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"Clinical And Etiological Characteristics Of Congestive Heart Failure: An Observational Study At Tertiary Hospital"

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ABSTRACT

Background: Heart failure (HF) remains a critical public health concern with high morbidity and mortality rates. Key contributing factors include ischemic heart disease, hypertension, diabetes mellitus, valvular heart disease, and cardiomyopathies. HF patients in India often present with greater disease severity and higher mortality compared to their Western counterparts. This study examines the clinical and etiological characteristics of HF in patients admitted to a tertiary care hospital.

Materials and Methods: A prospective, observational study was conducted on 140 patients diagnosed with congestive heart failure (CHF) over a 12-month period. Data collection included demographic details, comorbidities, clinical presentations, laboratory findings, and echocardiographic data. The study excluded patients with chronic obstructive pulmonary disease and congenital heart disease. Statistical analysis was performed to determine prevalence and outcomes.

Results: Out of 140 CHF patients, renal dysfunction (elevated serum creatinine) was observed in 45% of cases, with 60% exhibiting electrolyte imbalances. The most common electrolyte disturbance was hyponatremia (38%), followed by hyperkalemia (18%) and hypocalcemia (12%). Dyspnea (95%) and orthopnea (78%) were the most prevalent clinical symptoms, while ischemic heart disease (55%) and hypertension (65%) were the leading etiologies and comorbidities. A significant proportion of patients (46%) were classified under NYHA Class III, indicating moderate-to-severe functional limitation. The study also revealed a 12% in-hospital mortality rate, underscoring the severity of the condition.

Conclusion: CHF remains a significant healthcare challenge, especially in patients aged >45 years with comorbid conditions like hypertension and diabetes. Early identification and management of risk factors can improve outcomes. Renal dysfunction and electrolyte imbalances are common and significant factors in the management of congestive heart failure (CHF), with their presence contributing to poor outcomes and higher in-hospital mortality. Early identification and monitoring of renal and electrolyte parameters, especially in patients with advanced heart failure, are essential for optimizing treatment strategies and improving patient prognosis. The study emphasizes the need for a comprehensive approach to managing CHF, focusing on both cardiac and renal health to enhance patient care.

Key Words: heart failure in India, ischemic heart disease, hypertension, precipitating conditions

INTRODUCTION:

Heart failure (HF) is a multifaceted clinical syndrome marked by the heart's inability to meet the metabolic demands of the body due to structural or functional abnormalities[1]. Globally, HF affects approximately 26 million individuals, making it a significant global health concern. In India, the

prevalence of HF varies widely, ranging from 1.3 to 23 million, depending on regional studies and population demographics.[2,4] HF patients in India often present at a younger age and with more advanced disease compared to their Western counterparts, reflecting unique challenges in diagnosis and management. Renal dysfunction, often referred to as cardiorenal syndrome, is common in HF patients and contributes to poor prognosis. Electrolyte imbalances, including hyponatremia and hyperkalemia, are also frequently observed and can complicate management. Understanding the interplay between renal function, electrolyte balance, and heart failure severity is essential for improving patient outcomes.[5]

The rising incidence of HF in India is closely linked to the increasing prevalence of ischemic heart disease, hypertension, and diabetes mellitus. Persistent conditions such as rheumatic heart disease further contribute to the burden. These trends are exacerbated by rapid urbanization, changes in lifestyle, and limited access to healthcare resources. Consequently, HF remains a leading cause of hospitalizations and mortality, imposing a substantial economic and social burden.

This study aims to assess the clinical and etiological characteristics of CHF patients in a tertiary care setting. Understanding these profiles can guide targeted interventions to address modifiable risk factors and improve patient outcomes. By identifying common etiologies and precipitating factors, healthcare providers can adopt more effective strategies for early diagnosis, treatment, and prevention.

Materials and Methods: This prospective observational study was conducted over 12 months in the Department of Medicine at a tertiary care hospital. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was secured from all participants before their inclusion in the study. Patients aged over 18 years diagnosed with congestive heart failure (CHF) based on clinical and diagnostic criteria were included. Patients with chronic obstructive pulmonary disease or congenital heart disease were excluded.

Data collection encompassed demographic details, comorbid conditions, clinical symptoms, physical examination findings, and echocardiographic results. Renal function was assessed by measuring serum creatinine and estimated glomerular filtration rate (eGFR). Electrolyte imbalances, including sodium, potassium, and calcium levels, were also recorded**.** Descriptive statistical methods were applied to analyze the data, summarizing patient characteristics, clinical presentations, and outcomes.

Results: The study analyzed a cohort of 140 CHF patients. In addition to the clinical and etiological characteristics, renal dysfunction (e.g., elevated serum creatinine levels) was noted in 45% of the patients, and electrolyte imbalances were observed in 60%. Hyponatremia was the most common electrolyte disturbance (38%), followed by hyperkalemia (18%) and hypocalcemia (12%). Renal impairment was more prevalent in patients with advanced stages of heart failure (NYHA Class III and IV), highlighting the association between heart failure severity and renal function.

The demographic characteristics of the CHF patients in the study, including the male-to-female ratio, mean age, and age distribution. The majority of patients were male, with a mean age of 54.2 years, and a significant proportion were aged over 45.

Table1: Demographic Characteristics

Characteristic	Value
Male-to-female ratio	1.5:1
Mean age (years)	54.2 ± 10.8
Age group (>45 years)	70% (98 patients)

The most common clinical symptoms and signs observed in the CHF patients, Dyspnea, orthopnea, and paroxysmal nocturnal dyspnea were the most commonly reported symptoms, and basal lung crepitations were the most frequently observed clinical sign.

Table 2: Demographic Characteristics

Symptom/Sign	Number of Patients	Percentage %
Dyspnea	133	95%
Orthopnea	109	78%
Paroxysmal nocturnal dyspnea	84	60%
Chest pain	63	45%
Basal lung crepitations	126	90%
Peripheral edema	77	55%
Raised JVP	56	40%

Hypertension was the most prevalent comorbidity, closely followed by coronary artery disease and diabetes mellitus. These comorbid conditions are critical contributors to the development and progression of CHF.

Table 3: Comorbidities

Comorbidity	Number of Patients	Percentage %
Hypertension	91	65%
Coronary artery disease	77	55%
Diabetes mellitus	70	50%
Hyperlipidemia	56	40%

Ischemic heart disease emerged as the leading cause, followed by hypertensive heart disease and cardiomyopathies. Understanding the underlying causes is essential for targeting appropriate interventions.

Table 4: Etiology of CHF

Cause	Number of Patients	Percentage %
Ischemic heart disease	77	55%
Hypertensive heart disease	28	20%
Cardiomyopathy	21	15%
Valvular heart disease	10	7%

The precipitating factors that contributed to CHF exacerbations in the study cohort. Acute coronary syndrome and non-compliance with medications were the most common triggers for worsening of heart failure symptoms.

Table 5: Precipitating Factors

Cause	Number of Patients	Percentage %
Acute coronary syndrome	35	25%
Non-compliance with medications	25	18%
Uncontrolled hypertension	20	14%
Infections	17	12%

Patients based on the New York Heart Association (NYHA) functional classification, which assesses the severity of heart failure based on symptoms and physical limitations. Nearly half of the patients were in NYHA Class III, indicating moderate-to-severe functional limitation.

Table 6: Distribution According to NYHA Class

NYHA Class	Number of Patients	Percentage %
Class I	8	6%
Class II	20	14%
Class III	64	46%
Class IV	41	29%
Unknown	7	5%

Clinical management of CHF patients in the study. Infection treatment and inotropes were the most common interventions needed, followed by intubation/ventilation in critical cases.

Table 7: Clinical Management

Management	Number of Patients	Percentage %
Infection treatment	27	19%
Inotropes	17	24%
Intubation/ventilation	8	11%
Blood transfusion	7	10%
Dialysis	5	7%
Valve repair/replacement	4	6%

Table 8: Renal Function and Electrolyte Imbalances

Parameter	Number of Patients	Percentage %
Renal Dysfunction (Elevated Creatinine)	63	45%
Blood Urea Nitrogen (BUN) Elevation	56	40%
Hyponatremia	53	38%
Hyperkalemia	25	18%
Hypocalcemia	17	12%

In-hospital mortality stood at 12%, reflecting the severity of CHF cases.

Table 9: Outcomes

Outcomes	Number of Patients	Percentage %
In-hospital mortality	17	12%
Intensive interventions	14	10%

Discussion:

The study analyzed a cohort of 140 CHF patients, with key findings including a high prevalence of symptoms such as dyspnea and orthopnea, along with dominant comorbidities like hypertension and ischemic heart disease. The results were compared with similar studies to assess the similarities and differences in patient demographics, symptoms, comorbidities, and outcomes.

Our study found that 70% of the patients were over the age of 45, with a male-to-female ratio of 1.5:1. Similar findings were reported by Chaturvedi *et al.* (2016), and Harikrishnan S *et al.* (2015), who observed a similar male predominance (1.6:1) in their cohort of CHF patients. Clinical Symptoms: The most common symptoms in our cohort were dyspnea (95%) and orthopnea (78%). These findings are consistent with studies by *Vasan et al.* (2022)[8], who reported that dyspnea is present in nearly 90% of CHF patients. Our study also found that basal lung crepitations (90%) were the most common clinical sign, corroborating findings by *Patel et al.* (2018)[9], who highlighted the association of lung crepitations with left-sided heart failure, a common presentation in CHF.

Comorbidities and Etiology: Hypertension and ischemic heart disease were the most common comorbidities (65% and 55%, respectively), reflecting the findings of *Singh et al.* (2012)[10], who reported hypertension as a leading risk factor in over 60% of their CHF cohort. *Sood et al.* (2017)[11] also emphasized ischemic heart disease as the primary etiology in 50% of cases, which is similar to our finding of 55% of cases being attributable to ischemic heart disease. This highlights the critical role of these conditions in the pathogenesis of CHF.

Precipitating Factors: Acute coronary syndrome (25%) and non-compliance with medications (18%) were the most common precipitants of CHF exacerbation in our study. This is in agreement with *Khan et al.* (2021)[12], who found that acute coronary syndrome was a leading precipitant in 30% of cases, while medication non-compliance was identified in 20% of patients. The emphasis on medication adherence is crucial, as non-compliance remains a key challenge in CHF management.

NYHA Classification and Functional Status: In our cohort, 46% of patients were classified as NYHA Class III, indicating moderate-to-severe functional limitation. This is similar to the study by *Ahmed et al.* (2014)[13], who reported 47% of their CHF patients in Class III. These patients often experience significant functional limitations, which affect their quality of life and require intensive management.

Interventions and Mortality: Our study found that 12% of patients experienced in-hospital mortality, which is comparable to *Patel et al.* (2018)[14], who observed a mortality rate of 11%. The higher mortality rate in our cohort may reflect the severity of CHF cases, as suggested by the fact that nearly half of the patients were in NYHA Class III or IV. The need for interventions such as inotropes (17%) and intubation/ventilation (14%) also reflects the critical nature of the disease in our cohort.

Renal Dysfunction and Other Complications: Our study also documented significant renal dysfunction, with 45% of patients having elevated creatinine levels and 40% experiencing elevated BUN levels. These findings are consistent with *Zhao et al.* (2022)[15], who noted renal dysfunction in 50% of CHF patients. Hyponatremia (38%) and hyperkalemia (18%) were also common in our study, further reflecting the metabolic derangements associated with similarly reported electrolyte imbalances, with hyponatremia being a marker of poor prognosis in CHF.

In conclusion, the findings from our study align with existing literature, emphasizing the significant burden of comorbidities, symptoms, and complications in CHF patients. Future research should focus on optimizing management strategies, including improving medication adherence, managing precipitating factors, and addressing renal dysfunction to improve patient outcomes. The importance of early detection and appropriate interventions is also highlighted by the mortality rate observed in this study.

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