

A Study of Precipitating Factors Leading to Hospitalization in Patients of Heart Failure with Reduced Ejection Fraction at a Tertiary Care Hospital

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Abstract: *Background:* The incidence and prevalence of heart failure are rising in India; the aim of this study was to identify precipitating factors leading to decompensated heart failure and evaluate the outcome in patients with HFrEF. *Methods:* Our study was a prospective observational study which included 132 HFrEF patients hospitalized for acute decompensated heart failure. *Result:* Mean age of patients was 59±13.2 years; 59.85% were males, 40.15% were females. The most common etiologies of HFrEF were ischemic cardiomyopathy (38.6%), dilated cardiomyopathy (20.4%), valvular heart disease (17.4%). Most common precipitating factors were pneumonia (21.2%), myocardial ischemia (18.8%), dietary indiscretion/excessive oral fluid intake/IV fluids (15.1%), atrial fibrillation with fast ventricular rate (12.9%), non-compliance/inappropriate decrease in HF therapy (12.1%). Pneumonia, myocardial ischemia, worsening of renal function, valvular dysfunction and disease progression were associated with longer duration of hospital stay and high mortality. *Conclusion:* Pneumonia, myocardial ischemia and noncompliance to therapy and diet are common precipitating factors leading to acute decompensated heart failure in HFrEF patients. Patient education, regular follow-up and vaccination against respiratory infections can reduce hospitalization in HFrEF patients.

Keywords: HFrEF, Heart Failure, Precipitating Factors

1. Introduction

About 64.34 million people suffer from heart failure (HF) worldwide [1]. HF is a leading cause of repeated hospitalizations in India. Incidence and prevalence of HF are rising continuously due to rise in cardiovascular disease risk factors and high prevalence of rheumatic heart disease, anemia, tuberculosis and pericardial diseases in India. Although reliable data is lacking, it is estimated that the prevalence of HF in India ranges from 1.3 million to 4.6 million [2]. HFrEF (EF<40%) constitutes about half of all cases of HF. There are many factors that can precipitate HF hospitalization, these include myocardial ischemia, noncompliance to medications, arrhythmias, infection, uncontrolled hypertension (HTN), anemia, renal impairment, and diet [3]. Repeated hospitalizations are a strong predictor of mortality in HF patients [4]. Some HF admissions are avoidable. Understanding the preventable precipitating factors will help in HF management, reduce admission related financial burden on the patient and will help to improve the quality of life of the patient.

2. Materials and Methods

This study was a Prospective observational study carried out between January 2020 and December 2020 at a tertiary care hospital in central India. This study included 132 patients with ejection fraction of <40% and admitted for acute decompensated HF. After taking written informed consent medical history was obtained, physical examination done and laboratory data obtained. These patients were followed up till discharge from hospital / in hospital death.

All statistical analyses were performed using SPSS Statistical Package version 25.0 (SPSS Inc., IBM, Armonk, NY, USA). Categorical data are presented as numbers and

percentages, continuous variables are presented as mean ± standard deviation.

3. Results

The mean age of patients in this study was 59±13.2 years. 59.85% patients were male and 40.15% were females. Mean left ventricular ejection fraction (LVEF) was 31±8.2%. Patients had a mean hemoglobin concentration of 12.1±2.1 gm/dl and mean serum creatinine level of 1.3±0.88 mg/dl. Mean body mass index (BMI) of the patients was 28 ± 6.1 kg/m². [Table 1]

Ischemic cardiomyopathy was the most common etiology of HFrEF which was seen in 38.6% of the cases. Other etiologies of HFrEF identified were dilated cardiomyopathy seen in 20.4%, valvular heart disease seen in 17.4%, alcoholic cardiomyopathy in 7.6%, atrial fibrillation in 10.6%. [Table 2]

The most frequent precipitating factor identified was Pneumonia (21.2%), followed by myocardial ischemia (18.8%), dietary indiscretion/excessive oral fluid intake/IV fluids (15.1%), atrial fibrillation with fast ventricular rate (12.9%), non-compliance/inappropriate decrease in HF therapy (12.1%), anemia (8.3%), worsening renal function/renal failure (6.8%), uncontrolled hypertension (6.0%), valvular dysfunction (moderate - to - severe insufficiency) (3%), worsening HF/disease progression (3.8%), arrhythmias other than atrial fibrillation (3.8%) and infection other than pneumonia (1.5%). Some patients had more than one precipitating factors leading to hospitalization. [Table 3]

Relationship between the precipitating factors leading to hospitalization and outcome in terms of length of hospital

stay and mortality was also studied. Highest number of deaths were seen in association with pneumonia (n=10), followed by myocardial ischemia (n=4), worsening renal function/renal failure (n=3), worsening HF/disease progression (n=2), valvular dysfunction (n=2). Proportionately longer duration of hospital stay (>7 days) was seen in patients with pneumonia, other infections, worsening renal function/renal failure, worsening HF/disease progression, valvular dysfunction; whereas myocardial ischemia, dietary indiscretion/excessive oral fluid intake/IV fluids, atrial fibrillation with fast ventricular rate, other arrhythmia, non - compliance/ inappropriate decrease in HF therapy, anemia, uncontrolled hypertension were associated with shorter duration of hospital stay (<7 days). However due to small sample size and as many patients had more than one precipitating factors, statistical significance of this associations could not be established. [Table 4]

Table 1: Patient Characteristics

Patient Characteristics	Value
Age (years)	59 ±13.2
Male	79 (59.85%)
Female	53 (40.15%)
Mean LVEF (%)	31±8.2
Mean hemoglobin (g/dL)	12.1±2.1
Serum creatinine (mg/dL)	1.3 ± 0.88
BMI (kg/m ²)	28 ± 6.1

Table 2: Heart failure etiology

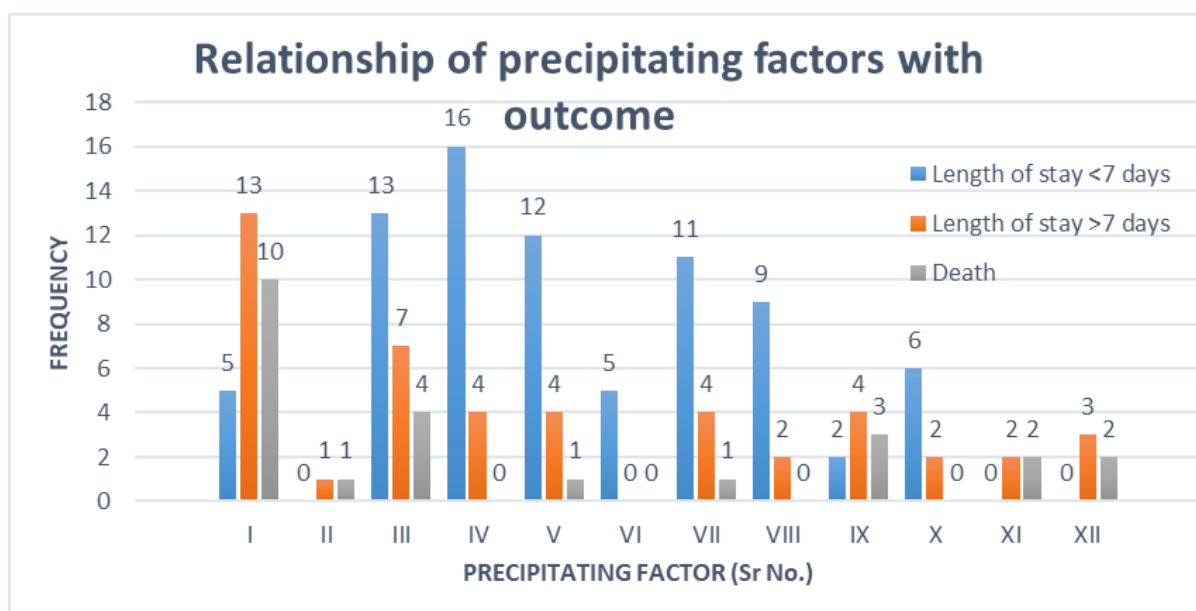
Heart failure etiology	Frequency	Percentage
Ischemic cardiomyopathy	51	38.6
Dilated cardiomyopathy	27	20.4
Valvular	23	17.4
Atrial fibrillation	14	10.6
Alcoholic cardiomyopathy	10	7.6
Other	7	5.3

Table 3: Precipitating factors

Precipitating factor	Frequency	Percentage
Pneumonia	28	21.2
Other infection	2	1.5
Myocardial ischemia	24	18.8
Dietary indiscretion/excessive oral fluid intake/IV fluids	20	15.1
Atrial fibrillation with fast ventricular rate	17	12.9
Other Arrhythmia	5	3.8
Non - compliance/inappropriate decrease in HF therapy	16	12.1
Anemia	11	8.3
Worsening renal function/renal failure	9	6.8
Uncontrolled hypertension	8	6.0
Valvular dysfunction (moderate - to - severe insufficiency)	4	3.0
Worsening HF/disease progression	5	3.8

Table 4: Relationship of precipitating factors with outcome

S.No.	Precipitating factor	Length of stay <7 days	Length of stay >7 days	Death
I	Pneumonia	5	13	10
II	Other infection	0	1	1
III	Myocardial ischemia	13	7	4
IV	Dietary indiscretion/excessive oral fluid intake/IV fluids	16	4	0
V	Atrial fibrillation with fast ventricular rate	12	4	1
VI	Other Arrhythmia	5	0	0
VII	Non - compliance/ inappropriate decrease in HF therapy	11	4	1
VIII	Anemia	9	2	0
IX	Worsening renal function/renal failure	2	4	3
X	Uncontrolled hypertension	6	2	0
XI	Valvular dysfunction (moderate to severe insufficiency)	0	2	2
XII	Worsening HF/disease progression	0	3	2



4. Discussion

The average age of patients in our study was 59 ± 13.2 years which was much less than western studies of heart failure [5 - 7].

In our study the most common etiology of heart failure was ischemic cardiomyopathy (38.6%) which was higher than in a study by Vakil done in 1949 [8]. In a study done by Joshi et al in 1999 Rheumatic heart disease was the most common etiology of heart failure [9], whereas in our study valvular heart disease was third most common etiology (20.4%) after dilated cardiomyopathy (17.4%). This shows that etiology of heart failure is changing in India and the prevalence of ischemic heart disease is rising. However ischemic heart disease as a cause of HFpEF is much higher in western studies [10 - 11].

In our study more than one precipitating factor was identified in some patients. The most common precipitating factor causing decompensation and leading to hospitalization was pneumonia (21.2%). Pneumonia is associated with fever and sinus tachycardia which can cause acute decompensation. To prevent respiratory infections influenza and pneumococcal vaccination is recommended in these patients [12], only few patients in our study were vaccinated. HFrEF patients with pneumonia had the high mortality rate in our study, it was also associated with longer duration of hospital stay.

Myocardial ischemia was also a major precipitating factor in our study seen in 18.8% of the patients. Ischemia was associated with high mortality in our study.

Dietary indiscretion/excessive oral fluid intake/IV fluids and non - compliance/inappropriate decrease in HF therapy were responsible for 15.1% and 12.1% admissions respectively. Both these factors were associated with early recovery and low mortality.

Atrial fibrillation with fast ventricular rate was responsible for 12.9% admissions and it was associated with rapid recovery after treatment and low mortality. As compared to our study other studies have reported atrial fibrillation as more frequent precipitating factor [13, 14]. Fast ventricular rate results in loss of atrioventricular synchrony and atrial contribution to ventricular filling [15]. Other Arrhythmia responsible for precipitation of decompensation included atrial flutter and ventricular bigeminy.

Severe Anemia as precipitating factor was seen in 8.3% of our patients. Correction of anemia was associated with rapid recovery and early discharge. Anemia precipitates decompensated heart failure by activation of neuro - hormonal mechanism, proinflammatory cytokine activation vasodilation mediated high - output state [16].

Worsening renal function/renal failure was responsible for heart failure hospitalization in 6.8% of the patients. It was also associated with longer duration of hospital stay and high mortality. Development of renal dysfunction in patients with heart failure makes management complicated as it is associated with development of anemia, impaired response to diuretics and requires dose adjustments or discontinuation

of drugs like angiotensin converting enzyme inhibitors, angiotensin receptor blockers and digoxin [17].

Uncontrolled hypertension as precipitating factor was seen in 6% of our patients, faster recovery was seen in these patients after control of hypertension and no mortality was seen in this group of patients.

Increase in grade of valvular dysfunction as compared to previous echocardiography was responsible for precipitation of decompensation in 3% of the patients. It was also associated with high mortality and longer duration of hospital stay. Most common valvular lesion was mitral regurgitation.

5. Conclusion

There are multiple factors that can precipitate acute decompensated heart failure. The outcome of hospitalization varied according to Precipitating factor. Many of the precipitating factors are preventable. Patient education, regular follow up and vaccination against respiratory tract infection can reduce hospitalization in HFrEF patients.

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