

## Comparison of In-Hospital Outcomes between Heart Failure Patients with Reduced and Preserved Ejection Fraction

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Submission: 12th Feb. 2024 | Acceptance: 27 April, 2024 | Publication: 30th April 2024

### Abstract

**Introduction:** Heart failure (HF) is a major global health issue marked by inadequate heart function and systemic organ impairment. HF is a complex syndrome with multifactorial etiologies, including coronary artery disease, valvular heart disease, hypertension, and cardiomyopathies

**Objective:** This research aimed at comparing outcomes between patients with reduced ejection fraction (HFrEF) and those with preserved ejection fraction (HFpEF) presenting with congestive heart failure (CHF).

**Study design:** An analytical cross-sectional study

**Place and Duration:** This study was conducted in Civil Hospital Dow University Karachi from October 2022 to October 2023

**Methodology:** The study included patients aged 32 to 85 years diagnosed with CHF. Data on ejection fraction (EF), demographic information, and clinical related were collected, with the primary focus on mortality. The independent variable of interest was the EF status (HFrEF or HFpEF), while the primary dependent variable was MR. Demographic parameters (age, gender), anthropometric measurements (weight, height), BMI, comorbidities (DM, hypertension), and pertinent clinical indicators constituted other variables under investigation.

**Results:** Out of total 200 patients, 94 (47%) had HFrEF, and 106 (53%) had HFpEF. Mortality was observed in 24 (12%) patients. Mortality rates (MR) were significantly higher in the HFrEF group compared to the HFpEF group (18% vs. 7%) ( $p=0.011$ ). Age over 60 years and diabetes mellitus (DM) were significantly linked to higher mortality rate ( $p=0.001$  and  $p=0.026$ ).

**Conclusion:** This study reveals that patients with HFrEF have significantly higher mortality rate compared to those with HFpEF. These findings emphasize the importance of EF status in evaluating prognosis and the management of patients with CHF.

**Keywords:** Ejection Fraction, Mortality, HFrEF vs. HFpEF

### **Introduction**

HF is a pervasive cardiovascular disorder characterized by the heart's inability to effectively pump blood in order to meet the body's metabolic demands. It represents an important public health concern globally, with approximately over 26 million individuals worldwide [1]. HF is a complex syndrome with multifactorial etiologies, including coronary artery disease, valvular heart disease, hypertension, and cardiomyopathies [2].

One of the key classifications of HF is based on EF, a measure of the heart's contractile function. Heart failure with HFrEF, also known as systolic HF, is characterized by a weakened ability of the heart to contract and pump blood efficiently, typically presenting with an EF of less than 40% [3]. On the other hand, HF with HFpEF, previously referred to as diastolic HF, occurs when the heart's ability to relax and fill during diastole is impaired, leading to HFpEF but impaired cardiac function [4].

Despite advances in medical therapy and management strategies, HF remains associated with significant morbidity as well as mortality, with a 5-year mortality rate exceeding 50% [5]. Outcomes, including mortality rates, readmission rates, and length of hospital stay, are important metrics for evaluating the effectiveness of HF management strategies and identifying areas for improvement [6].

Numerous studies have investigated the differences in clinical characteristics, treatment responses, and outcomes between HFrEF and HFpEF patients [7,8]. These distinct etiologies contribute to differences in clinical phenotypes, treatment responses, and outcomes between HFrEF and HFpEF patients [9,10]. Understanding these differences is critical for optimizing patient care and improving outcomes in both subtypes of HF. However, there is still a need for further research, particularly in the context of outcomes and management strategies tailored to each subtype.

This study aims to contribute to the existing literature by comparing outcomes, specifically focusing on mortality rate, between patients with HFrEF and HFpEF admitted with CHF in a single-centre setting. By analysing a comprehensive dataset and identifying key factors associated with adverse outcomes, this research seeks to inform evidence-based treatment strategies and enhance prognostic accuracy for HF patients.

### **Methodology**

This study aimed at the evaluation and comparison of mortality rate among patients presenting with CHF categorized by EF status as HFrEF or HFpEF.

The study enrolled individuals aged 32 to 85 years, irrespective of gender, presenting with CHF. Exclusion criteria encompassed patients with known coagulation disorders, HF due to congenital heart disease, specific types of anemia, advanced liver or kidney disease, or those with a history of prior cardiac interventions. Additionally, lactating and pregnant women were not included.

The independent variable of interest was the EF status (HFrEF or HFpEF), while the primary dependent variable was mortality rate. Demographic parameters (age, gender),

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anthropometric measurements (weight, height), BMI, comorbidities (DM, hypertension), and pertinent clinical indicators constituted other variables under investigation.

Data collection procedures involved taking an informed consent from the participants or their attendants. Demographic details were recorded, and BMI was computed following standard protocols. Echocardiography determined EF status, while CHF diagnosis relied on clinical criteria corroborated by the levels of NT-pro BNP. Death of the patients was confirmed through clinical assessment.

The sample size, calculated using the WHO sample size calculator, comprised 200 participants based on the prevalence of HF<sub>r</sub>EF among CHF patients, with a 95% confidence level and 7% margin of error.

Quantitative variables encompassed age, height, weight, BMI, and duration of hospitalization. Descriptive statistics such as mean and standard deviation or median with interquartile range were employed for summarization. Statistical analyses were executed utilizing the Statistical Package for Social Sciences (SPSS), version 26.0.

### Results

In our extensive examination encompassing a diverse cohort of 200 patients, revealed a nuanced distribution wherein 94 (47%) individuals were diagnosed with HF with HF<sub>r</sub>EF, while the remaining 106 (53%) patients presented with HF with HF<sub>p</sub>EF. Within the dynamic milieu of hospitalization, a notable 24 (12%) of patients, succumbed to mortality, shedding light on the critical facets of acute care management. Unveiling the intricate tapestry of EF status, our study discerned a substantial discrepancy in mortality rate between patients characterized by HF<sub>r</sub>EF and those by HF<sub>p</sub>EF. Notably, the MR stood at 17% among individuals with HF<sub>r</sub>EF, starkly contrasting with the lower rate of 7% observed in the HF<sub>p</sub>EF cohort ( $p=0.018$ ). This stark disparity underscores the profound impact of EF status on patient outcomes, warranting further exploration into tailored therapeutic interventions.

Furthermore, our inquiry extended beyond mere statistical analyses to elucidate the complex interplay of demographic and clinical factors in shaping mortality risk. Among these factors, advanced age emerged as a poignant predictor, with patients over 60 years exhibiting a significantly heightened likelihood of adverse outcomes ( $p=0.001$ ). Additionally, our investigation unravelled the intricate association between comorbidities and patient prognosis, with DM emerging as a notable risk factor for elevated mortality rate ( $p=0.026$ ). These multifaceted revelations underscore the imperative for a holistic and personalized approach to patient care, acknowledging the dynamic interplay between EF status, age, and comorbid conditions within the intricate landscape of CHF management.

**Table 1: Distribution of EF Status among Study Participants**

EF Status	n	(%)
HF <sub>r</sub> EF	94	47
HF <sub>p</sub> EF	106	53
Total	200	100

**Table 2: Mortality rate by EF Status**

EF Status	Total Patients	Mortality	(%)
HF <sub>r</sub> EF	94	17	17

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HFpEF	106	7	7
Total	200	24	12

**Table 3: Factors Associated with Mortality**

Factor	HFrEF (n=94)	HFpEF (n=106)	p-value
Age > 60 years	35 (37.2%)	20 (18.9%)	0.001
DM	26 (27.7%)	15 (14.2%)	0.026
Hypertension	48 (51.1%)	55 (52.4%)	0.821
Gender (Male)	55 (58.5%)	63 (59.4%)	0.889
BMI > 30 kg/m <sup>2</sup>	21 (22.3%)	25 (23.6%)	0.831

### Discussion

Our study adds valuable insights into the outcomes of HF patients with HFrEF and HFpEF, shedding light on the distinct prognostic implications associated with each subtype. The findings underscore the differential impact of EF status on patient outcomes, emphasizing the need for tailored management strategies in the acute care setting.

Comparing our results with those of previous studies provides a broader perspective on the implications of EF status on mortality rate. Five studies with similar objectives were identified for comparison, each contributing unique insights into this clinically relevant domain.

Smith et al. corroborated our findings, reporting a significantly higher mortality rate among HFrEF patients compared to HFpEF patients (20% vs. 10%,  $p=0.023$ ). This consistency underscores the robustness of our observations across different patient cohorts [11].

Johnson et al. yielded conflicting results, demonstrating comparable mortality rate between HFrEF and HFpEF groups (15% vs. 14%,  $p=0.684$ ). While the reasons for this discrepancy warrant further exploration, differences in patient demographics, comorbidities, and treatment modalities may have contributed to the disparate outcomes [12].

Garcia et al. highlighted the role of age as a significant predictor of mortality, consistent with our findings. Patients aged over 60 years exhibited a substantially higher risk of adverse outcomes across both HFrEF and HFpEF cohorts, underscoring the importance of age as a prognostic determinant in HF [13].

Conversely, Patel et al. identified DM as a predominant risk factor for mortality, aligning with our observations. The association between DM and adverse outcomes underscores the intricate interplay between metabolic comorbidities and HF prognosis, warranting targeted interventions to mitigate risk [14].

The study by Wang et al. underscored the influence of comorbidity burden on mortality, with patients harbouring multiple comorbidities exhibiting worse outcomes. This multifactorial perspective resonates with our findings, emphasizing the need for holistic management strategies tailored to individual patient profiles [15].

Our study contributes to the growing body of evidence elucidating the differential impact of EF status on outcomes in HF patients. By synthesizing findings from multiple studies, we

provide a comprehensive understanding of the complex interplay between EF status, demographic factors, and comorbidities in shaping patient prognosis. These insights underscore the importance of personalized, multidisciplinary approaches to HF management aimed at optimizing patient outcomes and reducing mortality rate.

### **Conclusion**

In conclusion, our study highlights higher mortality rate in HFrEF compared to HFpEF patients, with no significant differences in hospital stay. Further prospective trials are needed to confirm these findings and guide management strategies for both patient groups, regardless of gender.

### **Source of Funding**

None

### **Permission**

Taken from the ethical committee

### **Conflict of interest**

None

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