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Electrocardiographic changes in patients of COPD and their clinical correlation with disease severity.

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Abstract

Background: COPD is a leading cause of morbidity and mortality worldwide and is more common in smokers and those exposed to environmental pollution. It leads to deleterious effects on heart, Cor Pulmonale and congestive heart failure that are a major cause of morbidity and mortality. Early diagnosis and treatment can mitigate the ill effects of COPD and lead to better patient management and improve the morbidity data.

Methods: 50 patients with symptoms of COPD attending outpatient and admitted in wards of Rajindra Hospital Patiala were included in study. All patients were carefully examined, pulmonary function tests were carried out and a 12 lead ECG was done. Data was analyzed using standard statistical methods.

Results: The most common findings on ECG were P pulmonale, right axis deviation, right ventricular hypertrophy and right bundle branch block. All of these findings were more common with the increasing grade and also duration of the COPD.

Conclusions: ECG is able to diagnose cardiac involvement at early stage and effects of COPD are related to disease severity and duration. Early institution of therapy can mitigate long term complications of COPD.

Keywords: Chronic obstructive pulmonary disease(COPD), Electrocardiography(ECG)

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of morbidity and mortality in the industrialized and developing world. COPD is the fourth leading cause of death worldwide and is likely to be the Number 3 killer by 2030.^{1,2,3} The impact of respiratory diseases particularly COPD is expected to increase putting a heavy economic burden on the

society.⁴ One of the dreaded complications of COPD is Cor Pulmonale which occurs in 25 % of patients. Cor Pulmonale is a strong predictor of mortality in COPD.⁵ Thus early diagnosis of Cor Pulmonale and measures to recognize and treat it at early stage are vital to reduce morbidity and mortality. Clinical diagnosis of Cor Pulmonale is difficult due to presence of hyperinflated lungs. In such cases investigations like Radiology, ECG and Echocardiography are helpful.

The present study was planned to study the ECG changes in patients of COPD and to find their relationship with disease severity.

Aims and Objectives

1. To study the electrocardiographic changes in COPD.
2. To correlate the findings with duration and severity of disease and detection of cardiac involvement.

Type of Study –Prospective observational study conducted at Rajindra Hospital and Government Medical College, Patiala.

Materials and Methods

The present study was conducted on 50 patients of either sex who reported to the outpatient department or were admitted in medical wards. Detailed demographic study along with history was recorded for each patient. Patients were classified into various grades of COPD by spirometry using the GOLD criteria.⁵

Patients were classified into 4 grades based on FEV1 findings.

1. Grade 1- FEV1 >80 %
2. Grade 2A -FEV1 50-80%
3. Grade 2B-FEV1 30-50 %
4. Grade 3- FEV1 <30 %

Radiological and routine investigations were performed in all patients. A standard 12 lead ECG was recorded in all patients. Results were compiled and appropriate statistical methodology was used to find the significance of findings.

Exclusion Criteria: Patients with intrinsic disease of the left ventricle, hypertension, congenital cardiac lesions, Ischemic heart disease and other pulmonary diseases were excluded from the study.

Results

The age of patients included in this study ranged from 45 to 85 years with a mean age of 62.4 +/-9.28 years. Maximum number of patients was in the age group of 55-64 years. (Figure 1)

84 % (n=42) were males while females comprised 16 % of cases (n= 8) Majority of patients were from the rural background (74 %, n=37) while 26 % (n=13) were from urban clusters. 88% of patients presented with the chief complaint of cough, 98 % had dyspnoea and 30 % had congestive heart failure (CHF). (Figure 2)

Study of risk factors revealed that 80 % (n=40) were smokers while 48 % (n=24) had environmental exposure in addition.

50 % of the cases in the study (n=25) had severe disease (class 3) while 34 % (n=17) and 16 % (n=8) were in stage 2B and 2A respectively. None of the patients had stage 1 disease. (Figure 3)

The duration of disease ranged from 4-19 years with mean age of 10.14 +/- 3.99 years. (Figure 4)

Study of electrocardiographic changes revealed that electrocardiogram was normal in 30 % of cases. P Pulmonale was present in 23.5 % of cases of Stage 2B while it was present in 68 % of patients in stage 3. (Figure 5)

Right Axis deviation (RAD) was seen in 37.5 % cases in stage 2A, 52.84 % cases in Stage 2B and in 80 % cases in Stage 3. (Table 6)

Right Ventricular hypertrophy was seen in 29.41 % cases in stage 2B and in 80 % cases in stage 3. (Figure 7)

Right Bundle Branch Block (RBBB) was seen in 41.18 % cases in stage 2B and in 64 % cases in stage 3. (Figure 8)

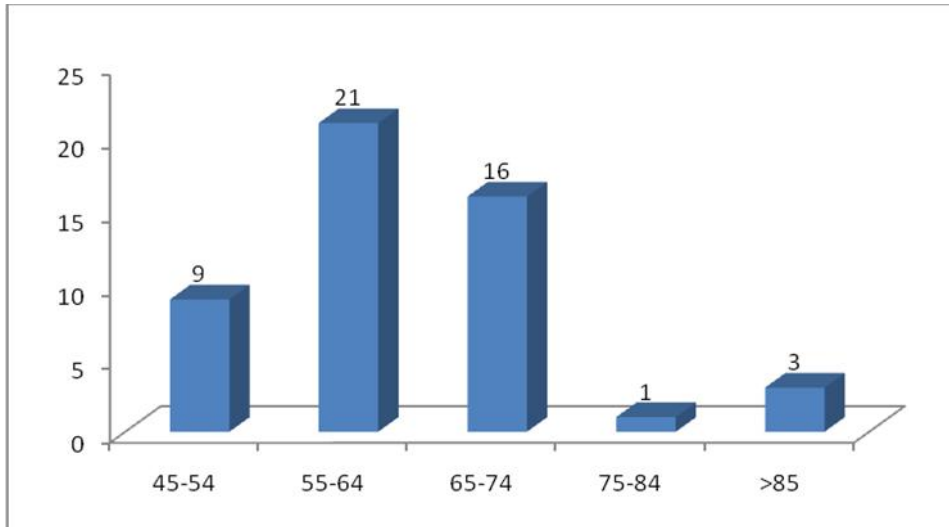


Figure 1 Age profile of patients

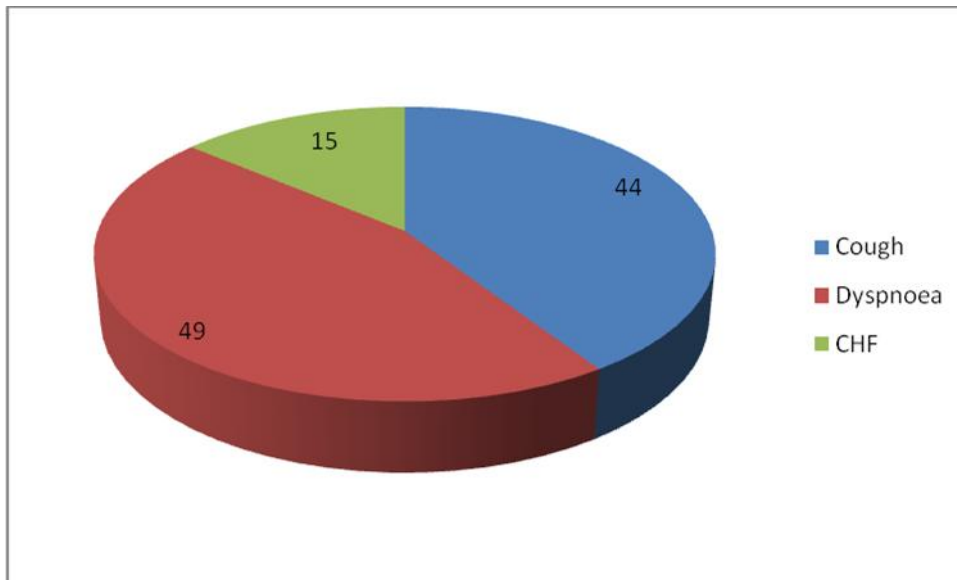


Figure 2 Distribution of patients according to presenting complaints

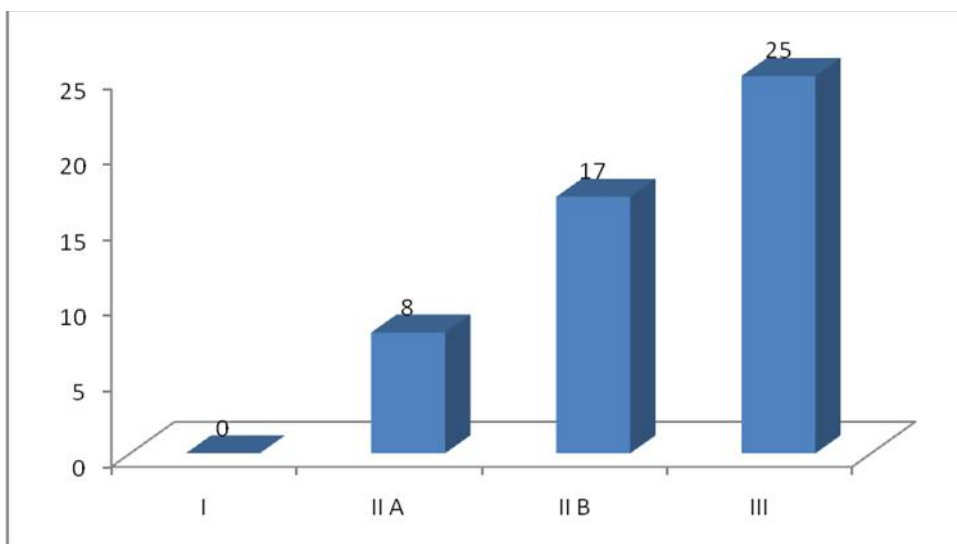


Figure 3 Distribution of cases according to severity

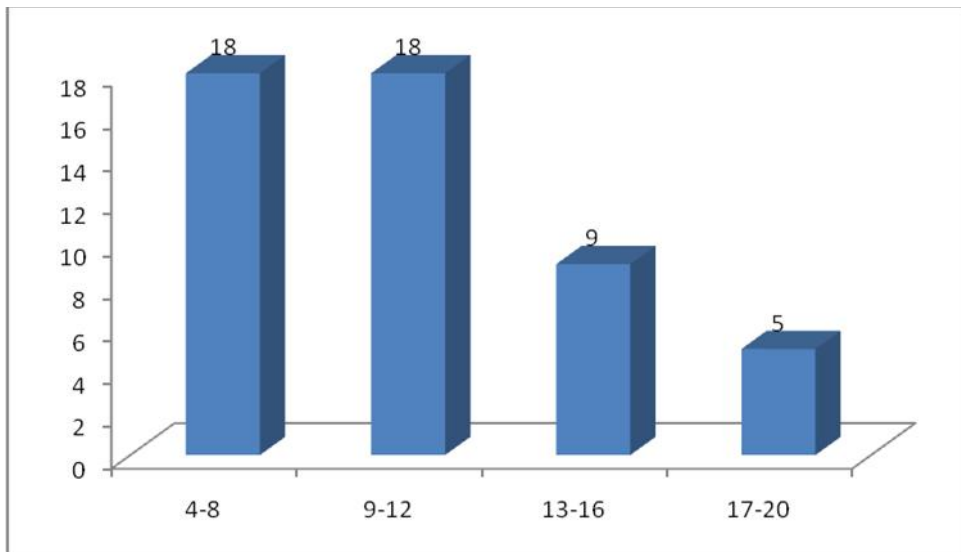


Figure 4 Distribution of cases according to duration of disease

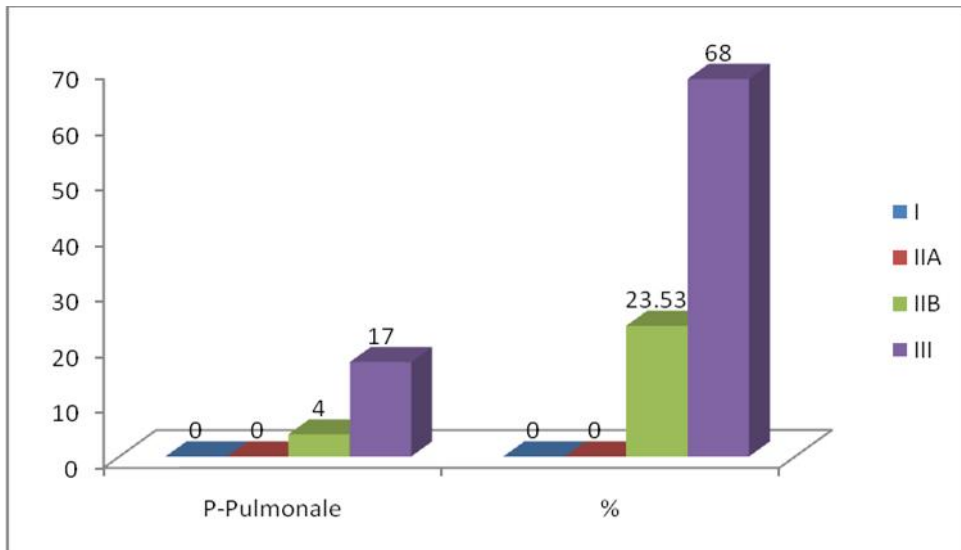


Figure 5 prevalence of P pulmonale according to severity of disease

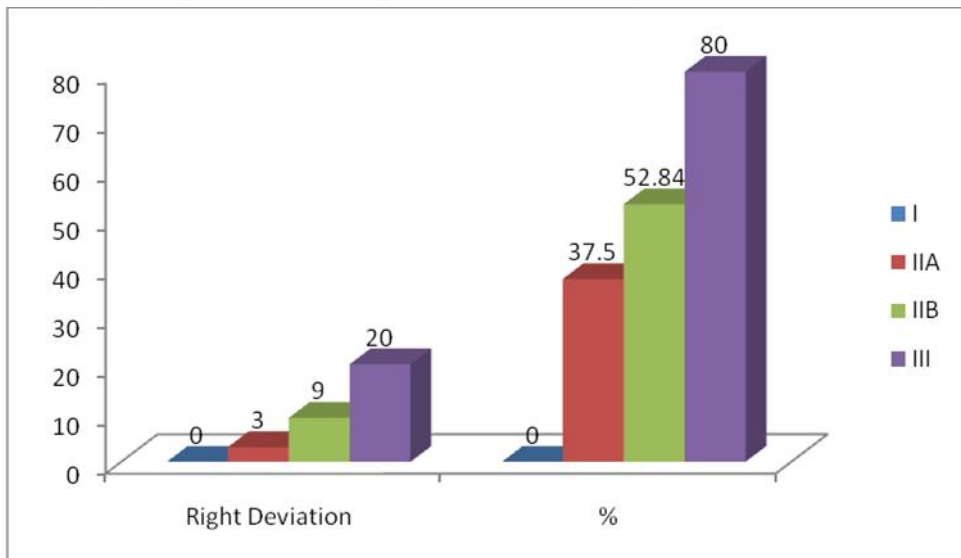


Figure 6 showing Axis deviation according to severity of disease

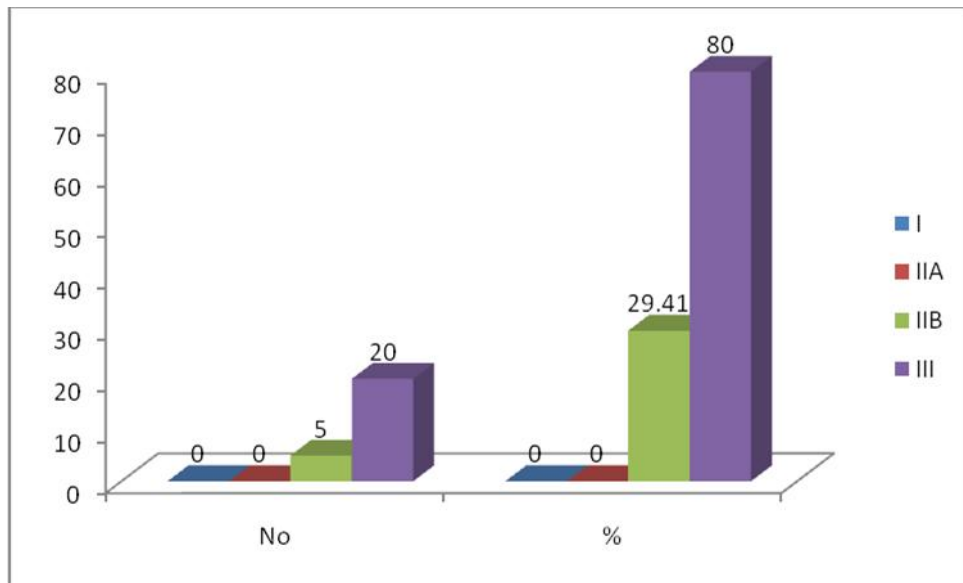


Figure 7 showing right ventricular hypertrophy according to severity of disease

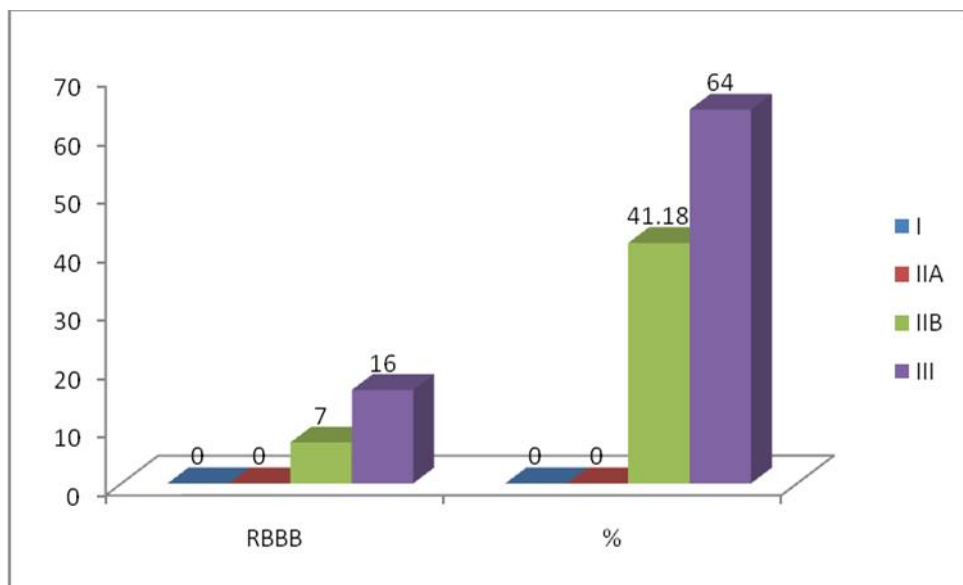


Figure 8 Showing RBBB on ECG according to severity of disease

Discussion

In the present study, age of the patients varied from 45-85 years with a mean age of 62.4 +/-9.28 years. Jatav et al⁶ reported mean age of 63.18 years in their study with range of 50-70 years. Sekhar et al⁷ and Suma KR⁸ reported maximum cases in age group of 55-64 years.

The male to female ratio was 6:1 in our study. Jatav et al⁶ reported 6.14:1, Radha krishnan et al⁹ had 84 % of male cases while Vikhe¹⁰ reported 88 % of cases were males.

The duration of symptoms ranged from 4-19 years in our study with mean duration of 10.14 +/- 3.99 years. Jatav et al⁶ reported 7.58 years as mean age in their study while it was 8.4 years reported by Radha krishnan.⁹

84 % of cases in our study had severe disease (stage 2B and 3), Jatav et al⁶ reported 30-49 % cases had severe disease. Dave et al¹¹ reported 38 % cases had severe disease. Sekhar et al⁷ reported similar findings to our study.

80 % of cases in our study were smokers while 48 % were exposed to environmental pollution. Cough, dyspnoea and CHF were the commonest symptoms present in 88 %, 98 % and 30 % cases respectively. Similar findings were reported by Radhakrishnan⁹, Jatav⁶ and Sekhar.⁷

Electrocardiographic evaluation revealed the 30 % of cases had no changes on surface ECG, similar findings were also reported by Bijana Lazovic¹² and Radha krishnan.⁹ P Pulmonale was the commonest finding, present in 23.5 % cases of Stage 2 B disease and in 68 % cases of stage 3 disease. Radha krishnan⁹ et al reported P pulmonale in 17.77% cases of mild disease and in 100 % cases of severe disease. Miriam J Warnier¹³ reported that prevalence of P pulmonale increased with duration of disease. In our study, as the duration of disease increased the prevalence of P pulmonale increased from 16.67 % in early disease to 60 % in late disease (17-20 years.) There was a significant statistical difference when comparing 4-8 years and 9-12 years and between 4-8 years and 13-16 years. (Figure 9)

Right Axis Deviation (RAD) was present in 37.5 % cases in stage 2A disease, in 52.84 % cases in stage 2B and in 80 % cases in stage 3 disease. There was a significant difference when comparing stage 2A to stage 3 ($p < 0.05$) (Figure 10) Similar findings were reported by Deepak Gupta et al¹⁴, Hina Banker¹⁵, Singh et al¹⁶ and Jaydev S Mod.¹⁷

RVH was seen in 29.4 % cases of stage 2 B disease and in 80 % of stage 3 disease. As the severity of COPD increases, there is a statistically significant difference in the development of RVH. Louridas G et al,¹⁸ Kudaiberdiev et al¹⁹ reported incidence of 45.09 and 48.7 % cases in their studies respectively.

On analysing the data of development of RVH with duration of disease, we found that prevalence of RVH increased with increasing duration of disease. It was 22.22 % in 4-8 years duration and gradually increased to 66.67 % in 9-12 and 13-16 years. There was a significant ($p < 0.01$) difference when comparing RVH in 4-8 years and 9-12 years also between ($p < 0.05$) on comparing 4-8 years and 13-16 years. (Figure 11)

Satish Kinagi²⁰ showed that complications of COPD like pulmonary hypertension, cor pulmonale were better found with ECG and echocardiography. Lokender Dave¹¹ showed in his study that the stage of COPD is proportional to the prevalence and severity of PAH.

Our study also showed that parameters on ECG demonstrating Right ventricular hypertrophy, right axis deviation and right atrial enlargement are a function of the severity and duration of COPD. The ECG can be used intelligently to find out the harmful effects of COPD on the cardiac structure and functions and measures to stop the damage early can be instituted.

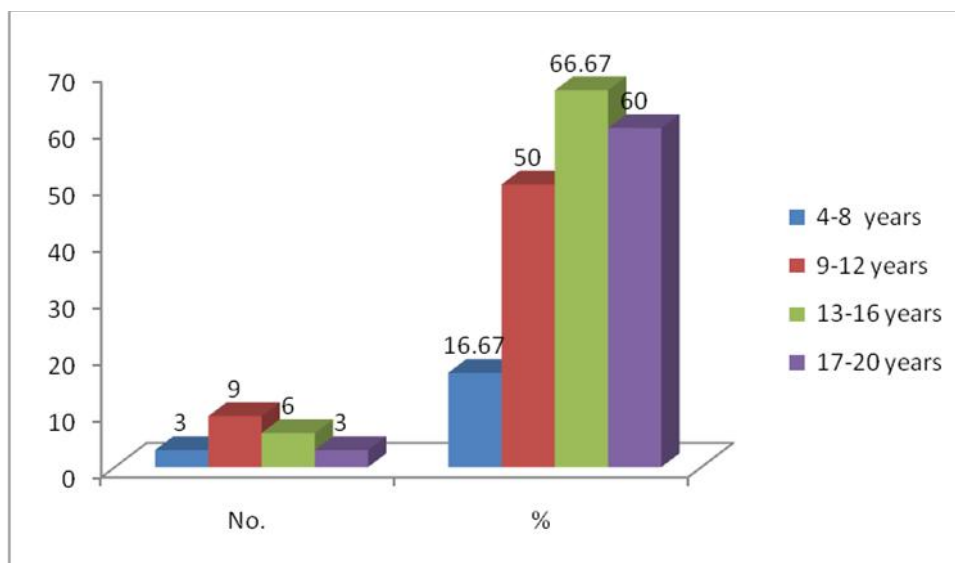


Figure 9 Comparison of P pulmonale according to duration of disease

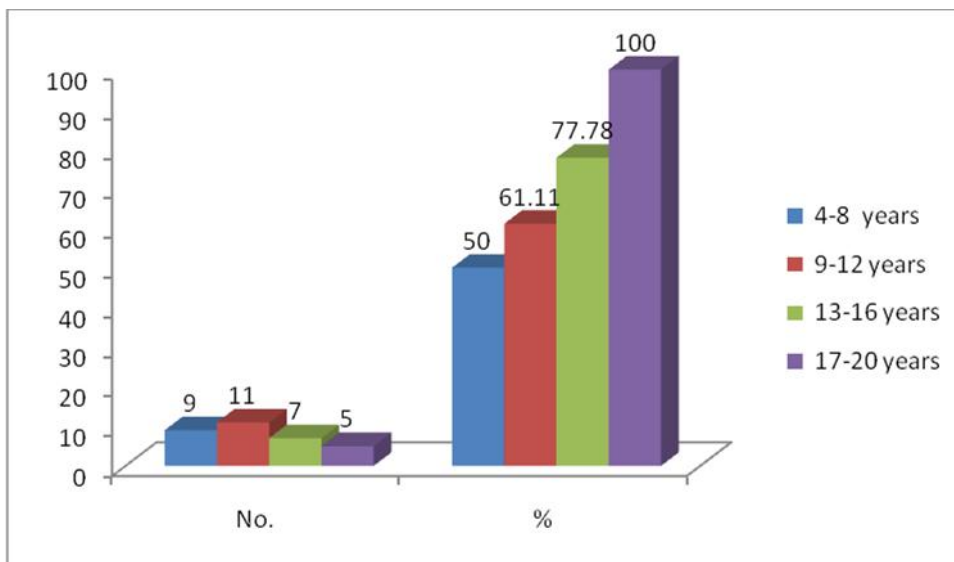


Figure 10 Comparison of QRS Axis deviation according to duration of disease

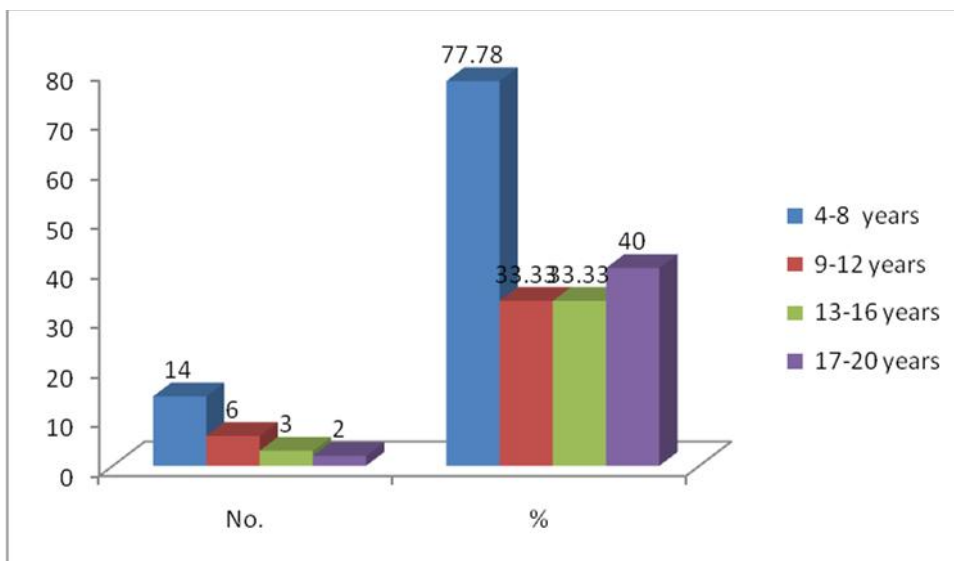


Figure 11 Comparison of right ventricular hypertrophy according to duration of disease.

Conclusion

ECG is able to diagnose cardiac involvement at early stage and the cardiac effects of COPD are related to severity and duration of COPD. Proper institution of therapy can mitigate long term complications of COPD and improve the quality of life in patients of COPD.

References

1. J. Reilly, Silverman. chronic obstructive pulmonary disease. In: Kasper Dennis, Hauser Stephen, Jameson J. Larry, S. Fauci anthony,

2. Longo, Loscalzo. Harrison's principles of internal medicine 19th edition, from New York, NY:McGraw Hill. 2015;2:1700.
3. Chen JC, Mannino DM. Worldwide epidemiology of chronic obstructive pulmonary disease. Curr Opin Pulm Med. 1999;5:93-9.
4. Murray CJ, Lopez AD. Global mortality, disability, and the contribution of risk factors: Global Burden of Disease Study. Lancet. 1997;349:1436-42.
5. Veigi G, Scoqnamiqilio A, Baldacci S, Pistelli F, Carrozzi L. Epidemiology of chronic obstruction pulmonary disease (COPD) Respiration2001;68:4-19.

5. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. Executive summary. Medical Communications Resources, Inc; 2007:1-43.
6. Vinod Singh Jatav, S. R. Meena, Shivcharan Jelia, Pankaj Jain, Devendra Ajmera, Vinit Agarwal, Chirangee L. Dayma, Mohd. Arif. Echocardiographic findings in chronic obstructive pulmonary disease and correlation of right ventricular dysfunction with disease severity. Jatav VS et al. Int J Adv Med. 2017Apr;4(2):476-480.
7. Sekhar CG, Sammaiah P, Bookya K, Balaji B. Study of cardiovascular complications in chronic obstructive pulmonary disease with reference to ECG and 2D echocardiography findings. Am J Pharm Health Res. 2016;4(1):97-111.
8. Suma KR, Srinath PS. Electrocardiographic and echocardiographic changes in chronic obstructive pulmonary disease (COPD) of different grades of severity. J Evol Med Dent Sci. 2015;4(30):5093-101.
9. Radha Krishnan D, Barama Srihari. A study on the severity of right ventricular dysfunction in correlation with the severity of lung dysfunction in chronic obstructive pulmonary disease patients-COPD. The American Journal of science and medical research 2015;1(1):112-119. ISSN: 2377-6196.
10. Vikhe VB, Shende PS, Patil RS, Tamakuwala KK, Patil AS, Gupta AP. Cardiovascular complications in chronic obstructive pulmonary disease with reference to 2D echocardiography findings. Natl J Med Res. 2013;3(4):385-8.
11. Dave L, Dwivedi P, Srivastava N, Yadav BS, Dohre R. A study of cardiovascular manifestations of COPD. Int J Res Health Sci[Internet]. 2014;2(3):812-7.
12. Lazovi B, Svenda MZ, Mazi S, et al. Analysis of electrocardiogram in chronic obstructive pulmonary disease patients. Med Pregl 2013;66(3-4):126-129.
13. Miriam J Warnier, Frans H Rutten, Mattijs E Numans, et al. Electrocardiographic characteristics of patients with chronic obstructive pulmonary disease. Journal of Chronic obstructive Pulmonary disease, COPD 2013;10:62-71. ISSN: 1541-2555 print / 1541-2563.
14. Deepak Gupta, Pradeep Agrawal, Kothari RP, et al. Electrocardiographic changes in chronic obstructive pulmonary disease-correlation with air flow limitation. IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2015;14(9):49-52. e-ISSN:2279-0853, p-ISSN:2279-0861. www.iosrjournals.org.
15. Hina Banker, Anita Verma. Electrocardiographic changes in COPD. NHL Journal of Medical Sciences 2013;2(2):55-58.
16. Singh VK., Jain SK. Effects of airflow limitation on the electrocardiogram in chronic obstructive pulmonary disease (COPD). Indian Chest Dis Allied Sci. 1989;31(1):1-8.
17. Jayadev S Mod, Parthavi Khandhar, Kanhai Lalani. Ecg changes in chronic cor pulmonale. Indian Journal Of Applied Research 2014;4(12):ISSN-2249-555X.
18. Louridas G, Angomachalelis N, Patakas D, Stavropoulos C, Right ventricular echocardiographic, vectrocardiographic and electrocardiographic study in cor pulmonale, Acta Cardiol 1980;35(6):429-36.
19. Kudaiberdiev Z, Diagnosis of right ventricular hypertrophy during pulmonary heart disease in patients with chronic bronchitis. Klin Med. (Mosk) 1991;69(5):90-3.
20. Sathish kinagi, Sharan Patil, Sayeeda Afiya, et al. Analysis of chronic obstructive pulmonary disease with clinical parameters, ECG, and Echo. Journal of Evolution of Medical and Dental Sciences 2014;3(57):12864-12880. DOI:10.14260/jemds/2014/3710.

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