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# *ECG CHANGES IN COPD- ASSESSING IT'S UTILITY FOR PREDICTING DISEASE SEVERITY*

**Dr Baqir Hussain VP, Dr Rajesh V**

PG Resident - Respiratory Medicine

Yenepoya Medical college

Mail : drbaqirhussain5533@gmail.com

Mobile No : 8858228833.

ORCID – 0009-0004-7394-2020

Professor and HOD - Respiratory medicine

Yenepoya Medical College

Mail: rajdocmmc@gmail.com

Mobile No: 8095810570.

ABSTRACT

Background- Both individuals with acute exacerbation of COPD and those with stable COPD showed a number of abnormalities on their ECG. Local data on acute exacerbations are, however, scarce. Therefore, in order to enhance the interpretation of ECG results, identify the related cardiac abnormality and appropriate therapy, and lower the risk of morbidity, this study aimed to identify ECG changes in COPD patients and to correlate it with the disease severity.

Methods and materials- This was a prospective observational study performed in the Department of Pulmonology in a tertiary care hospital from January 2022 to December 2023 on all patients diagnosed with COPD. ECG was taken for all patients, and changes were assessed.

Results- The most common ECG finding was P-pulmonale in E group, followed by Poor R wave progression and RVH/RAD. When we analysed the influence of COPD severity with ECG findings, we found a statistically significant correlation.

Conclusion- ECG changes in COPD can help in early diagnoses of changes leading to cor pulmonale, and help rule out other cardiac anomalies.

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Keywords- cor pulmonale, respiratory failure, right heart dysfunction

## INTRODUCTION

The prevalent, curable, and avoidable condition known as chronic pulmonary obstructive disease (COPD) is characterized by persistently inadequate airflow. It is also a significant worldwide public health concern [1].

In terms of global illness burden and global mortality, COPD comes in at number five and three, respectively. It is currently the second most common cause of morbidity and the top cause of mortality in the US [2]. Due to inadequate and varied primary care systems, low-income nations like Pakistan have significant difficulties in identifying and treating COPD, especially during exacerbations [3].

As per a pooled analysis, the estimated prevalence of COPD in India in 2023 was 7.4% [4]. The most prevalent cause of COPD is tobacco use along with a variety of other variables, including both indoor and outdoor. Cardiovascular disorders, osteoporosis, skeletal muscle dysfunction, metabolic syndrome, depression, and lung cancer are among the extrapulmonary symptoms of COPD [6]. Individuals with COPD are more likely to experience independent cardiovascular morbidity and death [7]. Certain electrocardiographic (ECG) abnormalities are linked to COPD. According to earlier research, individuals with COPD were more likely to experience atrial fibrillation, non-sustained ventricular tachycardia, cardiac arrhythmia, myocardial infarction, and sustained ventricular tachycardia [8,9].

According to a recent study, atrial fibrillation affects 8%–13% of all patients hospitalized to hospitals for an acute COPD exacerbation [10]. Additionally, a different study revealed that 22%–40% of COPD patients go through at least one severe or moderate exacerbation every year [11].

Both individuals with acute exacerbation of COPD and those with stable COPD showed a number of abnormalities on their ECG. Local data on acute exacerbations are, however, scarce. Therefore, in order to enhance the interpretation of ECG results, identify the related cardiac abnormality and appropriate therapy, and lower the risk of morbidity, this study aimed to identify ECG changes in COPD patients and to correlate it with the disease severity.

## METHODS AND MATERIALS

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This was a prospective observational study performed in the Department of Pulmonology in a tertiary care hospital from January 2022 to December 2023. In addition, the institutional review board gave it their blessing. Following an explanation of the study protocol to each participant, informed consent was obtained.

Patients with COPD (according to the operational definition) were included in the study, both male and female, aged 18 to 60.

Patients with bronchial asthma, acute exacerbation, history of cerebrovascular accident (CVA) or acute MI, head or spinal cord trauma, or fractured limbs were excluded from the study.

Additionally, individuals with a diagnosis of congenital heart disease, rheumatoid arthritis, myocardial infarction, ischemic heart disease, ST elevation, heart failure, or chest trauma were excluded.

After complete rest of 10 minutes, the patient is made to lie supine, and a twelve-lead ECG strip was recorded (50 mm/s paper speed, and 10 mm/mV gain). Changes suggestive of ST elevation or depression, T wave changes, atrial or ventricular arrhythmias and flutters were noted. Every value was taken into account in the semi-structured proforma.

## RESULTS

The study included 67 study participants that were diagnosed by operational definition with COPD.

We found that mean age was 60.82, and the majority of stud participants were in the age groups of 60-70 years.

45 study participants were males, while 22 were females.

Table 1 :- baseline characteristics

| | |
|---|---|
| N | 67 |
| age | 60.81 |
| males | 45 |

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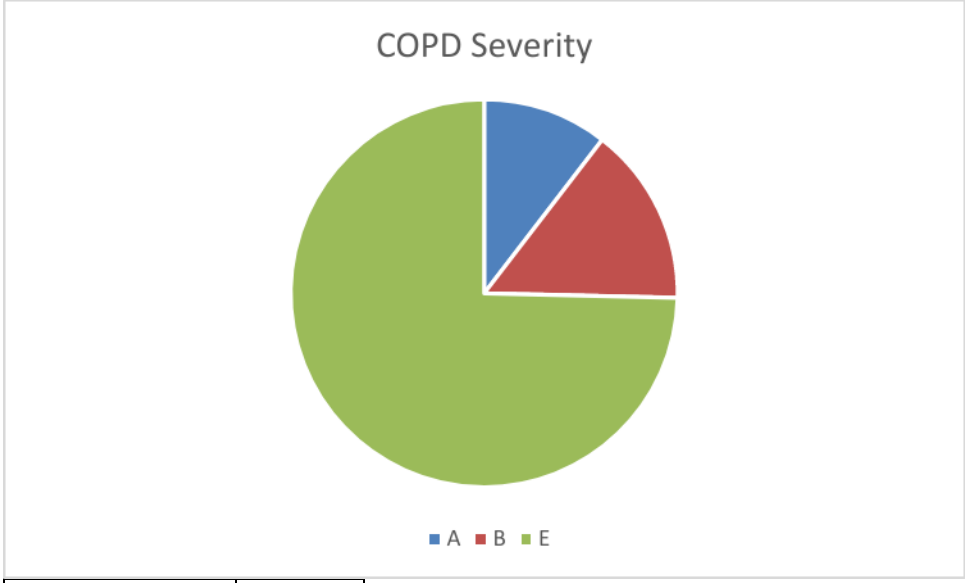


| | |
|---|---|
| smoking index | 683.75 |

Smoking index was calculated in all the smokers in the study population, with a mean value of 683.75.

MMRC grading is used as a clinical assessment of severity, and we noted that majority of the patients had grade 4 dyspnoea.

| MMRC grading | frequency |
|---|---|
| 1 | 7 |
| 2 | 10 |
| 3 | 2 |
| 4 | 48 |

In the present study, we observed that the most common category of COPD was ‘E’, which was observed in 45/67 study participants.

Several ECG changes were observed in patients with COPD included in the present study.

| COPD severity | P-PULMONALE | P-WAVE VER. | LEAD 1 SIGN | LOW AMP. QRS | POOR R W. PRO. | RIGHT AX.DE. | RVH |
|---|---|---|---|---|---|---|---|
| A | 0 | 0 | 0 | 2 | 1 | 0 | 0 |
| B | 1 | 1 | 0 | 0 | 1 | 0 | 2 |

ISSN: 0975-3583,0976-2833 VOL15, ISSUE 9, 2024

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| E | 30 | 3 | 2 | 1 | 21 | 8 | 20 |

The chi-square statistic is 23.9037. The p-value is .002379. The result is significant at $p < .05$.

The most common ECG finding was P-pulmonale in E group, followed by Poor R wave progression and RVH/RAD.

When we analysed the influence of COPD severity with ECG findings, we found a statistically significant correlation.

| Smoking index | P-PULMONALE | P-WAVE VER. | LEAD 1 SIGN | LOW AMP. QRS | POOR R W. PRO. | RIGHT AX.DE. | RVH |
|---|---|---|---|---|---|---|---|
| < 150 | 1 | 1 | 0 | 2 | 1 | 1 | 2 |
| 150-300 | 3 | 1 | 1 | 0 | 4 | 2 | 4 |
| >300 | 27 | 2 | 1 | 1 | 18 | 5 | 16 |

Using Pearson's correlation, we found that Kappa to be 1, with a positive correlation between COPD severity and the subsequent ECH changes.

## DISCUSSION

ECG abnormalities were highly prevalent in COPD patients who presented with severe disease and higher smoking index. Furthermore, men and younger age groups had a higher rate of ECG abnormalities. As pulmonary obstruction severity rose, so did the frequency of aberrant ECG readings [10]. P-pulmonale and right ventricular hypertrophy are the most prevalent ECG abnormalities seen in 23.6% of the patients in our study. Our findings somewhat align with Grymonprez et al.'s findings [14], which indicated that right atrial enlargement and right ventricular hypertrophy are common in COPD patients. According to Harvey and Hancox [15], ECG abnormalities are very common at baseline in individuals with acute COPD exacerbation. In other words, 37% of patients exhibited T wave abnormalities, 17% had conduction block, 8% had ST-segment depression, and 6% had novel abnormalities [15].

Furthermore, in line with our findings, Jatav et al. and Sekhar et al. observed that right ventricular hypertrophy was more common in COPD patients [16, 17]. Our results, however, differed with those of Singh II et al., who found that the frequency of low voltage QRS, ventricular conduction, p-pulmonale, and right axis deviation was greater than that of right atrial enlargement and right ventricular hypertrophy [18].

Improved comprehension of ECG anomalies in COPD can lead to advancements in ECG interpretation findings and the identification of the predominant pathophysiology of airway

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illnesses. In order to better determine the prognosis and the risk for morbidity and mortality among patients with COPD, early cardiac screening should be prioritized. In the present study, the authors observed that ECG abnormalities were highly prevalent in COPD patients who presented with a smoking index more than 150, and a those with a higher grade of disease.

## CONCLUSION

Patients with severe COPD who present with and higher smoking index had a high prevalence of ECG abnormalities. Hence, ECG may be a valuable tool for detecting ischemic abnormalities among patients with COPD, independent of previously known heart disease, in clinical settings.

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ISSN: 0975-3583,0976-2833 VOL15, ISSUE 9, 2024

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