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A prospective study on etiology and clinical profile of chronic Cor pulmonale

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Abstract

Background: Cor pulmonale accounts for approximately 6% to 7% of all adult heart disease cases in the United States and is involved in 10% to 30% of hospital admissions for congestive heart failure nationwide.

Materials and Methods: This prospective study was conducted at Al-Ameen Medical College and Hospital in Vijayapura, adhering to specific inclusion and exclusion criteria. The sample included 73 cases, with detailed medical histories and symptom analyses collected from each participant. A thorough clinical examination was also performed.

Results: Among the 73 patients, 25 (34.3%) were aged 40 to 50 years, while another 25 (34.3%) were over 60 years. The majority were male (80.8%), and 50 patients (68.5%) had a history of smoking. All participants presented with symptoms of breathlessness, cough, and swelling of the feet. Physical examinations showed tachypnea, crepitations, and rhonchi in all individuals. Chronic bronchitis and emphysema were identified as the leading causes of chronic cor pulmonale in 44 patients (60.2%).

Conclusion: This study found that chronic bronchitis and emphysema were common causes of chronic cor pulmonale, primarily affecting middle-aged and older individuals, with males affected more than females and smoking identified as a major contributing factor. Common symptoms included breathlessness, cough, and lower extremity swelling. Physical examinations frequently revealed tachypnea, crepitations, rhonchi, and notable signs such as epigastric pulsations, loud P2, pansystolic murmur of tricuspid regurgitation, and parasternal heave. Chronic cor pulmonale has a substantial impact on both pulmonary and cardiac function; 53.7% of patients are at risk of readmission within one year of discharge. The condition is generally associated with a poor prognosis. This highlights the importance of early detection of signs and symptoms to enhance management outcomes.

Keywords: Chronic cor pulmonale; Clinical profile; Etiology; Chronic bronchitis; Emphysema

1. Introduction

Cor pulmonale is a disease in which respiratory conditions, including diseases of the bronchial-lung tissue and thoracic or pulmonary vascular diseases cause changes to the right ventricle's structure and function. Pulmonary Hypertension (PH) is a major risk factor in the development of cor pulmonale^[1]. COPD is the primary cause of chronic cor pulmonale^[2]. In the new diagnostic classification of Pulmonary Hypertension, cor pulmonale corresponds to the third group of the classification (PH associated with disorders of the respiratory system and/or hypoxemia)^[3]. Cor pulmonale is estimated to account for 6-7% of all types of adult heart disease in the United States^[4] and accounts for 10-30% of decompensated heart failure-related admissions in the United States^[5]. Chronic cor pulmonale has a substantial impact on both pulmonary and cardiac function; 53.7% of patients are at risk of readmission within one year of discharge^[6]. Pulmonary hypertension is the "sine qua non" of cor pulmonale. Accordingly, the mechanism of cor pulmonale are first those of Pulmonary hypertension. In chronic respiratory diseases, PH results from increased pulmonary vascular resistance

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(PVR), whereas cardiac output and pulmonary “capillary” wedge pressure (PCWP) are generally normal; PH is said to be precapillary^[1]. The factors leading to an increased PVR in chronic respiratory disease are numerous but alveolar hypoxia is by far the most predominant^[7]. Signs and symptoms of cor pulmonale include dyspnea on exertion (most common), fatigue, lethargy, exertional syncope and exertional chest pain, abdominal edema or distension, and lower extremity edema. Physical findings may include; Peripheral (ankle) edema, Palpable left the parasternal lift, loud S2 (accentuation of the pulmonary component of the second heart sound), holosystolic murmur of tricuspid regurgitation at the left lower sternal border and ascites^[4]. In this regard, our study was designed to identify the etiology and to examine the clinical profile in patients with chronic cor pulmonale.

Objectives of study

To identify the etiologies in patients with chronic cor pulmonale that lead to the disease and to study their clinical profiles.

2. Materials and methods

All patients admitted to Department of General Medicine, Al-ameen medical college and hospital, vijayapura from september 2022 to march 2024, with chronic cor pulmonale were taken for the study considering the inclusion and exclusion criteria.

The study included patients aged 18 years and older diagnosed with chronic cor pulmonale and confirmed right ventricular dysfunction, based on clinical history, general physical examination, electrocardiography, and echocardiography. Patients younger than 18 years and those with underlying heart disease that could lead to right ventricular failure were excluded from the study. Data were collected using a structured proforma designed to fulfill the study objectives. A detailed history was obtained, and a physical examination was conducted, encompassing evaluations of vital signs and evaluations of the cardiovascular, respiratory, abdominal, and central nervous systems. The clinical profile of each patient was recorded, and necessary investigations were performed.

2.1. Statistical analysis

The data obtained was entered in a Microsoft Excel sheet, and statistical analysis was performed using statistical package for the social sciences (version 20). Descriptive analysis was performed using frequency and percentages.

3. Results

Table 1 Distribution of age

Age groups (in Years)	Number of cases	Percentage
<40	9	12.3%
40 – 50	25	34.3%
51-60	14	19.1%
>60	25	34.3%

INFERENCE: Among the 73 cases, 25 (34.3%) were in the 40–50 years age group, 25 (34.3%) were over 60 years old, 14 cases (19.1%) were between 51 and 60 years of age and 9 cases (12.3%) were under 40 years old.

Table 2 Distribution of gender

Gender	Number of cases	Percentage
Male	59	80.8%
Female	14	19.2%

INFERENCE: Among the total of 73 cases, 59 (80.8%) were males and 14 (19.2%) were females

Table 3 Distribution of smoking habit

Smoking	No. of cases	Percentage
Absent	23	31.5%
Present	50	68.5%

INFERENCE: Among the 73 total cases, 50 (68.5%) had a smoking habit while 23 (31.5%) did not.

Table 4 Distribution of symptoms

Symptoms	No. of cases	Percentage
Breathlessness	73	100
Cough	73	100
Pain abdomen	46	63.1
Loss of appetite	55	75.3
Swelling of feet	73	100
Fever	13	17.8
Hemoptysis	13	17.8
Palpitation	15	20.5
Chest pain	20	27.4

INFERENCE: Among the subjects, all 73 (100%) experienced symptoms of breathlessness, cough, and swelling of the feet. Additionally 46 (63.1%) had pain abdomen, 55 (75.3%) had a loss of appetite, 13 (17.8%) had a fever, 13 (17.8%) had hemoptysis, 15 (20.5%) had palpitations, and 20 (27.4%) had chest pain.

Table 5 Distribution of physical findings

Physical Findings	No. of cases	Percentage
Tachycardia	38	52.1
Tachypnea	73	100
Downward liver dullness	20	27.4
Obliteration of cardiac dullness	20	27.4
Impalpable apical impulse	20	27.4
Epigastric pulsation	68	93.2
Parasternal heave	53	72.6
Loud P2	67	91.8
PSM(TR)	49	67.1
Crepitations and Rhonchi	73	100
Ascites	28	38.3

INFERENCE: Among the subjects, all 73 (100%) showed signs of tachypnea, crepitations and rhonchi. Additionally, 38 (52.1%) showed signs of tachycardia, 20 (27.4%) had downward liver dullness, 20 (27.4%) had obliteration of cardiac dullness, and 20 (27.4%) had an impalpable apical impulse. Furthermore, 68 (93.2%) showed epigastric pulsation, 53 (72.6%) had a parasternal heave, 49 (67.1%) had a PSM (TR), 67 (91.8%) had a loud P2, and 28 (38.3%) showed signs of ascites.

Table 6 Distribution of causes of chronic cor pulmonale

Causes of chronic cor pulmonale	No. of Cases	Percentage
Chronic bronchitis and emphysema	44	60.2
Bronchial asthma	4	5.4
Bronchiectasis	12	16.4
Sequelae of pulmonary tuberculosis	10	13.7
Kyphoscoliosis	1	1.3
Interstitial lung disease	2	2.7

INFERENCE: Among the 73 cases, 44 (60.2%) had chronic bronchitis and emphysema as the cause of chronic cor pulmonale, 12 (16.4%) had bronchiectasis, 10 (13.7%) had sequelae of pulmonary tuberculosis, 4 (5.4%) had bronchial asthma, 2 (2.7%) had interstitial lung disease, and 1 (1.3%) had kyphoscoliosis.

4. Discussion

4.1. Age

In our study, 25 (34.3%) patients were between 40 and 50 years of age, 25 (34.3%) were over 60 years of age, 14 (19.1%) were between 51 and 60 years of age, and only 9 (12.3%) were under 40 years of age. The peak incidence of chronic cor pulmonale in our study was observed in the 4th, 5th, and 6th decades of life (Table 1). This finding is consistent with the study by Debabrata et al^[8], where a maximum of 25% of patients were in the 60 to 69 years age group and 15% were under 40 years. Additionally, the study by Nagwanshi et al^[9], reported that 29.72% of cases were in the >60 years age group, while 25.6% of cases were in the 40–50 years age group. Similarly, Malipatil et al^[10], reported that the peak incidence of chronic cor pulmonale was in the middle and older age groups.

4.2. Gender

In our study, out of a total of 73 cases, 59 (80.8%) were male and 14 (19.2%) were female (Table 2). Suresh Kumar Cherlopalli et al^[11] reported that out of their cases, 83.3% were male and 16.6% were female. Similarly, Thakker et al^[12] found that out of their cases, 86.6% were male and 13.3% were female.

4.3. Smoking habit

In our study, out of a total of 73 cases, 50 patients (68.5%) reported a history of smoking, while 23 patients (31.5%) did not (Table 3). Divya et al^[13] found that 70% of their patients had a smoking history. Numerous studies have identified smoking as a significant contributor to chronic cor pulmonale. Suresh Kumar Cherlopalli et al^[11] reported that 85.5% of their patients had a history of smoking.

4.4. Symptoms

In our study, all 73 cases presented with symptoms of breathlessness, cough, and peripheral edema (Table 4). These findings are consistent with those reported by Malipatil et al^[10], who noted that 100% of their participants experienced breathlessness and swelling of the feet, with 90% also exhibiting cough with expectoration. Similarly, Debabrata et al^[8] found that 100% of their cases had both breathlessness and cough, while 93.75% presented with edema.

Additionally, we observed that 46 patients (63.1%) reported abdominal pain. Debabrata et al^[8] documented abdominal pain in 70% of their patients.

Our results revealed that 55 cases (75.3%) experienced a loss of appetite, which is consistent with the study by Sunil Babu et al^[14], where a loss of appetite was reported in 80% of cases. Furthermore, Gireesh et al^[15] noted that 92% of cases exhibited this symptom, indicating the chronic nature of the disease.

Fever was noted in 13 patients (17.8%), which is consistent with the findings of the study by Malipatil et al^[10], which reported that 16% of their patients had fever.

Hemoptysis was present in 13 cases (17.8%), correlating with the findings of the study by Suresh Kumar Cherlopalli et al^[11], which reported hemoptysis in 18.6% of cases.

In our study, 15 cases (20.5%) experienced palpitations, while 20 cases (27.4%) reported chest pain. Palpitations were observed in 20% of cases in the study by Debabrata et al^[8] and in 20% of cases in the study by Sunil Babu et al^[14]. Furthermore, chest pain was reported in 30% of cases in the study by Malipatil et al^[10].

4.5. Physical findings

In our study, all 73 participants (100%) exhibited signs of tachypnea, crepitations, and rhonchi (Table 5). These findings align with those of Malipatil et al^[10] and Divya et al^[13] both of whom reported these symptoms in 100% of their cases. Additionally, Nagwanshi et al^[9], observed tachypnea in 100% of cases, with crepitations and rhonchi identified in 94.59% of cases.

Tachycardia was observed in 38 cases (52.1%). Divya et al^[13] reported tachycardia in 48% of cases.

Our results indicated that 20 cases (27.4%) presented with signs of downward liver dullness, obliteration of cardiac dullness, and an impalpable apical impulse. In the study by Nagwanshi et al^[9], obliteration of cardiac dullness was noted in 27.02% of cases, while an impalpable apical impulse was documented in 29.72% of cases. Furthermore, Malipatil et al^[10], reported downward liver dullness in 30% of their cases.

We also found that 68 cases (93.2%) exhibited signs of epigastric pulsation. Debarata et al^[8] reported epigastric pulsation in 100% of cases.

Among our study subjects, 53 cases (72.6%) displayed signs of parasternal heave. Gireesh et al^[15], reported parasternal heave in 74% of cases, while Sunil Babu et al^[14] reported it in 76% of cases.

Our analysis identified a pansystolic murmur (PSM) of tricuspid regurgitation (TR) in 49 subjects (67.1%). In comparison, Debabrata et al^[8] recorded a murmur of TR in 62.5% of cases.

Additionally, 67 subjects (91.8%) in our study exhibited signs of loud P2. Gireesh et al^[15] found loud P2 in 96% of cases, while Divya et al^[13] noted it in 90% of cases.

Lastly, ascites was documented in 28 subjects (38.3%) in our study. Divya et al^[13] reported ascites in 40% of cases, and Nagwanshi et al^[9] observed ascites in 43.24% of cases.

4.6. Causes of chronic cor pulmonale

According to our results, the majority of cases, 44 (60.2%), were found to have chronic bronchitis & emphysema as the underlying cause of chronic cor pulmonale (Table 6).

In the study by Debabrata et al^[8] chronic bronchitis with or without emphysema was identified as the primary cause of chronic cor pulmonale in 75% of cases. Thakker et al^[12] reported that chronic bronchitis was present in 40% of cases and emphysema in 10% of cases. Gireesh et al^[15] reported that 58% of cases were attributed to chronic bronchitis combined with emphysema. Nagwanshi et al^[9] reported chronic bronchitis with or without emphysema as the most common cause in 55% of cases. According to Matina et al^[16] the prevalence of cor pulmonale among COPD patients was 68%. Additionally, Yogeswaran A et al^[17] concluded that cor pulmonale is linked to disease severity in COPD and serves as a predictor of outcomes in pulmonary hypertension associated with COPD.

Our study found bronchiectasis in 12 (16.4%) cases as a cause of chronic cor pulmonale. In comparison, Gireesh et al^[15] reported bronchiectasis in 10% of cases, Nagwanshi et al^[9] reported it in 14.86% of cases and Padmavati et al^[18] reported it in 17.3% of cases.

In our study, 10 (13.7%) cases were attributed to sequelae of pulmonary tuberculosis as a cause of chronic cor pulmonale. Debabrata et al^[8] reported that 10% of cases were due to pulmonary tuberculosis. Malipatil et al^[10] reported that 22% of cases had pulmonary tuberculosis as a cause of chronic cor pulmonale. Gireesh et al^[15] identified pulmonary tuberculosis as the cause in 14% of cases. Kotresh et al^[19] reported that cor pulmonale was prevalent in 11% of patients with pulmonary tuberculosis.

Our results showed that bronchial asthma was the cause of chronic cor pulmonale in 4 (5.4%) cases. Malipatil et al^[10] found that 8% of cases were attributed to bronchial asthma as a cause of chronic cor pulmonale.

Our results showed that interstitial lung disease (ILD) was present in 2(2.7%) cases. In comparison, Debabrata et al^[8] reported ILD in 1.25% of cases as a cause of chronic cor pulmonale, while Malipatil et al^[10] reported ILD in 2% of cases as a cause of chronic cor pulmonale.

Only 1.3% of cases in our study had kyphoscoliosis as the cause of chronic cor pulmonale. In comparison, Gireesh et al^[15] reported kyphoscoliosis as the cause in 4% of cases.

Limitation

The study was conducted at a single center with a small sample size, which may not accurately represent the broader population of individuals with chronic cor pulmonale. As a result, the generalizability of the findings may be limited.

5. Conclusion

The present study concludes that chronic bronchitis and emphysema were common causes of chronic cor pulmonale in the studied population. Males were affected more than females, and smoking was identified as a major contributing factor. The peak incidence of chronic cor pulmonale was observed in middle-aged and older individuals. The most common symptoms included breathlessness, cough, and swelling of the feet. Physical examination frequently revealed tachypnea, crepitations, and rhonchi, with additional notable findings such as epigastric pulsations, loud P2, pansystolic murmur (PSM) of tricuspid regurgitation (TR), and parasternal heave. Chronic cor pulmonale significantly affects both pulmonary and cardiac function, with 53.7% of patients at risk of readmission within one year of discharge. The condition is generally associated with a poor prognosis. This highlights the importance of early detection of signs and symptoms to enhance management outcomes.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

The study was approved by the Ethical Committee of Al Ameen Medical College Hospital, Vijayapura, Karnataka, India, on July 28, 2022.

Statement of informed consent

Informed consent was obtained from all participants included in the study.

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