

A Study on Electrocardiographic Changes in Chronic Obstructive Pulmonary Diseases

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DOI: [10.21276/sjams.2019.7.4.41](https://doi.org/10.21276/sjams.2019.7.4.41)

| Received: 13.04.2019 | Accepted: 18.04.2019 | Published: 30.04.2019

Abstract

Original Research Article

Introduction: Chronic Obstructive Pulmonary Disease (COPD) is a major cause of chronic morbidity and mortality throughout the world. It is defined as a disease state characterized by airflow limitation that is not fully reversible. Patients with chronic obstructive pulmonary disease (COPD) are at increased risk of cardiovascular disease. Cardiac morbidities changes associated with COPD can be seen in electrocardiography (ECG). **Material and Methods:** This was a descriptive type of cross sectional study, conducted in the tertiary care teaching hospital of medical college of southern Maharashtra. In present study total 100 COPD patients were included after their verbal informed consent. They were staged by pulmonary function test (PFT) and evaluated by electrocardiography. **Results:** Out of 100 participants 72 were males and 28 were females. The mean age of the participants was 52.08 ± 10.2 years. Analysis of ECG showed that 63% of the patients had evidence of right ventricular hypertrophy (RVH) and 66% patients had P. pulmonale. **Conclusion:** Present study concluded that the COPD patients should be screened electrocardiographically in addition to other clinical investigations and examination for the detection of cor-pulmonale.

Keywords: COPD, Electrocardiography, had P. Pulmonale, Right Ventricular Hypertrophy.

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INTRODUCTIONS

Chronic obstructive pulmonary diseases (COPD) is a term used by some investigator to describe those patients with pulmonary disease who share in common the clinical and pathophysiologic characteristic of chronicity. COPD is considered as one of the major cause of morbidity and mortality throughout worldwide. According to World Bank data it is expected to move from its status in 2000 as the 4th and 12th most frequent cause of mortality and morbidity, respectively, to the 3rd and 5th leading cause of mortality and morbidity, respectively, in 2020 [1,2].

Chronic obstructive pulmonary disease (COPD) is defined as a disease state characterized by airflow limitation that is not fully reversible. Chronic obstructive pulmonary disease (COPD) includes emphysema, an anatomically defined condition characterized by destruction and enlargement of the lung alveoli; chronic bronchitis, a clinically defined condition with chronic cough and phlegm; and small airway disease, a condition in which small bronchioles are narrowed [3].

Chronic obstructive pulmonary disease (COPD) is associated with abnormal inflammatory

response of the lungs to chronic inhalation exposure from smoke, dust and other air pollutants. It manifest as chronic cough with or without sputum production [4]. Many studies have mentioned that chronic bronchitis and emphysema are intimately related in so many ways that they are always considered under the heading of chronic obstructive pulmonary diseases [5-8]. In Chronic obstructive pulmonary disease (COPD) airway limitation is usually progressive. Manifestation of disease as chronic cough with or without sputum production for more than three months of a year for at least two consecutive years is considered essential for COPD [4].

Chronic obstructive pulmonary disease (COPD) has considerable effects on cardiac functions, including those of the right ventricle, left ventricle, and pulmonary blood vessels [3]. Several studies reported changes in the activity of heart including P-wave axis and amplitude, rightward displacement of QRS and T-axis, reduction of amplitude of QRS complex in limb and precordial leads, sinus tachycardia, Right bundle branch block (RBBB) etc., among COPD patients [4]. Most of the increased mortality associated with COPD is due to cardiac involvement, which is directly due to pulmonary arterial hypertension ultimately leading to cor-pulmonale. Chronic cor-pulmonale is usually the end

result of long standing pulmonary disease, which results from pulmonary hypertension and subsequently right ventricular hypertrophy and failure [3].

COPD is associated with considerable morbidity and a patient of COPD causes economic burden to the family as well as to the national health expenditure. It is necessary to diagnose the disease early and identify patients who are likely to develop complications; and to prevent long-term complications, promote longevity and improve quality of life. With this background current study was conducted at tertiary care teaching hospital to study the electrocardiographic changes in chronic obstructive pulmonary diseases.

MATERIALS AND METHODS

Institutional Ethics Committee (IEC) permission was obtained before commencement of study. This was a descriptive type of cross sectional study, conducted in the tertiary care teaching hospital of medical college of southern Maharashtra. Present study was carried out in the department of Medicine for the period of three years. In this study total 100 COPD patients were included after their verbal informed consent. Initially, in all 100 patients symptoms suggestive COPD were ascertain following physical, radiographic and pulmonary function test (PFT) were done. For diagnosis of COPD, guidelines by American Thoracic Society[9] and also by British Thoracic Society[10] were followed.

Patients who gave history of tuberculosis and bacteriological or radiological evidence of tuberculosis were excluded from the study. Also the patients of asthma, bronchiectasis, pneumoconiosis, valvular heart disease, ischaemic heart disease and hypertension, diabetes etc. Were excluded from the present study. All selected patients were subjected to routine hematological investigations and history of smoking was obtained in detail, whenever it was present. Every patient was subjected to pulmonary function test and patients were graded according to the severity of COPD with guidelines given by global initiative for obstructive lung disease (GOLD). A standard 12 lead electrocardiogram including 3 bipolar limb leads 3

unipolar limb leads and 6 unipolar precordial leads was performed. All necessary precautions desired in ECG were taken. Electrocardiograms were recorded with BPL ECG machine employing standardization (1cm = 1mv). Various ECG parameter like rate, axis deviation, P-wave changes, QRS complex, T-wave, ST changes etc. were observed. Data was enters in Microsoft Excel and analyzed using descriptive statistics like frequency, proportions, mean & standard deviation. Table & graphs used to summarize the results.

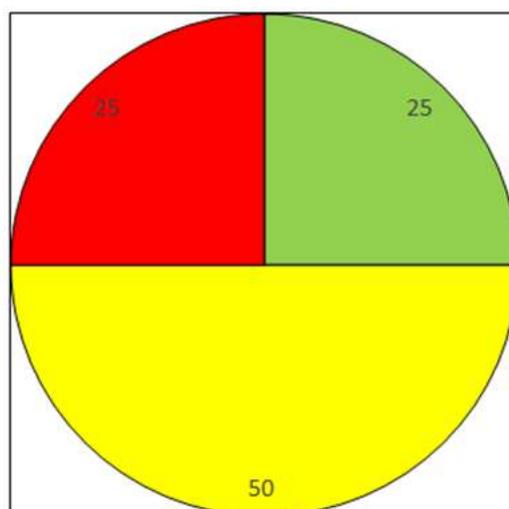
RESULTS

In present study electrocardiographic changes of chronic obstructive pulmonary disease were studied in 100 patients. Out of 100 participants 72 were males and 28 were females. The mean age of the participants was 52.08 ± 10.2 years. The minimum and maximum age of the participants was 30 years and 80 years respectively. The maximum number of cases belonged to 41 to 50 years (Table 01). All the male patients in the present study (72) were smokers. None of the female patients studied gave history of smoking. Of those 72 smoker male patients, 58 and 14 were Bidi and cigarettes smokers respectively. Out of 72 smokers 50 gave the history of smoking since more than 11 years. Rest of them gave history of smoking of less than 11 years. None of our patients smoked for less than 02 years. In present study majority of patients had history of cough with expectoration (78%) since 6 to 8 years. The mean duration of symptoms was 6.56 years.

In present study on radiological examination 54% and 36% of the patients had emphysema and chronic bronchitis suggestive features respectively and 10% found to have normal chest. In present study 50% patients had moderate impairment of respiratory functions (FEV1/FVC ratio 51-60%), 25% had minimal (FEV1/FVC ratio 60-79%) and 25% had marked impairment (FEV1/FVC ratio 40-50%) of respiratory functions. (Graph 01) Analysis of ECG showed that 63% of the patients had evidence of right ventricular hypertrophy (RVH) in the study. In present study 66% patients had P. pulmonale, 49% right axis deviation and 14% incomplete of RBBB.

Table-01: Age wise distribution of the participants. (n=100)

Sr. No.	Age (Yrs.)	No of patients (%)
1.	30 Yrs.– 40 Yrs.	09 (09%)
2.	40 Yrs. – 50 Yrs.	40 (40%)
3.	51 Yrs. – 60 Yrs.	34 (34%)
4.	61 Yrs. – 70 Yrs.	14 (14%)
5.	71 Yrs. – 80 Yrs.	03 (03%)
	Total	100 (100%)



■ Minimal (60-79%) ■ Moderate (51-60%) ■ Marked (40-50%)

Graph-01: Grades of respiratory impairment according to (PFT: FEV1/FVC ratio)

Table-02: Electrocardiographic changes in COPD patients

Sr. No.	Electrocardiographic findings	No of patients (%)
1.	Right ventricular hypertrophy (RVH)	63 (63%)
2.	Right Axis deviation (RAD)	49 (49%)
3.	P. Pulmonale	66 (66%)
4.	Incomplete RBBB	14%
5.	Normal QRS axis	51 (51%)
6.	Verticalisation of P wave axis	86 (86%)
7.	Dominant 'R' in avR	24 (24%)
8.	'S1 S2 S3' pattern	26 (26%)
9.	'S1 Q3' pattern	13 (13%)
10.	Slurred 'S' wave	22 (22%)
11.	ST and T wave inversion	14 (14%)
12.	Prolonged intrinsicoid deflection in Rt. precordial lead	11 (11%)
13.	R/S ratio lead V1, V2 and V6	23 (23%) & 46 (46%)

DISCUSSION

The present study was carried out to study electrocardiographic changes in patients with chronic obstructive pulmonary disease. In this study 100 cases of chronic obstructive pulmonary disease were studied. Some were indoor patients and few were from out patients department also. Most of the patients were from low socioeconomic group and some of them working the farm. Out of 100 participants 72 were males and 28 were females. In this study the mean age of the participants was 52.08 ± 10.2 years. The minimum and maximum age reported by the participants was 30 years and 80 years respectively. The maximum number of cases belonged to 4th and 5th decade of life. The maximum numbers of COPD patients (70%) in the study conducted by Jatav VS *et al.* [3] were in the 6th and 7th decades, mean age of presentation was 63.18 years, which were higher as compared to present study. In JavatVs *et al.* [3] study 86% were male and 14% were females. In present study

female proportion found to be more than Jatav VS *et al.* [3] study.

In present study all the male patients were smokers. Out of 72 smokers 50 gave the history of smoking since more than 11 years. Jatav VS *et al.* [3] reported that mean duration of smoking in his study was 25.06 years. Majority of smokers of this study had history of smoking more than 20 pack years. In present study females found to be chronically exposed smokes from chulha. Similar finding was also noted by Jatav VS *et al.* [3] in his study.

In present study 54% and 36% patients diagnosed to be having emphysema and chronic bronchitis on radiological examination. Jatav VS *et al.* [3] reported 72% and 42% cases of emphysema and chronic bronchitis respectively which were comparatively higher than our study. In present study on pulmonary function test 50% cases found to have moderate level of respiratory impairment and in each

25% cases marked and minimal respiratory impairment found. In a study conducted by Jatav VS *et al.* [3] majority of patients (44%) had severe and very severe COPD (31%), 4% patients had mild COPD and 22% had moderate COPD.

In present study on ECG analysis showed that 63% of the patients had evidence of right ventricular hypertrophy (RVH). In present study 66% patients had P. Pulmonale, 49% right axis deviation and 14% had incomplete of RBBB. Study conducted by Rachakonda R *et al.* [1] reported 19.58% and 26.8% cases of P. Pulmonale and RV hypertrophy respectively. Jatav VS *et al.* reported 45% and 53% cases of P. Pulmonale and right ventricular hypertrophy respectively. Agarwal RL *et al.* [4] reported peaked P-wave in 35.7% COPD patients, whereas abnormal duration of QRS complex in only 8.1% of the patients.

CONCLUSION

Present study concluded that the COPD patients should be screened electrocardiographically in addition to other clinical investigations and examination for the detection of cor-pulmonale.

REFERENCES

- Rachakonda R, Beri S, Kalyankumar PV. Study of ECG and echocardiographic findings in COPD patients in a tertiary care centre. *J Evolution Med Dent Sci.* 2016 Mar 24;5(24):1276-80.
- Global initiative for chronic obstructive lung disease. 2006. https://www.who.int/respiratory/copd/GOLD_WR_06.pdf.
- Jatav VS, Meena SR, Jelia S, Jain P, Ajmera D, Agarwal V, Dayma CL, Arif M. Electrocardiographic characteristics of patients with chronic obstructive pulmonary disease and its correlation with disease severity. *International Journal of Advances in Medicine.* 2017 Mar;4(2):514.
- Agarwal RL, Kumar D, Gurpeet, Agarwal DK, Chabra GS. Diagnostic value of electrocardiogram in chronic obstructive pulmonary disease (COPD). *Lung India.* 2008;25(2):78-81
- American Thoracic Society. Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med.* 1995; 152:S77-S121.
- British Thoracic Society. Guidelines for the management of chronic obstructive pulmonary disease. *Thorax.* 1997; 52(suppl 5):S1–S28.
- Pauwels RA, Buist AS, Calverley PM, Jenkins CR, Hurd SS. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: NHLBI/WHO Global Initiative for Chronic Obstructive Lung Disease (GOLD) Workshop summary. *American journal of respiratory and critical care medicine.* 2001 Apr 1; 163(5):1256-76.
- Siafakas NM, Vermeire P, Pride NA, Paoletti P, Gibson J, Howard P, Yernault JC, Decramer M, Higenbottam T, Postma DS. Optimal assessment and management of chronic obstructive pulmonary disease (COPD). The European Respiratory Society Task Force. *European Respiratory Journal.* 1995 Aug 1; 8(8):1398-420.
- American Thoracic Society. Standards for the diagnosis and care of patients with chronic obstructive pulmonary disease. *Am J Respir Crit Care Med.* 1995; 152:S77-S121.
- British Thoracic Society. Guidelines for the management of chronic obstructive pulmonary disease. *Thorax.* 1997; 52(suppl 5):S1–S28.