

Original Research Article

Correlation of ECHO findings with duration of hospital stay in heart failure patients

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ABSTRACT

Background: The study aimed to assess the correlation, if any, between echocardiographic findings of heart failure patients and their duration of hospital stay

Methods: A retrospective, analytical study was conducted at a tertiary care centre in Chennai to assess the correlation between the duration of hospital stay and the severity of heart failure, determined by echocardiographic findings. The study population of 50 heart failure cases were categorised into heart failure with preserved EF, heart failure with mid-range EF, heart failure with reduced EF as per the 2022 AHA/ACC/HFSA guideline for the management of heart failure. Each case was assessed based on age, sex, comorbidities, symptomology at the time of admission based on NYHA classification.

Results: Of the 50 heart failure cases, 33 (66%) patients had HFrEF, 12 (24%) had HFmrEF and 5 (10%) had HFpEF. As per NYHA functional classification of effort-related dyspnoea, 12% belonged to class 1, 34% to class 2, another 34% to class 3 and 20% to class 4 heart failure. The mean duration of hospital stay was 7.2 days, with the longest duration of stay being 22 days and the shortest, only 2 days.

Conclusions: A fall in ejection fraction in a case of heart failure tends to lead to a longer duration of hospital stay. It was found that older patients and those with more comorbidities were also hospitalized for a greater period of time.

Keywords: Heart failure, CCF, Duration of hospitalization, HFrEF, HFpEF, Echocardiography, Comorbidities

INTRODUCTION

With a global prevalence of more than 37.7 million cases, heart failure (HF) affects around 2-3% of the world's population.¹ Heart failure is defined as “a complex clinical syndrome with symptoms and signs, resulting from any structural or functional impairment of ventricular filling or ejection of blood.”² It is a rapidly emerging public health issue, especially in ageing populations and is expected to rise exponentially over the years to come.³ The aetiology of heart failure is a multifactorial one and can be attributed to hypertension, ischemic heart disease, diabetes mellitus, infections, valvular heart disease and cardiomyopathies.⁴ In early stages of heart failure, compensatory mechanisms

act on the failing heart in an attempt to increase the cardiac output and maintain adequate function. As the disease advances however, the imbalance between oxygen supply and oxygen demand worsens leading to a progressive decompensation in cardiac function. Patients fall into a vicious cycle of deterioration which culminates in terminal heart failure and eventually, death. HF is one of the leading causes of in-patient admission amongst the elderly and is responsible for 1.8 million hospitalisations annually in India.⁵ Patients of chronic heart failure are often admitted for acute exacerbations of the disease. The duration of hospitalisation can depend on the age, medical history of the patient, the severity of HF and treatment given. Meanwhile, the rate of readmission and mortality amongst

HF patients are subject to their adherence to treatment guidelines during hospital admission.⁶ The in-hospital mortality rate for HF is an astounding 10-30.8% in Indian patients, in comparison to only 4-7% amongst their Western counterparts.⁷ For early initiation of treatment and better outcomes in HF, early diagnosis and assessment of the disease using ECG, echocardiography and other relevant investigations are of utmost importance. Hence, this study aims to assess the correlation between the echocardiographic findings and duration of hospital stay in heart failure patients.

METHODS

A retrospective, analytical study was conducted from April 2022 to September 2022 at Saveetha medical college and hospital, a tertiary care centre in Chennai. It aimed to assess the duration of stay and the factors influencing the duration of hospitalization in patients admitted for treatment of heart failure. The study was approved by the institutional ethics committee of SMCH and data obtained from the medical case records of 73 patients admitted and diagnosed with heart failure. 23 patients were excluded as per the exclusion criteria. The study population comprised of the remaining 50 patients. The clinical profile of each patient was assessed based on their symptomology at time of admission, NYHA grading of dyspnoea, history of comorbid illnesses and in-hospital outcomes. The duration of hospital stay was noted.

The New York heart association (NYHA) functional classification of effort-related dyspnoea is considered as a simple but powerful marker of HF severity.⁸ Hence, the NYHA classification was used in this study to diagnose and grade the heart failure on a clinical basis at the time of admission. The NYHA grading was based on the following: Class I- No limitation of physical activity. Ordinary physical activity does not cause symptoms (undue fatigue, palpitation, dyspnoea or anginal pain). Class II- Slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnoea or anginal pain. Class III- Patients have cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary physical activity causes fatigue, palpitation, dyspnoea or anginal pain. Class IV- Patients have cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms present even at rest. If any physical activity is undertaken, discomfort is increased.⁹ The severity of heart failure was categorised based on the left ventricular ejection fraction (LVEF), ascertained by echocardiography. As per the 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure, the study population was categorised as follows: heart failure with preserved EF (HFpEF): LVEF $\geq 50\%$, heart failure with mid-range EF (HFmrEF): LVEF 41-49% and heart failure with reduced EF (HFrEF): LVEF $\leq 40\%$. All the data collected was analyzed using SPSS V16.0

Inclusion criteria

Inclusion criteria were; Patients diagnosed with cardiac failure, Patients of both sexes included and those above the age of 18 years.

Exclusion criteria

Exclusion criteria were; Patients with missing data fields, those discharged against medical advice or transferred to another hospital and Patients who suffered from in-hospital deaths.

RESULTS

Of the 73 case records initially obtained, 23 patients were excluded due to in-hospital mortalities and missing data. A total of 50 heart failure patients with ages ranging from 20 to 81 years old, were included in this study. The mean age of the study population was 58.1 ± 13.2 years and 52% of the heart failure patients were female (N=26) whilst 48% were male. More than half (56%) of the patients had coronary artery disease, which was slightly more common among males than females. Other frequent comorbidities included systemic hypertension (50%), diabetes mellitus (42%) and a previous history of MI (28%) among patients of HF. The baseline characteristics and comorbid illnesses of the study population are displayed in detail in (Table 1).

Table 1: Baseline characteristics and comorbid illnesses.

Comorbidities	Male	Female	Total, N (%)
Coronary artery disease	16	12	28 (56)
Systemic hypertension	10	15	25 (50)
Diabetes mellitus type 2	9	12	21 (42)
Myocardial infarction	4	10	14 (28)
Valvular heart disease	1	5	6 (12)
Thyroid disorders	0	4	4 (8)
CKD	4	0	4 (8)
Other	3	4	7 (14)

Based on the LVEF, 33(66%) patients were diagnosed as having HFrEF, 12 patients had HFmrEF and 5 patients had HFpEF as represented by (Figure 1). The patients of HFrEF subgroup showed a male predominance (54.5%) whilst both HFmrEF and HFpEF was more prevalent among females. Patients with HFpEF had a mean age of 53.2 years whereas those with HFrEF were found to be older with a mean age of 57.75 years (Figure 2). All patients were graded in accordance with the NYHA functional classification of effort-related dyspnoea and of the total 50 HF cases, majority (68%) of the patients belonged to either class 2 or class 3 dyspnoea. There were 6 patients in class 1 NYHA, 17 patients in class 2, another 17 patients in class 3 and 10 patients having class 4 dyspnoea. The (Figure 3) further elaborates on the relationship between the NYHA functional grading and

the varying degrees of sever heart failure. The (Figure 3) further depicts the varying degrees of heart failure in patients presenting with each class of dyspnoea at the time of admission.

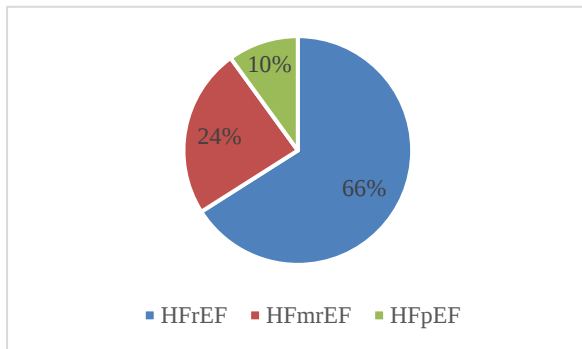


Figure 1: Severity of heart failure based on ECHO-LVEF.

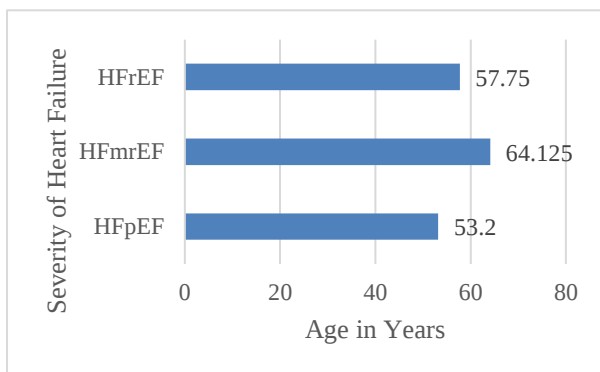


Figure 2: Age-wise comparison of severity of heart failure.

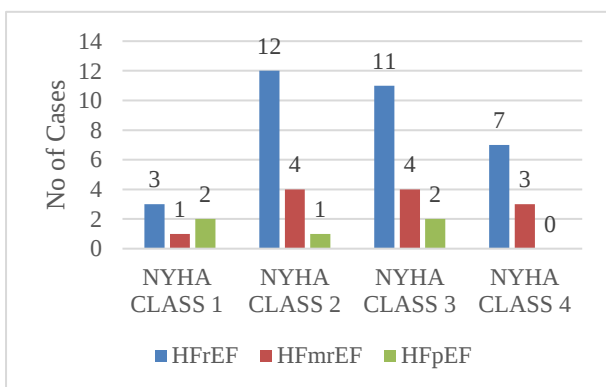


Figure 3: NYHA grading and severity of HF (based on ECHO-LVEF).

The average duration of hospital stay among the total study population was 7.2 days, with the longest duration of stay being 22 days and the shortest, only 2 days. There was a negative correlation between the LVEF and duration of hospitalisation for management of heart failure. The (Figure 4) represents a roughly downward trend in the relationship between age of the patient and length of hospital stay.

hospital stay. Patients with more comorbid illness also seemed to require a longer duration of hospitalisation, implying that those with better left ventricular function and less comorbidities were discharged sooner from the tertiary care centre. The (Figure 4) represents a roughly downward trend in the relationship between age of the patient and length of hospital stay.

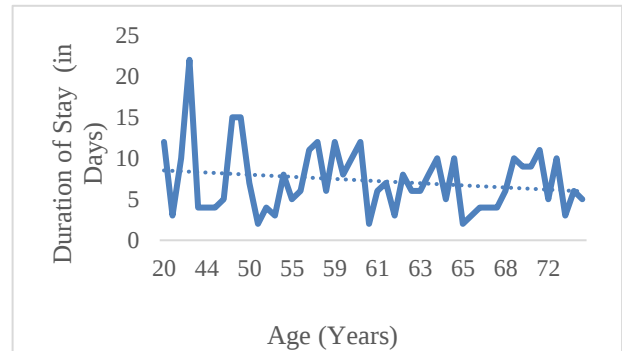


Figure 4: Age vs. duration of hospital stay.

DISCUSSION

The present study assessed a total of 50 patients having varying degrees of heart failure. 52% of patients were female while 48% were male. When categorised based on the left ventricular ejection fraction determined by echocardiography, 66% of patients had HFrEF, 24% had HFmrEF and 10% of patients had HFpEF. A South Indian study by Shukkoor et al had a similar division with HFrEF constituting 65.9% of HF patients and HFmrEF, HFpEF making up 20% and 14% of patients respectively.¹⁰ The mean age of the study population was 58.1 ± 13.2 years and patients with HFpEF had a mean age of 53.2 years whereas those with HFrEF were found to be older with a mean age of 57.7 years. The patients of HFrEF subgroup showed a male predominance (54.5%) whilst both HFmrEF and HFpEF subgroups had a female preponderance of 58.3% and 80% respectively. In comparison, a 2012 study by Steinberg et al concluded that patients with HFpEF were older and more likely to be female than with patients with HFrEF.¹¹ Coronary artery disease was the most prevalent comorbidity in this study (56%). 50% of HF patients had systemic hypertension, 42% were diabetics and 28% had a previous history of MI. Other significant comorbid illnesses included valvular heart disease, thyroid disorders, and chronic kidney disease. Studies by Savarese et al and Bragazzi et al also find coronary artery disease to be a major risk factor for heart failure, with the highest global prevalence among all other causes.^{12,13} In contrast, diabetes mellitus was the most common comorbidity documented by Shukkoor et al in the Indian setting.¹⁰ When stratified based on NYHA functional classification of effort-related dyspnoea, majority (68%) of the patients of this study belonged to either class 2 or class 3. 12% of patients belonged to class 1 NYHA, 34% to class 2, another 34% of patients to class 3 and the remaining 20% to class 4 heart failure. Almost one third of participants (32.9%) of a study based on the Trivandrum heart failure registry, presented

with NYHA class IV heart failure.^{14,15} The mean duration of hospital stay among the total study population was 7.2 days, with the longest duration of stay being 22 days and the shortest, only 2 days. On par with this, Wright et al reported a median length of hospital stay of 6 days in their study.¹⁴ The present study found a negative correlation between the LVEF and duration of hospitalisation for management of heart failure. Patients with more comorbid illness also seemed to require a longer duration of hospitalisation, implying that those with better left ventricular function and less comorbidities were discharged earlier from hospital. Studies conducted in Ethiopia and in the US also corroborate that patients with a prolonged length of stay were more likely to have a higher number of comorbidities.¹⁵⁻¹⁷

CONCLUSION

The above study concludes that a fall in ejection fraction in a case of heart failure tends to lead to a longer duration of hospital stay. Conversely, those with better left ventricular function are discharged from the hospital earlier. It was found that older patients and those with more comorbidities were also hospitalized for a greater period of time.

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