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‘’STUDY THE ECG FINDINGS, ECHO FINDINGS AND HOLTER MONITORING FINDINGS IN COPD PATIENT’’

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Abstract-

Introduction- Chronic obstructive pulmona1y disease (COPD) is a prevalent respiratory condition characterized by airflow limitation that is not completely reversible, with a forced expiratory volume in one second to forced vital capacity (FEVl/FVC) ratio of less than 70%. It ranks as the fom1h leading cause of mortality worldwide, following myocardial infarction, cancer, and stroke. COPD is associated with significant morbidity and mortality, and cardiovascular events have been identified as the leading cause of death in COPD patients

Aims Objective: This prospective cohort study aimed to investigate ‘’’Compare the ECG findings, ECHO findings and Holter monitoring findings’’ will be carried out in the Department of Medicine, J.A. Group of Hospitals, Gwalior from June 2020 to June 2021

Methods: The study included 100 diagnosed cases of COPD, divided into stable COPD and acute exacerbations. Routine blood investigations, electrocardiogram (ECG), 2D echocardiography, and 24-hour Holter monitoring were conducted to assess cardiac rhythm disturbances. The type of arrhythmia was noted for each patient. Statistical analysis was performed using SPSS 26 software.

Results: Among the COPD patients, 53% had supraventricular ectopic, 20% had atrial tachycardia, 16% had conduction abnormalities, and 10% had ventricular ectopics. Males had a higher prevalence of COPD and arrhythmias compared to females. ECG abnormalities associated with right heart dysfunction, such as P-pulmonale, right ventricular hypertrophy (RVH), and right bundle branch block (RBBB), were more prevalent in patients with severe COPD. Sinus tachycardia was more common in severe COPD patients. ECG abnormalities showing **Right heart dysfunction like P- pulmonale +RVH +RBBB** and **P-Pulmonale +Right atrial enlargement+ Right ventricular hypertrophy (RVH)** were significantly higher in patients with GOLD stage III/IV.

Conclusion: The study findings highlight the relationship between COPD severity and the presence of arrhythmias. Patients with severe COPD had a higher incidence of ECG abnormalities associated with right hea11 dysfunction. The prevalence of arrhythmias in COPD patients was estimated at 12-14%, with supraventricular ectopics and atrial tachycardia being the most common types observed. Understanding the prevalence and types of arrhythmias in COPD patients can guide appropriate monitoring and interventions to reduce arrhythmia-related complications.

Keywords: Chronic obstructive pulmonary disease, arrhythmias, Holter monitoring, COPD severity, right heart dysfunction.

INTRODUCTION

In both developed and developing countries, chronic obstructive pulmonary disease (COPD) is a prominent cause of illness and death [1]. According to major studies [2,3], cardiovascular events are the leading cause of COPD-related death, and there is some evidence that arrhythmias may playa role in some of these events [4]. Patients with both stable [5] and worsened COPD [6,7] might develop atrial or ventricular rhythm abnormalities, which can increase the risk of sudden death [6,7].

GOLD (guidelines for obstructive lung disease) defines chronic obstructive pulmonary disease (COPD) as a clinical condition characterized by airflow limitation that is not totally reversible, with FEV1/FVC 70%. Chronic bronchitis and emphysema are two types of COPD. It is the world's fourth biggest cause of mortality, trailing only myocardial infarction, cancer, and stroke. According to multiple studies, cardiovascular problems, including arrhythmias, caused a significant number of mortalities in patients with moderate COPD, particularly in younger people.

In 69 percent of cases, supraventricular tachycardia was present. Repetitive ventricular arrhythmia was found in 64% of the patients, and it wasmuch more common in men and those with oedema or high PCO2. In 35% of the patients, the ventricular premature beats were greater than or equivalent to25 per hour. Arrhythmias in COPD are likely complex, involving a number of risk factors such as hypoxia, acidosis, and a reduction in FEV1. In stable COPD patients, a lower FEV1 is an independent predictor of new onset atrial fibrillation.

The occurrence of arrhythmias in COPD sufferers is predicted to be 12-14 percent [8,9]. Arrhythmias may be because of different comorbidities, together with coronary heart sickness, hypertensive coronary heart sickness, proper and/or left ventricular failure, hypokalemia and hypomagnesaemia, digoxin, or macrolide antibiotics [10]. COPD and arrhythmias have not unusual place hazard factors, together with older age and smoking, and arrhythmias may be because of different comorbidities, together with coronary heart sickness, hypertensive coronary heart sickness There were no times of arrhythmias in spite of research of ischemic coronary heart sickness after bronchodilation and smoking interplay in COPD [11].

The aim of this study was to estimate the prevalence and types of arrhythmias in COPD patients and to correlate them with severity and presence of right heart failure and acute exacerbations. This would impact management of COPD patients.

AIMS & OBJECTIVES

The present study entitled ''Compare the ECG findings, ECHO findings and holter monitoring findings will be carried out in the Department of Medicine, J.A. Group of Hospitals, Gwalior from June 2020 to June 2021.

MATERIALS AND METHODS

The present study will include patients attending the Department of Medicine, J.A. Group of Hospitals confirmed to have Chronic obstructive pulmonary disease.

Duration of study : 1 year
Study design : Prospective - COHORT study
Sample design: Purposive sampling
Study population: Diagnosed cases of COPD between 30-60 yrs
Sample size: 50 cases of COPD, then divided into two groups as stable and acute exacerbations.
Study period: June 2020 to June 2021

All patients included in the study then underwent routine blood investigations such as hemogram, erythrocyte sedimentation rate, blood
sugars, renal function tests, liver function tests, electrocardiogram and 2D echocardiography. Then 24 hour Holter monitoring was started with the machine Release 2.9 Digitrak XT Philips. Type of arrhythmia was noted.

Statistical Analysis : Results were compiled and the data was analyzed using
SPSS 26 and graphs shall be generated by Microsoft Excel and Word. A p-value of less than 0.05 shall be considered significant.

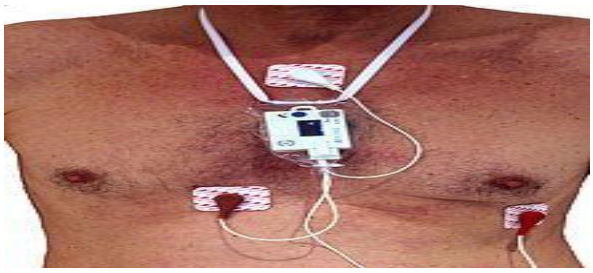
INCLUSION CRITERIA
All confirmed case of COPD (including known cases as well as newly diagnosed cases) of age group 30 yrs to 60 yrs – diagnosed on the basis of Revised GOLD criteria- attending the Department of Medicine, J.A. Group ofHospital during the stipulated study period from June 2020 to June 2021 will be included in the study.

EXCLUSION CRITERIA
1. Age <30 yrs and age>60 yrs
2. All the patients of ischemic heart disease, structural heart disease,diagnose on ECG and 2D Echo studies.
3. Patients with other lung disease like interstitial lung disease and pneumonia and active TB diagnosed on Chest X-ray , sputum microscopy and PFT
4. Patients on medication and other then those prescribed for COPD which have attendency to cause arrhythmia.
5. Patients with endocrine and metabolic disturbances which are known tocause arrhythmia.
6. Patients who refused to give informed written consent.

Ethical considerations:
The ethical approval from Institutional Ethical Committee of Gajra Raja Medical College, Gwalior, M.P. has been obtained before initiation of thestudy.

Informed Consent:
Each study participants was explained about the purpose of study in detail and their consent was obtained before data collection. They were assured that the collected data will be confidentially stored and utilized only for research purpose.

Holter Monitoring



In medicine, a **Holter monitor** (often simply **Holter**) is a type of ambulatory electrocardiography device,a portable device for cardiac monitoring (the monitoring of the electrical activity of the cardiovascular system)for at least 24 to 48 hours (often for two weeks ata time).
The Holter's most common use is for monitoring ECG heart activity (electrocardiography or ECG). Its extended recording period is sometimes useful for observing occasional cardiac arrhythmias which would be difficult to identify in a shorter period. For patients having more transient symptoms, a cardiac event monitor which can be worn for a month or more can be used.[1]
When used to study the heart, much like standard electrocardiography, the Holter monitor records electrical signals from the heart via a seriesof electrodes attached to the chest. Electrodes are placed over bones to minimize artifacts from muscular activity. The number and position of electrodes varies by model, but most Holter monitors employ between three and eight. These electrodes are

connected to a small piece of equipment that is attached to the patient's belt or hung around the neck, keeping a log of the heart's electrical activity throughout the recording period. A 12 lead Holter system is also available when precise ECG signal information is required to analyses the exact nature and origin of the rhythm signal.[5]

OBSERVATIONS

-In the present study, Total 100 male and female patients were included in thestudy among which 20 patients were female (20%) and 80 patients were male(80%).

-Out of 100 patients, maximum cases belonged to age group 61-70 years (n=37), followed by 51-60 years (n=29). Mean age of the cases was 61.18 years with standard deviation of 9.59.

-Out of 80 male patients, maximum belonged to the age group 61-70 years (n=29). Out of 20 female patients, maximum belonged to the age group 61-70years (n=8).

Table 1: Distribution of patients on the basis of ECG detectingArrhythmias

ECG	Total No. of patients(n=100)	Percentage(%)
Arrhythmia	42	42%
Normal	58	58%
Total	100	100%

In present study, Out of 100 patients 42 (42%) have Arrhythmia inECG and 58% have Normal ECG.

Table 2 : Distribution of COPD patients according to type ofarrhythmia in Holter monitoring

Type Arrhythmia	Number of Patients (N=100)	Percent
Supraventricular Ectopics	48	48%
Ventricular Ectopics	9	9%
Atrial Tachycardia	18	18%
Ventricular Tachycardia	0	0%
Conduction Abnormality	15	15%

In our study, 48% patients had Supraventricular Ectopics arrhythmia followed by 18% had Atrial tachycardia followed by 15% had conduction Abnormality then 9% had Ventricular Ectopics.

Table 3 : Showing Electrocardiographic changes in patients ofCOPD according to disease severity

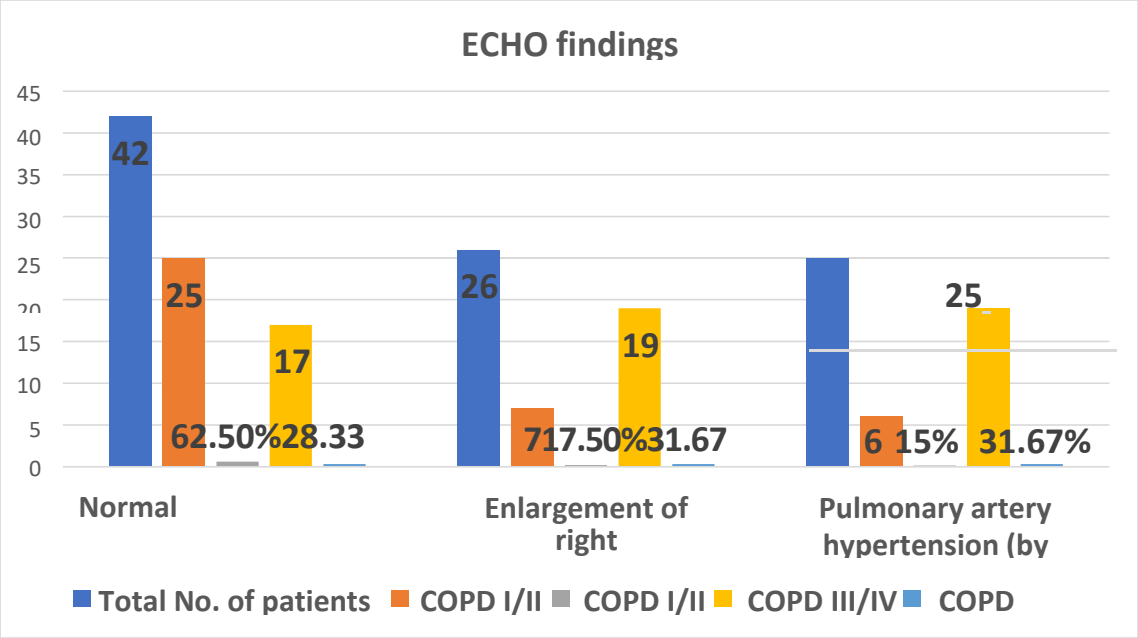
ECG findings	Total No. of patients	COPD I/II (n=40)		COPD III/IV (n=60)	
		No.	%	No.	%
Normal electrocardiogram	36	25	62.5	11	18.3
Sinus tachycardia	14	4	10%	10	16.6%
P-Pulmonale +Right atrial enlargement+ Right ventricular hypertrophy (RVH)	43	10	25%	33	55%
P-Pulmonale + Rightventricular hypertrophy(RVH) + Right bundle branch block (RBBB)	7	1	2.5%	6	10%

- Out of 100 patients, 36 had **normal ECG findings**, of which 25 (62.5) belonged to mild category (GOLD stage I/II) and 11(18.3%) belonged to moderate-severe category (GOLD stage III/IV).
- Out of total 40 patients in GOLD stage I/II, 62.5% had normal ECG (n=25) while among 60 patients in GOLD stage III/IV, only 18.3% had normal ECG (n=11).
- ECG abnormalities showing **Right heart dysfunction like P- pulmonale +RVH +RBBB** and **P-Pulmonale +Right atrial enlargement+ Right ventricular hypertrophy (RVH)** were significantly higher in patients with GOLD stage III/IV (i.e. 10% and 55%) as compared to patients with GOLD stage I/II (i.e.2.5% and 25%).

- ECG abnormalities showing **Sinus tachycardia** were significantly higher in patients with GOLD stage III/IV (i.e. 16.6%) as compared to 10% in patients with GOLD stage I/II.

Table 4: Showing Echocardiographic evaluation of COPDpatients according to disease severity

EC*H*O findings	Total No. of patients(N=100)	COPD I/II(n=40)		COPD III/IV(n=60)	
		No.	%	No.	%
Normal echocardiogram	49	27	**67.5**	22	**36.66**
Enlargement of right cardiac chambers	26	7	**17.5**	19	**31.67**
Pulmonary arteryhypertension	25	6	**15**	19	**31.67**



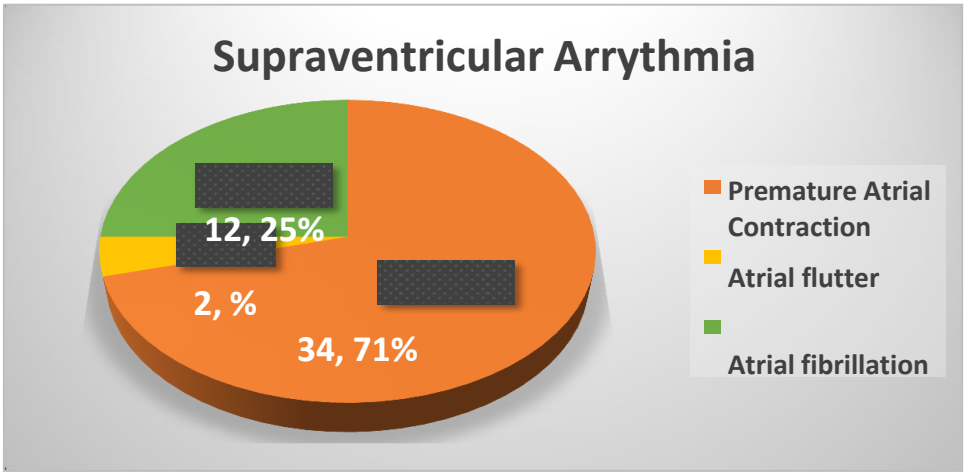
Graph : Showing Echocardiographic evaluation of COPDpatients according to disease severity

- Out of 100 patients, 42 had normal ECHO findings, of which 25 belonged to mild category (GOLD stage I/II) and 17 belonged to moderate-severe category (GOLD stage III/IV).
- Out of total 40 patients in GOLD stage I/II, 62.5% had normal ECHO (n=25) while among 60 patients in GOLD stage III/IV, only 28.33% had normal ECHO (n=17).
- ECHO abnormalities showing Right heart dysfunction like Right cardiac chamber enlargement and Pulmonary artery Hypertension werefound to be significantly higher in patients with GOLD stage III/IV (i.e.31.67% each) as compared to patients with GOLD stage I/II (i.e. 17.5% and 15% respectively).

Table 5: Distribution of patient on the basis of SupraventricularArrythmia and their frequency

Supraventricular Arrythmia	Number of Patients(N=48)	Percent (%)
Premature Atrial Contraction	34	71%
Atrial flutter	2	4.1%
Atrial fibrillation	12	25%
Total	48	100%

In present study, In supraventricular arrhythmia, 48 patient out of 100 is suffered in which 71% patients had Premature Atrial Contraction and 25% had Atrial Fibrillation.



Graph: Distribution of patient on the basis of SupraventricularArrythmia and their frequency

Table 6 : Distribution of patient on the basis of Atrial Tachycardia andtheir frequency

Atrial Tachycardia	Number of Patients(N=18	Percent (%)
Multifocal Atrial Tachycardia	16	88.8%
Paroxysmal Atrial Tachycardia	2	11.1%

In present study, 18 patients out of 100 suffered from Atrial Tachycardia, in which 16 patients had Multifocal Atrial Tachycardia and 2 patients had Paroxysmal Atrial Tachycardia.

Table 7: Association between Gold Stage and Right Cardiac ChamberEnlargement (2D ECHO)

Right CardiacChamber Enlargement (2D ECHO)	Gold Stage				Total
	I	II	III	IV	
Present	0(0%)	7(26.9%)	10(38.5%)	9(34.6%)	26(100%)
Absent	12(16.2%)	21(28.4%)	23(31.1%)	18(24.3%)	74(100%)
Chi Square Value-5.303		Df-3	P-Vale-0.151		100(100%)

In present study, there is no association between Right Cardiac Chamber Enlargement (2D ECHO and COPD. Out of 100 patients, In Gold III stage of COPD, 10 patients had Right Cardiac Chamber Enlargement (2D ECHO followed by 9 patients had Gold Stage IV of COPD and 7 patients had Gold Stage II of COPD It is statistically insignificant ($p<0.05$).

Table 8: Association between Gold Stage and PAH (2D ECHO)

PAH(2D ECHO)	Gold Stage				Total
	I	II	III	IV	
Present	0(0%)	5(20%)	12(48%)	8(32%)	25(100%)
Absent	12(16%)	23(30.7%)	21(28%)	19(25.3%)	75(100%)
Chi Square Value-7.343		Df-3	P-Vale-0.062		100(100%)

In present study, there is no association between PAH (2D ECHO) andCOPD. Out of 100 patients, In Gold III stage of COPD, 12 patients had PAH (2D ECHO) followed by 8 patients had Gold Stage IV of COPD and 5 patients had Gold Stage II of COPD It is statistically insignificant ($p<0.05$).

Table 9: Association between Gold Stage and Normal (2D ECHO)

Normal2D ECHO	Gold Stage				Total
	I	II	III	IV	
Yes	12(25%)	23(47.9%)	10(20.8%)	3(6.2%)	48(100%)
No	0(00%)	5(9.6%)	23(44.2%)	24(46.2%)	52(100%)
Chi Square Value-44.938		Df-3	P-Vale-0.0001		100(100%)

In present study, there is association between Normal (2D ECHO) and COPD. Out of 100 patients, In Gold II stage of COPD, 23 patients had Normal (2D ECHO) followed by 12 patients had Gold Stage I of COPD and 10 patients had Gold Stage III of COPD It is statistically significant ($p<0.05$).

DISCUSSION

Chronic Obstructive Pulmonary Disease (COPD) is a multi-system disease with a pulmonary component that is characterized by severe, non- reversible progressive airflow limitation, which is frequently coupled with an aberrant inflammatory response of the lung to noxious particles or gases. The global initiative for chronic obstructive pulmonary disease (COLD) has produced the most well-known and commonly recognized definition, with a post-bronchodilator cut-off point of FEV1/FVC ratio 70.

The heart is the most targetable organ for COPD as a systemic complication, and it develops much pathology of cardiovascular disorders (CVDs) or cardiovascular complications, the most common of which is cardiac arrhythmia, but also other CVDs (angina hypertension, coronary artery disease, and congestive heart failure) due to shared risk factors (advanced age, smoking, environmental pollutants, gender, and socioeconomic status) . COPD raises the risk of cardiac arrhythmias, which are becoming more common, particularly in cases of acute exacerbation, respiratory failure, and rising comorbidities.

The aim of the study

3. To assess the pattern of arrhythmia in COPD patient.
4. Relationship between arrhythmia and severity of COPD (Gold Staging)
5. Compare the ECG findings, ECHO findings and holter monitoringfindings
6. Association between arrhythmia and prognosis or outcome of COPD.
7. Comparing the result of Holter monitoring in stable and acute exacerbation patient of COPD.

-The age of the studied population ranged from 41 to more than 70 years. The mean age of the study population was 61.18 ± 9.59 years.

-In the studied population, males account for 80%, with a male: female ratio of 4:1, which was comparable to other study mentioned below. Higher prevalence in males may be attributed to smoking and exposure to various dusts and allergens at workplace and outdoors.

-The mean duration of illness in our study population was 9.21 ± 6.04 years.

Among the studied 100 patients, 28% had <5 years duration ofsymptoms, 41% had 6-10 years duration while 31% had duration of >10 years.

-This implies that severity of COPD is proportional to duration of illness i.e., the disease progresses gradually with the time and hence, timely optimum intervention should be done to slow the progression of disease, to delay the complications and improve the quality of life.

Arrhythmia in COPD

1. Electrocardiographic findings

- In present study, 42% suffering from arrhythmia and 58% werenormal.
- Out of 100 patients, 36 had **normal ECG findings**, of which 25 (62.5) belonged to mild category (GOLD stage I/II) and 11(18.3%) belonged to moderate-severe category (GOLD stage III/IV).
- Out of total 40 patients in GOLD stage I/II, 62.5% had normal ECG (n=25) while among 60 patients in GOLD stage III/IV, only 18.3% hadnormal ECG (n=11).
- ECG abnormalities showing **Right heart dysfunction like P- pulmonale +RVH +RBBB** and **P-Pulmonale +Right atrial enlargement+ Right ventricular hypertrophy (RVH)** were significantly higher in patients with GOLD stage III/IV (i.e. 10% and 55%) as compared to patients

with GOLD stage I/II (i.e.2.5% and 25%).

- ECG abnormalities showing **Sinus tachycardia** were significantly higher in patients with GOLD stage III/IV (i.e. 16.6%) as compared to 10% in patients with GOLD stage I/II.

2. Echocardiographic findings

- Out of 100 patients, 42 had normal ECHO findings, of which 25 belonged to mild category (GOLD stage I/II) and 17 belonged to moderate-severe category (GOLD stage III/IV).
- Out of total 40 patients in GOLD stage I/II, 62.5% had normal ECHO (n=25) while among 60 patients in GOLD stage III/IV, only 28.33% had normal ECHO (n=17).
- ECHO abnormalities showing Right heart dysfunction like Right cardiac chamber enlargement and Pulmonary artery Hypertension werefound to be significantly higher in patients with GOLD stage III/IV (i.e. 31.67% each) as compared to patients with GOLD stage I/II (i.e. 17.5% and 15% respectively).

-In this study, theycompared different type of arrhythmia with the severity of COPD7. In the present study we have tried to find out the prevalence of various arrhythmias and its correlation with severity of COPD. A study reported cardiac arrhythmias in 20% of all cor-pulmonale patients, of which supraventricular ectopic beats were the most common [9].

A study carried by **Dabadghao VS et al**, stated that Holter monitoring is undoubtedly more sensitive than ECG in detecting cardiacarrhythmias and resting ECG may not demonstrate the arrhythmias. In presentstudy, most common arrhythmia on Holter monitoring was atrial pair and atrial premature beats which were present in 58% and 50% participants respectively. Other arrhythmias were atrial run (32%), ventricular premature beats (32%), ventricular couplets (30%), ventricular triplets (24%), ventricular trigeminy (24%) and ventricular run (22%).

In the present study 12 patients of mild COPD patients, 28 patients of moderate COPD, 33 patients of severe COPD and 27 patients of very severe COPD.

Corelation Between Arrhythmia and severity of the COPD

In present study, out of 100 Patients In Gold III stage of COPD, 18 patients had **Supraventricular Ectopics** followed by 14 patients had Gold Stage II of COPD and 12 patients had Gold Stage IV of COPD It is statistically insignificant ($p<0.05$).

In present study, out of 100 patients, In Gold III stage of COPD, 4 patients had **Ventricular Ectopics** followed by 3 patients had Gold Stage II of COPD and 2 patients had Gold Stage IV of COPD It is statisticallyinsignificant ($p<0.05$).

In present study, out of 100 patients, In Gold IV stage of COPD, 4 patients had **Atrial Tachycardia** followed by 12 patients had Gold Stage IV of COPD and 3 patients had Gold Stage II and III of COPD It is statistically significant ($p<0.05$).

In present study, Out of 100 patients, In Gold II stage of COPD, 7 patients had **conduction Abnormality** followed by 5 patients had Gold StageIII of COPD and 3 patients had Gold Stage IV of COPD It is statistically insignificant ($p<0.05$).

A study carried by **Dabadghao VS et al**, Out of 25 patients with atrial premature beats, 14 (56%) were suffering from moderate obstructionand 7 (28%) were suffering from severe obstruction. Out of 15 patients who had ventricular couplets, 10 (66.7%) had moderate obstruction and 4 (26.7%) had severe obstruction. Out of 12 patients of ventricular triplets, 9 (75%) were suffering from moderate obstruction and 3 (25%) had severe obstruction(Figure 5). Out of 9 patients who had ventricular bigeminy, 6 (66.7%) had moderate obstruction and 2 (22.2%) had severe obstruction. Out of 11 patients with ventricular run, 8 (72.7%) were suffering from moderate obstruction, 2 (18.2%) had mild obstruction and 1 (16.7%) had severe obstruction (Table 4). Out of 16 patients with ventricular premature beats, 7
(43.8%) were suffering from moderate obstruction, and 5 (31.3%) were suffering from severe obstruction (Table 5). But none of these arrhythmias had statistically significant association with the

severity of COPD.

In a study by **Konecny et al[5]**, which compared prevalence of arrhythmia in COPD patients with a control group, atrial fibrillation/atrial flutter occurred in23.3%, non-sustained ventricular tachycardia in 13.0% and sustainedventricular tachycardia (0.9%).

SUMMARY

100 selected cases of COPD were then evaluated as per electrocardiographic and echocardiographic findings- and the following observations were made.

1. Out of 100 patients, maximum cases belonged to age group 61-70 years(n=37), followed by 51-60 years (n=29). Mean age of the cases was 61.18 years with standard deviation of 9.59.
2. Out of 100 patients, 80 were male and 20 were female.
3. Out of 80 male patients, maximum belonged to the age group 61-70 years (n=29). Out of 20 female patients, maximum belonged to the age group 61-70 years (n=8).
4. Out of 100 patients, 41 patients had duration of illness between 6 to 10 years, 31 patients had duration of illness > 10 years while 28 patients had duration of <5 years. The mean duration of COPD was 9.21 years with standard deviation of 6.04.
5. Out of 100 patients, 36 had normal ECG findings, of which 25 belonged to mild category (GOLD stage I/II) and 11 belonged to moderate-severe category (GOLD stage III/IV).
6. ECG abnormalities showing **Right heart dysfunction like P- pulmonale +RVH +RBBB** and **P-Pulmonale +Right atrial enlargement+ Right ventricular hypertrophy (RVH)** were significantly higher in patients with GOLD stage III/IV.
7. ECG abnormalities showing **Sinus tachycardia** were significantly higher in patients with GOLD stage III/IV (i.e. 16.6%) as compared to 10% in patients with GOLD stage I/II.
8. Out of 100 patients, 42 had normal ECHO findings, of which 25 belonged to mild category (GOLD stage I/II) and 17 belonged to moderate-severe category (GOLD stage III/IV).
9. Out of total 40 patients in GOLD stage I/II, 62.5% had normal ECHO (n=25) while among 60 patients in GOLD stage III/IV, only 28.33% had normal ECHO (n=17).
10. ECHO abnormalities showing Right heart dysfunction like Right cardiac chamber enlargement and Pulmonary artery Hypertension werefound to be significantly higher in patients with GOLD stage III/IV (i.e.31.67% each) as compared to patients with GOLD stage I/II (i.e. 17.5% and 15% respectively).
11. Out of 100, 48% patients had Supraventricular Ectopics arrhythmia followed by 18% had Atrial tachycardia followed by 15% had conduction Abnormality then 9% had Ventricular Ectopics.

CONCLUSION

This study entitled ''Compare the ECG findings, ECHO findings and holter monitoring findings included 100 patients of COPD who were subjected to Electrocardiography, Echocardiography and Holter Monitoring for cardiac Arrhythmia.

COPD patients were found to have high prevalence of arrhythmia, as evident by ECG/ECHO/Holter monitoring findings i.e. 24% in our study, which correlated well with the duration ($p<0.001$) and severity of the COPD as per GOLD staging ($p<0.001$). Our findings support definite clinical correlation between arrhythmia with duration and severity of COPD.

Hence this study demonstrated a significant presence of supraventricular and ventricular arrhythmias in patients with COPD which were detected on Holtermonitoring. These rhythm disturbances were mostly asymptomatic and were not found on routine ECG. As studies have related these with mortality, clinicians need to keep a look out for these arrhythmias in COPD patients, which will impact their outcomes and treatments.

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