

Research Article

Comparison of In-Hospital Outcomes between Heart Failure Patients with Reduced (HFrEF) and Preserved Ejection Fraction (HFpEF): A Single-Center Cross-Sectional Study

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ABSTRACT

Background: Heart failure (HF) is a major global health problem characterized by structural and/or functional cardiac abnormalities that impair ventricular filling or ejection. It is associated with significant morbidity and mortality. HF is broadly classified into heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF), with approximately 50% of patients presenting with HFpEF. Common risk factors include

coronary artery disease (CAD), advanced age, diabetes mellitus, and hypertension. Despite comparable clinical burden, effective treatment options—particularly for HFpEF—remain limited.

Objective: To compare in-hospital mortality between patients with HFpEF and HFrEF.

Study Design: Cross-sectional study.

Duration and Place of Study: This study was conducted at People's University of

Medical and Health Sciences Nawabshah
from March 2025 to March 2026

echocardiography, NT-proBNP, cross-sectional study

Methodology: A total of 200 patients aged 35 to 80 years with congestive heart failure were included using consecutive sampling after informed consent. Ejection fraction was assessed by echocardiography, and the diagnosis of HF was supported by NT-proBNP levels. The primary variables were ejection fraction category (HFpEF vs HFrEF) and in-hospital mortality. Comorbidities, including hypertension and diabetes mellitus, were also recorded. Data were analyzed using SPSS, with a p-value < 0.05 considered statistically significant.

Results: Of the 200 patients, 92 (46%) had HFrEF and 108 (54%) had HFpEF. The mean age was 56.4 ± 12.7 years. The overall in-hospital mortality rate was 12%. A greater proportion of deaths occurred among patients with HFrEF compared to HFpEF (66.7% vs 33.3%). Higher mortality was also observed in patients aged >60 years.

Conclusion: HFrEF is associated with higher in-hospital mortality compared to HFpEF.

Keywords: Heart failure, HFrEF, HFpEF, in-hospital mortality, ejection fraction,

INTRODUCTION

Heart failure (HF) is a major global health problem [1]. It is a clinical syndrome characterized by inadequate cardiac output and/or elevated intracardiac pressures, leading to systemic organ dysfunction. Structural and functional abnormalities of the heart contribute to the development of HF, resulting in impaired systolic and/or diastolic function [2]. The incidence of HF is associated with several risk factors, including coronary artery disease (CAD), advanced age, diabetes mellitus, and hypertension [3].

Despite significant advances in therapeutic strategies, HF remains associated with high morbidity, mortality, and frequent hospitalizations [4]. It has been reported that approximately 20% of patients die within one year of diagnosis [5], and this rate increases to nearly 53% within five years. Among hospitalized patients, mortality rates range from 17% to 45% within one year of admission [6]. Furthermore, only about half

of patients with HF survive beyond five years [7,8].

HF is broadly classified based on left ventricular ejection fraction (LVEF) into heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF). Approximately 50% of patients with HF have HFpEF [9]. Although both subtypes are associated with comparable morbidity and mortality, effective treatment options for HFpEF remain limited. Consequently, ongoing research is focused on identifying biomarkers to better understand disease pathophysiology and improve diagnostic and therapeutic approaches [10]. In contrast, advances in the management of HFrEF have led to improved prognosis in these patients, whereas outcomes in HFpEF have shown less improvement over time.

In addition, approximately 40% to 50% of HF patients exhibit mildly reduced LVEF [11]. This group is classified as heart failure with mildly reduced ejection fraction (HFmrEF). Depending on the LVEF cut-off values used in different clinical studies, these patients may overlap with either the HFrEF or HFpEF categories [12].

Therefore, this study was conducted to compare in-hospital mortality between patients with HFpEF and HFrEF and to evaluate the association of clinical and demographic variables with mortality in these groups.

METHODOLOGY

This cross-sectional study included a total of 200 patients diagnosed with congestive heart failure. Participants were aged between 35 and 80 years, and both genders were included. A non-probability consecutive sampling technique was employed to minimize selection bias. All patients were informed about the study, and written informed consent was obtained prior to enrollment. Ethical approval was granted by the Institutional Ethical Review Committee.

Exclusion

Criteria:

Patients with known coagulation disorders, renal failure, congenital heart disease, advanced liver disease, or valvular heart disease were excluded. Additionally, individuals with a history of prior cardiac interventions were not included in the study.

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Demographic data, including age, gender, height, and weight, were collected. Body mass index (BMI) was calculated using standard methods. Left ventricular ejection fraction (LVEF) was assessed using echocardiography. The diagnosis of congestive heart failure was supported by elevated NT-proBNP levels in conjunction with clinical criteria. In-hospital mortality was determined through clinical assessment and hospital records.

The primary independent variable was ejection fraction status, categorized as preserved (HFpEF) or reduced (HFrEF). The primary dependent variable was in-hospital

mortality. Additional variables included comorbid conditions such as hypertension and diabetes mellitus.

Quantitative variables were summarized as mean $\pm$ standard deviation or median with interquartile range, as appropriate. Data analysis was performed using SPSS version 26. The Shapiro–Wilk test was applied to assess the normality of continuous variables. The chi-square test and independent samples t-test were used for group comparisons. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 200 patients were included in this study. The age of the participants ranged from 35 to 80 years, with a mean age of 56.4 ± 12.7 years. There were 96 (48%) males and 104 (52%) females. The baseline demographic and clinical characteristics of the study population are presented in Table 1.

Table No. 1: Baseline Demographic and Clinical Characteristics

Variables	N	%
Gender		
Male	96	48
Female	104	52
Coronary Artery Disease (CAD) Family History	44	22

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Variables	N	%
Smoking History	88	44
Diabetes Mellitus (DM)	72	36
Hypertension	112	56

Hypertension was the most common comorbidity, followed by smoking history and diabetes mellitus.

Table No. 2: Descriptive Statistics of Quantitative Variables

Variables	Mean $\pm$ SD
Age (years)	56.4 $\pm$ 12.7
Height (m)	1.70 $\pm$ 0.10
Weight (kg)	77.1 $\pm$ 11.4
BMI (kg/m ²)	27.2 $\pm$ 4.4
Hospital stay (days)	4.5 $\pm$ 1.5

The mean BMI of the study population falls within the overweight range.

Table 3 shows the distribution of patients according to ejection fraction and in-hospital mortality. A greater proportion of patients had HFpEF (54%) compared to HFrEF (46%). The overall in-hospital mortality rate was 12% (n = 24), with a higher proportion of deaths observed among patients with HFrEF.

Table No. 3: Distribution of Ejection Fraction and In-Hospital Mortality

Parameters	N	%
Ejection Fraction		
HFrEF	92	46.0
HFpEF	108	54.0

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Parameters	N	%
In-hospital Mortality (n = 24)		
HFrEF	16	66.7
HFpEF	8	33.3

Table 4 presents the stratification of variables with respect to in-hospital mortality along with corresponding p-values. Mortality was significantly higher among patients aged >60 years. Smoking and diabetes mellitus also showed statistically significant associations with in-hospital mortality.

Table No. 4: Stratification of Variables with Respect to In-Hospital Mortality

Variables	Yes (n=24)		No (n=176)		p-value
	N	%	N	%	
Age (years)					0.001
35–60	7	29.2	122	69.3	
>60	17	70.8	54	30.7	
BMI (kg/m²)					0.31
19–27	14	58.3	84	47.7	
>27	10	41.7	92	52.3	
Gender					0.52
Male	13	54.2	83	47.2	
Female	11	45.8	93	52.8	
CAD Family History	6	25.0	37	21.1	0.65
Smoking History	15	62.5	73	41.5	0.04
Diabetes Mellitus	14	58.3	60	34.1	0.03
Hypertension	14	58.3	98	55.7	0.80

DISCUSSION

Heart failure remains a major global cardiovascular condition associated with significant morbidity, mortality, and increased healthcare burden [13]. Previous studies have shown that its incidence is predominantly higher in older individuals, particularly those aged above 60 years. It is estimated that nearly 50% of patients with heart failure present with preserved ejection fraction (HFpEF) [9], while the remaining cases are primarily classified as heart failure with reduced ejection fraction (HFrEF). Although both phenotypes are associated with comparable morbidity and mortality outcomes, treatment options for HFpEF remain limited, representing a significant challenge in clinical practice and research. Additionally, symptoms such as dyspnea and fatigue in patients with preserved ejection fraction may not be exclusively attributable to HFpEF, as co-morbid conditions frequently contribute to the clinical presentation.

In the present study, the mean age of patients was 56.4 ± 12.7 years. This finding is consistent with previous studies reporting mean ages ranging from 53.6 ± 16.8 years to 76.3 ± 7.2 years [14,15,16]. The slight variation in age distribution across studies may be attributed to differences in

population characteristics, healthcare access, and disease awareness.

Regarding gender distribution, females constituted a slight majority in our study population (52%), while males accounted for 48%. Similar findings have been reported in previous research, where females comprised 51% and males 49% of the study population [17]. These differences may be explained by variations in healthcare-seeking behavior, access to medical facilities, and symptom recognition among different populations.

In this study, the overall in-hospital mortality rate was 12% ($n = 24$). A significantly higher proportion of mortality was observed among patients with HFrEF (66.7%) compared to those with HFpEF (33.3%). These findings are consistent with previous studies reporting in-hospital mortality rates ranging from 13% to 33% among heart failure patients [18]. We also observed that the duration of hospital stay was comparable between both HFpEF and HFrEF groups. However, the difference in mortality rates highlights that both phenotypes require careful clinical monitoring and management [19].

Echocardiography proved to be a valuable diagnostic tool in assessing left ventricular function and guiding the management of

heart failure. Its widespread use is supported by its availability, non-invasive nature, cost-effectiveness, and diagnostic accuracy, particularly in patients with heart failure. These advantages are also emphasized in the European Society of Cardiology guidelines [20].

This study has certain limitations. It was conducted at a single center with a relatively small sample size. Additionally, the study design was cross-sectional and did not allow for assessment of long-term outcomes. Therefore, further multicenter prospective studies with larger sample sizes are recommended to evaluate the long-term prognosis and outcomes of patients with congestive heart failure.

CONCLUSION

Those with low ejection fraction (HFrEF) had a greater in-hospital mortality rate compared to those with high ejection fraction (HFpEF). This highlights the significance of early risk stratification and intervention in HFrEF patients. The study showed that despite having comparable clinical characteristics and duration of stay, increasing age and the presence of diseases like diabetes and hypertension were linked with higher mortality rates.

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This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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