Original Research Article

Clinical and radiological profile among cor pulmonale patients in a tertiary care hospital

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Abstract

Background: Cor pulmonale is the cardiac disease caused by a lung dysfunction. This disease is severe and denotes the advanced stage of a pulmonary disease. Our study aimed to describe the clinical profile, radiological features electrocardiography (ECG) and Echocardiography (ECHO) changes in clinically proven cases of cor pulmonale. **Materials and Methods:** 150 patients who were diagnosed to have cor pulmonale based on the inclusion criteria were selected from medical wards of tertiary care hospital. The study was done for a period of 2 years and detailed history and physical examination was noted in all the selected patients along with chest x ray pa view, 12 leads ECG and ECHO **Results:** Among 150 patients 108(72%) were males and the peak incidence was found in 4th, 5th, 6th decades of life. Among 150 patients 96 (54%) were smokers. 60% were diagnosed to have chronic bronchitis with or without emphysema. Chest X ray showed details relevant to the clinical profile. ECG showed 52 % with Right Ventricular Hypertrophy (RVH), 62% with Right Axis Deviation (RAD), 32% with Right Bundle Branch Block (RBBB) and 71 % with P pulmonale. Every patient showed echo features suggesting of cor pulmonale. **Conclusion:** Our study found out that smoking attributed to pulmonary disease which either can be chronic bronchitis or COPD eventually leads to cor pulmonale. There are many definitive signs and radiological features which relates to cor pulmonale. But each signs and features differs according to the underlying pulmonary diseases. ECHO can be used as a definitive non invasive technique to determine cor pulmonale at an early stage

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INTRODUCTION

Heart and lung which occupies the chest cavity are connected in many ways. But nobody thought about the link between these two organs in their diseased conditions until the start of 20th century. The term cor pulmonale is introduced by the third decade of nineties to the medical literature. Cor pulmonale is defined as a change in the structure and function of the right ventricle (RV) of the heart caused by a primary disorder of the respiratory system. Right ventricular disease caused by coronary malfunction is not considered as cor pulmonale as such but it can later lead to cardiac complications.1The definition of cor pulmonale is now fairly universally accepted as “alteration in structure and function of the right ventricle resulting from diseases affecting the structure and function of the lung or its vasculature”. This specifically excludes the alterations resulting from diseases of the left ventricle or congenital heart disease.[2] The reasons which lead to cor pulmonale is multiple ; those characterized by a limitation to airflow (COPD and other causes of chronic bronchial obstruction), restriction of pulmonary volumes from extrinsic or parenchymatous origin (restrictive lung diseases) and due to exchange

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abnormalities which are partially explained by poor ventilatory drive (respiratory insufficiency of "central" origin).[2] In Delhi, India where a large segment of the population lives under conditions of severe air pollution, the incidence of cor pulmonale has been estimated to be about 16 %. In England, cor pulmonale was responsible for 30-40 % of all clinical cases of heart failure. In United States, 10-30% of hospital admissions for congestive heart failure are due to cor pulmonale.[3] The exact prevalence/incidence of the disease is not gathered because of the lack of literature in these area. The recognition of cor pulmonale is important in health care field as it is gaining pace to become the most common cause of heart failure. The prognosis of cor pulmonale is variable depending upon the underlying pathology. Development of cor pulmonale as a result of a primary pulmonary disease usually heralds a poorer prognosis. For example, patients with chronic obstructive pulmonary disease (COPD) who develop cor pulmonale have a 30% chance of surviving 5 years.[4] There are many techniques to identify it. Echocardiogram is considered as the ideal non invasive technique to detect the presence of cor pulmonale than other techniques like chest X ray or electrocardiography.[5] The disparities in the prevalence and the causative factors of the diseases indicate influence of external or local environment for the disease. Also individual or locality based differences can be noticed in the radiological investigations.[6] So we aim to study the clinical profile of the disease along with its radiological features to make a better picture which will further aid others in early recognizing and treating the disease.

MATERIALS AND METHODS

A cross sectional observational study was conducted among Cor pulmonale patients admitted in the Department of General Medicine in Shri Sathya Sai medical college and research institute, Kancheepuram district, Tamil Nadu. The patients were selected by simple random sampling. The study was conducted for a period of two years (June2016 to May 2018). All the cor pulmonale patients included in the study were diagnosed by a clinical history with cough with Sputum, paroxysmal cough, dyspnea, Fluid retention with edema and ascites, recurrent chest infections, cyanosis, fatigue, chest pain, syncope and palpitation. Also those with General physical examination suggesting heart failure and Radiological examination, electrocardiographic and echocardiographic changes associated with cor pulmonale. Patients with congenital heart disease, valvular or myocardial disease, arterial occlusive disease from emboli, primary pulmonary hypertension and those with left heart diseases were excluded from the study. After obtaining informed consent subjects were interviewed about their socio-demographic details (age, occupation, and smoking status) and symptom details. After physical examination, detailed investigations were done including hematology, urine, sputum, Chest X ray, electrocardiography (ECG), echocardiography and pulmonary function test (PFT). Data was entered in Micro Soft Excel and analyzed using statistical software. Descriptive details were presented as frequencies, means and standard deviations. Inferential statistical methods were used to find any significant association. P value less than 0.05 was considered as significant.

RESULTS

Out of the 150 subjects, majority 108(72%) were males and most 111(74%) of the subjects belonged to less than 60 years. Most 40 (26.66%) of the subjects belonged to 50-59 years. Half 75(50%) of the cases occurred from the month of December to March. Majority 76(50.67%) of the subjects were daily wagers.

Table 1: Age distribution among the study population

Age (years)	Frequencies	percentage
30 - 39	34	22.66%
40 - 49	37	24.66%
50 - 59	40	26.66%
60 - 69	23	15.33%
70 - 79	16	10.66%

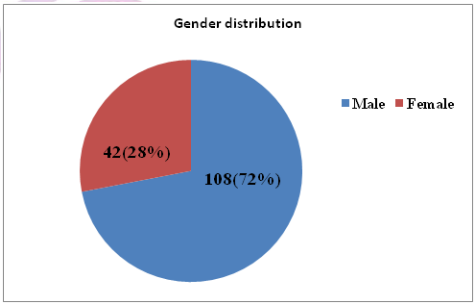

Figure1: Gender distribution among the study population (n = 150)

Majority 108(72%) of the subjects were males among the study population. Among 150 subjects, 96 (54%) were smokers (More than 10 cigarettes/beedis per day). Out of that 70(72.92%) were smoking for a period of more than 10 years.

Table 2: Duration of symptoms among the study population

Duration of symptoms	Frequency	Percentage
1 - 5	70	46.66%
6 -10	66	44%
11 -20	9	6%
>20	5	3.33%

Most of the subjects 70(46.66%) had a symptom duration of 1-5 years and 5(3.33%) of subjects had a symptom duration of more than 20 years. All subjects had symptoms of cough with expectoration and breathlessness. Majority of the subjects had swelling of

limbs 145(96.66%), pain abdomen 123(82%) and loss of appetite 120(80%). Other symptoms like hemoptysis 56(37.33%0, fever 48(32%), chest pain 45(30%) and palpitations 14(9.33%) were present for the subjects among the study population. About 135(90%) of the subjects had cyanosis, 110(73.33%) had clubbing and 129(86%) had pedal edema on general examination. Respiratory system examination showed the presence of tachypnoea, ronchi and capitation among all the cases. Most of the subjects had barrel shaped chest 125(83.33%), decreased chest expansion 147 (98%) and decreased breath sounds 110(73.33%). Majority of the subjects had loud P2 139(92.66%), Raised JVP 133(89%), left parasternal heave 132(88%), dullness in the 2nd left intercostals space 123(82%) and tricuspid regurgitation 125 (83.33%).

Table: 3 Etiology for cor pulmonale among the study population

Causes	Frequency	Percentage
Chronic bronchitis with emphysema	90	60%
Bronchial asthma	19	12.66%
Bronchiectasis	18	12%
Old Pulmonary Tuberculosis	22	14.66%
Kyphoscoloiosis	1	0.66%

Most of the study subjects 90(60%) had a history of chronic bronchitis with emphysema which preceded cor pulmonale. Hematology examination showed that in most of the cases the hemoglobin percentage was between 8gm % to 14gm%, except in 7 patients where the hb% was between 4 gm % to 7gm% who required blood transfusion. For majority of the subjects 135(90%) had a total leucocyte count between 4,000 to 11,000cells/cumm and 15 (10%) subjects had count > 11,000cells/cumm. Erythrocyte Sedimentation Rate was raised in more than half of the subjects and urine examination showed normal in all subjects except for traces of albumin in some. Sputum examination for AFB was done in subjects with X ray suggestive of pulmonary Koch's. In 6 (4%) subjects sputum AFB was positive. Sputum for culture and sensitivity was done for all patients. In few patients the sputum culture showed staphylococcus, Klebsiella and E-coli organisms.

Table 4: Chest X ray characteristics among the study population

Signs	No of cases (n=150)	Percentage
Chronic bronchitis with emphysema	90	60%
Enlarged Transverse Diameter of cardia	70	46.66%
Prominent pulmonary conus	32	21.33%
Right Descending Pulmonary Artey diameter > 16mm	49	32.66%
Bronchiectasis	18	12%
Old PTB	22	14.6%
Kyphoscoliosis	1	0.6%

The table shows that majority of the subjects had X ray features of chronic bronchitis with emphysema 90 (60%) and enlarged Transverse Diameter of cardia 70(4.66%).

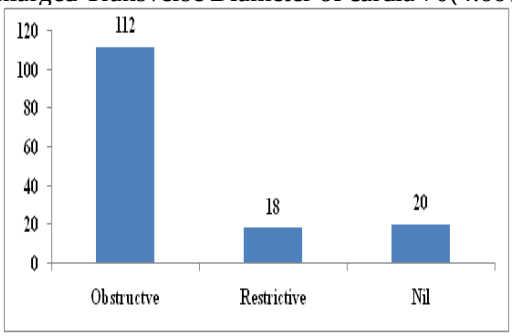

Figure 2: Pulmonary function test (PFT) features among the study population (n = 150)

The figure shows that majority 112 (74.67%) of the subjects showed an obstructive type of pulmonary function test.

Table 5: Electrocardiography findings among the study population

Findings	Frequency	percentage
P pulmonale	107	71%
Right axis deviation	92	62%
Right ventricular hypertrophy (RVH)	77	52%
Right bundle branch block (RBBB)	48	32%
Low voltage complex	62	42%
Arrhythmias	60	40%

The table shows that majority of the subjects showed P pulmonale 107(71%), right axis deviation 92(62%) and right ventricular hypertrophy 77(52%). The echocardiography investigation showed that all subjects present with enlarged right atrium and right ventricle with pulmonary artery hypertension either associated with trivial or moderate tricuspid regurgitation. Only 5 (3%) patients who were known case of COPD (Chronic Obstructive Pulmonary Disease) with hypertension showed global hypokinesia.

DISCUSSION

In our study we aimed to study the clinical and investigation profile of cor pulmonale patients. Our study showed an increased incidence in the 5th decade of life. Also our study showed an increased presence in third and fourth decades of life. This finding is consistent with other studies.[6,8] This study showed an increased preponderance of the disease towards lesser age group. This can be due to the fact of increased environmental pollution and work related exposure. Also tobacco exposure in the early stages of life ca be attributed to the increased presence. In our study majority of the cor pulmonale subjects were males. This finding is consistent with other studies.[7,9] Increased male incidence can be attributed to the tobacco usage or pollution exposure or

showed the general neglect about the risk factor avoidance. In our study majority among the population were agriculturists and daily wagers. This finding also is similar to other studies.[7,10] This can be attributed to the increased exposure to outside pollutants leads to the occurrence in susceptible people. In the study majority 96(54%) were smokers and out of which majority 70(72.92%) were smoking for more than 10 years. This strong association between smoking and cor pulmonale can be attributed to the development of COPD, progressing to cor pulmonale. This finding is also consistent with many studies[6,11,12] where smokers are more prone to COPD which exacerbates into COPD and then to heart failure. The occurrence of disease in non smokers can be attributed to the exposure to indoor air pollution and tobacco exposure in their work place In our study we found an increased incidence of cor pulmonale from December to March which attributes to the winter season where indoor and outdoor pollution get augmented along with exacerbation of underlying pulmonary disease leading to cor pulmonale. In our study we found that majority 136 (90.67%) had symptom duration of less than 10 years which is similar to other studies.[6,13] In the study majority 90(60%) had an underlying pulmonary disease as chronic bronchitis with emphysema. This finding is similar to studies[12,14] In some studies[7,15] pulmonary tuberculosis and COPD constitute majority of pre existing pulmonary diseases. Chest X ray finding in our study showed chronic bronchitis with emphysema 60%, enlarged TD of cardia 46.66%, RDPA>16 mm 32.66%, prominent pulmonary conus 21.33%, bronchiectasis 12%, old PTB 14.6% and Kyphoscoliosis 0.6%. These findings are consistent with other studies1[2,16] projecting the evidence of underlying pulmonary disease. In our study RDPA>16 mm was present in 32.66% compared to that of 62%[12] and 77% [17] in other studies. In our study most common sign present among subjects was raised Jugular Venous pressure 89% and left parasternal heave 89%, also loud P2 was present. This finding also correlated in other studies[7,15] which thereby can be taken as a classical must present sign in cor pulmonale. Also the study showed the presence of cyanosis 90% and presence of obstructive features of lung disease in physical examination. Similar findings were present in other studies.[7,18] The presence or appearance of the clinical signs and examination findings depend on the duration of the symptoms of the underlying pulmonary diseases. In our study that majority 112 (74.67%) of the subjects showed an obstructive type of pulmonary function test which is similar to a study[12] where 96% had obstructive type. This shows the increased presence of such underlying pulmonary disease which eventually lead to cor pulmonale. In our study ECG findings shown by the subjects were P pulmonale 71%, Right axis deviation 62%, right ventricular hypertrophy 52%, RBBB 48%, low voltage complex 4% and arrhythmias 40%. Increased incidence of P pulmonale, RVH and right axis deviation present in this study is similar to many studies[6,12] which show that presence of P pulmonale can be a definitive sign of cor pulmonale. In this study echocardiography showed an enlarged right atrium and right ventricle with pulmonary artery hypertension either associated with trivial or moderate tricuspid regurgitation in every patient. This finding also similar to other studies.[6,12]

CONCLUSION

In our study we found that majority of smokers in the fourth to fifth decade with an underlying pulmonary disease of chronic bronchitis eventually end up in cor pulmonale. Chest X ray, ECG and ECHO gives many definitive features in identifying this disease. The description of clinical and radiological profile of the subjects made the study a valid one as the presence of these features can be considered as a red flag sign towards the progression of cor pulmonale. So the results are important in consideration to an emergency physician, cardiologist or a medical practitioner. Our study lacked the presence of non cor pulmonale subjects which would have lead to derivation of further related features among the cor pulmonale subjects. Absence of details in the treatment and follow up also can be considered as a limitation of the study.

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