study. Written informed consent is obtained from all eligible subjects who are willing to participate in the study.

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Enrolled subjects will be interviewed for sociodemographic details.

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They will be subjected to thorough clinical examination.

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Echocardiography will be done to the above patients and cardiologist opinion will be obtained.

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All collected data by above methods will be appropriately entered in case record form and analysed.

INCLUSION CRITERIA:
➢ Age of onset of disease >40 years.
➢ Patients with symptoms suggestive of COPD.
➢ Diagnosis of COPD based on GOLD criteria.
➢ Willing to participate in the study

EXCLUSION CRITERIA:
➢ History suggestive of asthma.
➢ Other lung diseases that significantly contribute to decline in lung function.
➢ Patients with clinically evident active pulmonary tuberculosis.
➢ Patients with primary cardiac disease.
➢ Patients who have poor echo window.
➢ Ongoing or recent exacerbation of COPD within 2 weeks prior to the enrolment in the study.
➢ Coexisting conditions that are contraindications or render forced expiratory maneuver difficult to perform.

PATIENTS WITH COPD CLASSIFIED BASED ON GOLD CRITERIA.

Six Minute Walk Test was done according to American Thoracic Society(ATS) recommendations. Echocardiography was done according to the guidelines by American Society of Echocardiography followed by cardiologist opinion was obtained. Statistical analysis was carried out using SPSS version.17 software. Confidence interval – 95% (p – 0.05). After initial analysis significant variables were considered for logistic
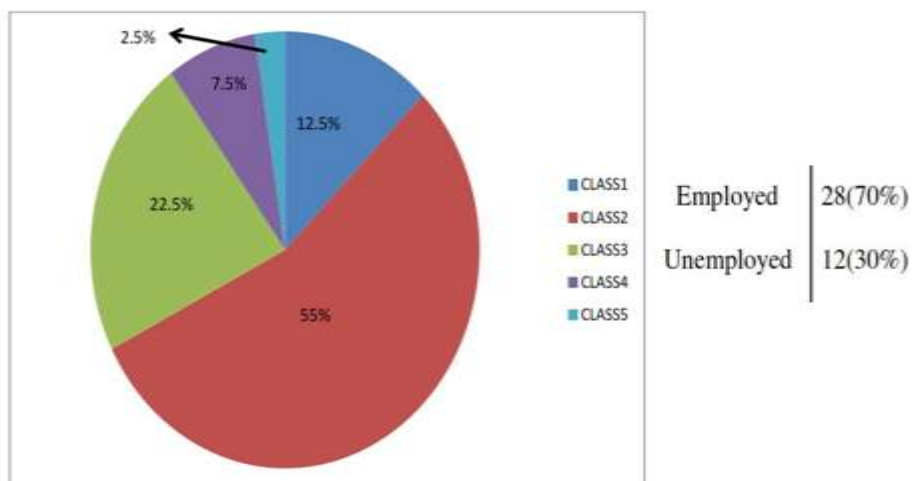
regression analysis.

GRADE	POST BRONCHODILATOR FEV1 in COPD patients having FEV1/FVC less than 0.7
I- MILD COPD	FEV 1 $\geq$ 80% of predicted
II- MODERATE COPD	50% $\leq$ FEV1 less than 80% of predicted
III- SEVERE COPD	30% $\leq$ FEV1 less than 50% of predicted
IV- VERY SEVERE COPD	FEV 1 less than 30% of predicted

IV. RESULTS AND DISCUSSION

Demographic characteristics of the study population Socio economic status of the study population
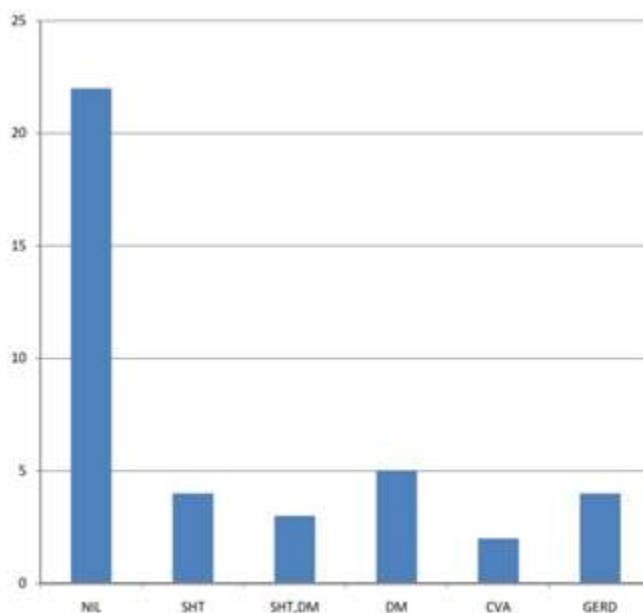
S.No	Variable	Sample(n = 40) subjects
1.	Age (in years)	60.65±9.42
2.	Male gender (%)	40(100%)
3.	BMI (in Kg/m^2)	21.44±3.49

Socio economic status of the study population

Employed	28(70%)
Unemployed	12(30%)

CLASS1, CLASS2, CLASS3, CLASS4, CLASS5
12.5%, 55%, 22.5%, 7.5%, 2.5%

COMORBIDITIES:

- Comorbidities -18(45%) of subjects
- Diabetes - 5(12.5%)
- Hypertension - 4(10%)
- GERD - 4(10%)
- CVA - 4(10%)

SMOKING PATTERN:
Mean smoking pack years - 43.47 ± 24.16 pack years

35(87.5%) subjects - more than 20 pack years
05(12.5%) subjects - less than 20 pack years

DURATION OF DISEASE:
Mean duration of symptoms - 5.8 ± 3.5 years
18(45%) of subjects had symptoms more than 5 years
22(55%) of subjects had disease less than 5 years
Mean SpO2 - 97.25 ± 1.35

Dyspnoea –MMRC grade

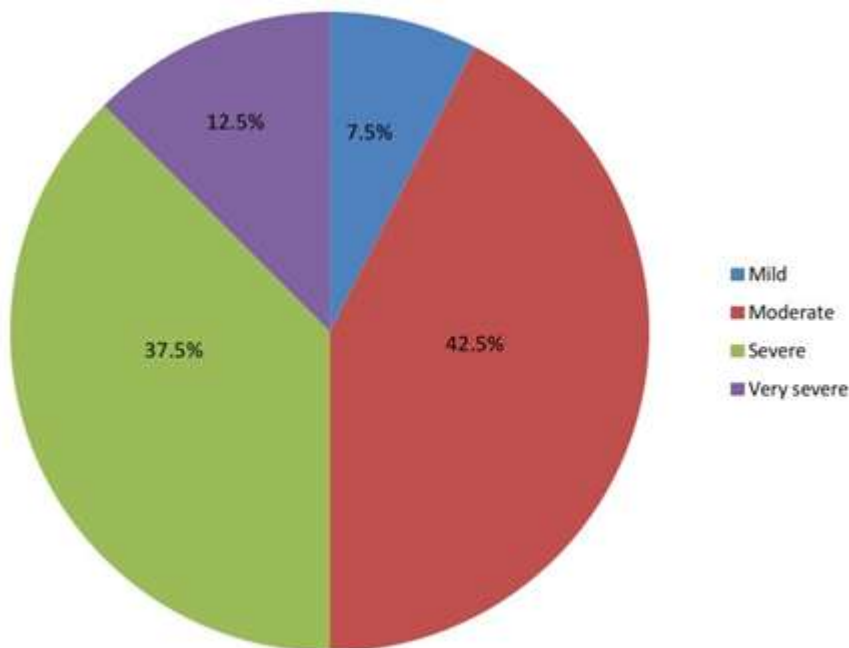|	
Grade 1	16(40%)
Grade 2	20(50%)
Grade 3	4(10%)
Grade 4	0

GRADING OF COPD BASED ON GOLD GUIDELINES :
Mean FEV1 - 1.24 ± 0.49 liters

Mean FEV1 % predicted - 51.05 ± 16.09 %
Mean FVC - 2.25 ± 0.66 liters

GOLD grading of severity of COPD	No of patients	Percentage
Mild	3	7.5%
Moderate	17	42.5%
Severe	15	37.5%
Very severe	5	12.5%

COMPARISON OF SEVERITY OF COPD WITH DYSPNOEA GRADE:

MMRC	Mild COPD	Moderate COPD	Severe COPD	Very Severe COPD
Grade 1	18.8%	56.2 %	25%	0
Grade 2	0 %	40%	45%	15%
Grade 3	0%	0%	50%	50%

Severity of dyspnoea showed significant correlation with severity of obstruction with P value of 0.023

PULMONARY HYPERTENSION:

Pulmonary hypertension	No of subjects n = 40	Percentage
Present	14	35%
Absent	26	65%

COPD severity	No of patients with PH	Percentage with PH
Mild	1	33.3%
Moderate	4	26.7%
Severe	6	35.3%
Very severe	3	60%

Comparing duration of disease with pulmonary hypertension:

Duration of disease	Subjects with PH
Less than 5 years	10
More than 5 years	4

Statistically not significant (p – 0.125)

CORRELATION OF VARIABLES BETWEEN PH AND NON PH GROUP
(Univariate analysis):

Variables	PH group (mean ± SD)	Non PH group (mean ± SD)	'P' value
Age(in years)	64.14 ± 9.07	58.76 ± 9.23	0.085
BMI(in kg/m^2)	19.82 ± 2.59	22.31 ± 3.64	**0.030**
Smoking (in Pack years)	54.07 ± 28.09	37.76 ± 20.09	**0.040**
Duration (In years)	5.07 ± 3.09	6.19 ± 3.78	0.349

Logistic regression analysis of variables between PH and non PH group:

| Variables	Adjusted odds ratio	95% confidence interval	'P' Value
BMI	0.76	0.59 – 0.98	0.04
Smoking pack years	1.024	0.99 – 1.05	0.13

BMI remained statistically significant with 'P' value of 0.04(adjusted odd's ratio of 0.76, 95%.confidence interval 0.59 – 0.98). Smoking pack years lost its significance('P'value of 0.13, adjusted odd's ratio of 1.024, 95% confidence interval 0.99 – 1.05). We found that pulmonary hypertension was 0.76 times commoner in patients with low body mass index.

2D Echocardiography findings
1. Correlation of Right ventricle Thickness with pulmonary hypertension:
Mean RVT - 0.68 ± 0.13 cm. 12 subjects with PH had RVT > 0.5cm and 2 subjects with PH had RVT < 0.5cm. Statistically not significant '(P' value = 0.232).

RVT	Pulmonary hypertension (n =14)
< 0.5 Cm	2
>0.5 Cm	12
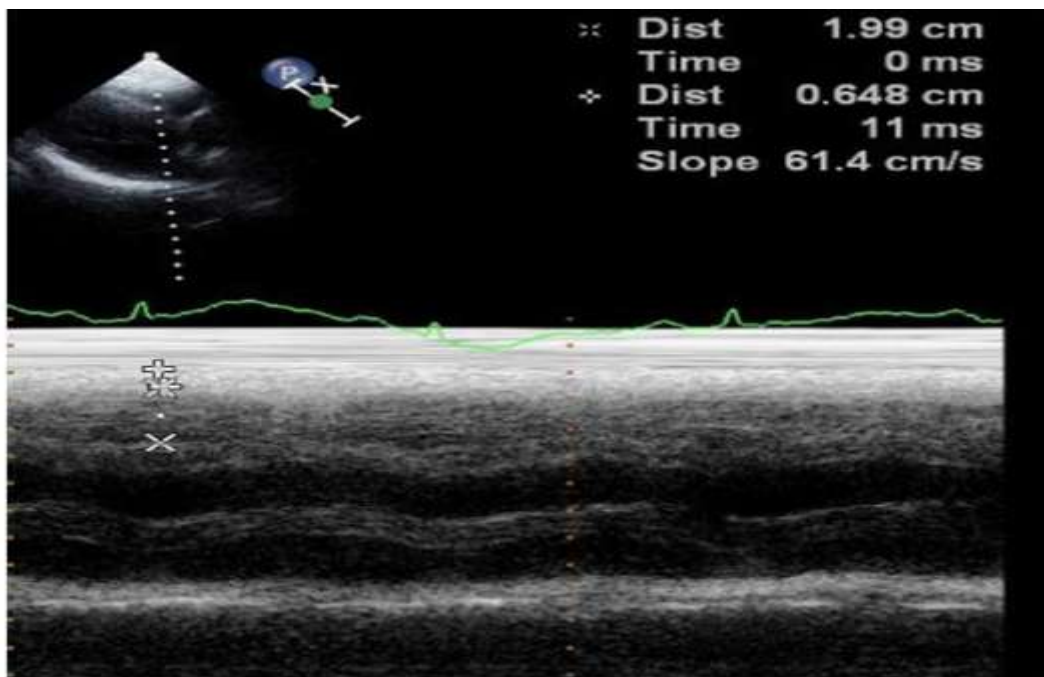
2. Comparison of severity of airway obstruction with LVDD:
LVDD was found in 14 subjects.

Severity of obstruction	Patients with LVDD
Mild	33.3%
Moderate	23.5 %
Severe	53.3 %
Very severe	20%
	P = 0.296

Statistically not significant.

The important findings in our study were as follows. The mean post bronchodilator FEV1and predicted FEV1 in our study population were 1.24 ± 0.49 liters and 51.05 ± 16.09% respectively. The prevalence of pulmonary hypertension increased with the severity of COPD. In stable COPD patients, the pulmonary hypertension were of mild grade.By univariate analysis, COPD patients with pulmonary hypertension had lower BMI and had high smoking pack years than the patients without pulmonary hypertension with 'P' value of 0.030 and 0.040 respectively. With Multiple logistic regression, BMI remained statistically significant with 'P'value of 0.04

V.   CONCLUSION

Our study showed that prevalence of pulmonary hypertension increased with severity of COPD. Severe pulmonary hypertension was not observed in our study with stable COPD patients. Right ventricle hypertrophy and diastolic dysfunction of left ventricle were the other common findings in COPD patients. Since cardiovascular disease is the major cause of morbidity and mortality in COPD, it is essential to evaluate the cardiac status at the time of initial diagnosis. The overall survival and quality of life can be improved by addressing this comorbidity.

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