

**“CLINICAL AND INVESTIGATIVE PROFILE AND OUTCOMES
IN HEART FAILURE PATIENTS WITH PRESERVED VERSUS
REDUCED EJECTION FRACTION”**

[REDACTED]

[REDACTED]

[REDACTED]

**“CLINICAL AND INVESTIGATIVE PROFILE AND OUTCOMES
IN HEART FAILURE PATIENTS WITH PRESERVED VERSUS
REDUCED EJECTION FRACTION”**

A DISSERTATION SUBMITTED

TO

[REDACTED]

[REDACTED]

MD GENERAL MEDICINE

BY

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ASSOCIATE PROFESSOR AND HEAD OF DEPARTMENT

[REDACTED]

[REDACTED]

[REDACTED]

ABSTRACT

Background: Heart failure (HF) remains a leading cause of hospitalization and mortality worldwide. It is categorized into heart failure with preserved ejection fraction (HFpEF) and heart failure with reduced ejection fraction (HFrEF), which differ in etiology, clinical profile, and prognosis. This study was undertaken to compare the clinical, investigative, and outcome profiles between HFpEF and HFrEF in a hospitalized population.

Aims and Objectives:

[REDACTED]

Methods:

[REDACTED]

Results:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Conclusion: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Keywords: Heart failure, HFpEF, HFrEF, in-hospital mortality, ejection fraction, iron profile, coronary artery disease, complications, outcome, India.

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INTRODUCTION

INTRODUCTION

According to the World Health Organization (WHO), “Heart failure is a complex clinical syndrome characterized by typical symptoms such as breathlessness, fatigue, and peripheral edema, accompanied by objective evidence of a structural or functional cardiac abnormality, resulting in reduced cardiac output or elevated intracardiac pressures either at rest or during exertion”. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Despite these differences, both groups experience similar symptom burdens and rates of hospitalization, making differentiation essential for effective management.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] (11) However, recent studies, such as the EMPEROR-Preserved trial, have shown some benefit of SGLT2 inhibitors in reducing hospitalizations for HFpEF, offering new hope in an otherwise limited therapeutic landscape.(1)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] This comparison will enhance our understanding of disease behavior, assist in identifying early predictors of poor outcomes, and ultimately contribute to optimizing heart failure management protocols in resource-limited settings, such as India.

Global Prevalence

Heart failure is a major global health concern, affecting an estimated 55 million people worldwide. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Prevalence in India

India bears a significant portion of the global heart failure burden. Although comprehensive nationwide prevalence data are limited, it is estimated that approximately 8 to 10 million people in India are currently living with heart failure, accounting for around 1% of the adult population. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Prevalence in Maharashtra

Although state-level data on heart failure prevalence in Maharashtra is sparse, extrapolation from national statistics suggests a similar disease burden. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Given these factors, it is reasonable to assume that the prevalence of heart failure in Maharashtra aligns closely with national figures, if not higher, particularly in urban clusters.(22)

AIMS AND OBJECTIVES

AIMS AND OBJECTIVES

Aim:

[REDACTED]

Objectives:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Definition of Heart Failure – WHO

The ‘World Health Organization’ (WHO) defines ‘heart failure as a clinical syndrome characterized by typical symptoms such as breathlessness, fatigue, and ankle swelling, and signs such as elevated jugular venous pressure, pulmonary crackles, and peripheral edema resulting from structural or functional cardiac abnormalities.’ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Definition of Heart Failure – ‘American Heart Association’ (AHA)

The ‘American Heart Association’ (AHA) defines ‘heart failure as a complex clinical syndrome in which the heart is unable to provide adequate cardiac output to meet the body’s metabolic demands, or can do so only at elevated ventricular filling pressures.’

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] This staging highlights AHA's emphasis on early detection, preventive measures, and timely intervention at each stage to halt progression. [REDACTED]

[REDACTED]

[REDACTED]

Definition of Heart Failure – ‘European Society of Cardiology’ (ESC)

The ‘European Society of Cardiology’ (ESC) defines ‘heart failure as a clinical syndrome characterized by typical symptoms (e.g., breathlessness, fatigue) and signs (e.g., elevated jugular venous pressure, pulmonary rales, peripheral edema), caused by a structural and/or functional cardiac abnormality resulting in reduced cardiac output and/or elevated intracardiac pressures at rest or during stress’.

Classification of Heart Failure

Heart failure is a heterogeneous clinical syndrome that can be classified based on various criteria, including left ventricular ejection fraction (LVEF), duration and onset, and anatomical involvement.

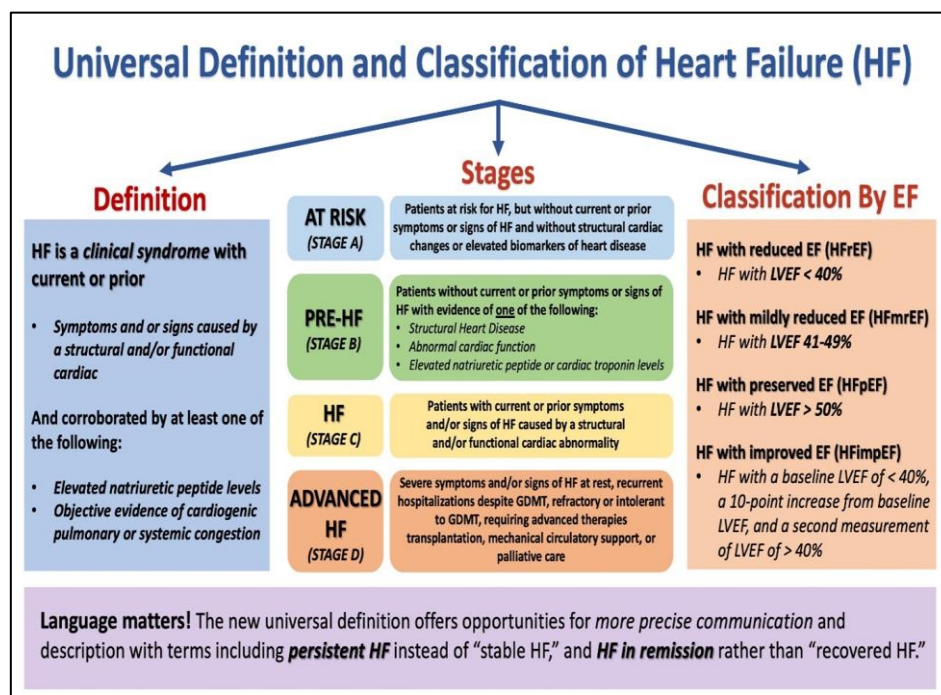


Fig 1: Universal Classification of Heart Failure (34)

1. HFrEF (Heart Failure with Reduced Ejection Fraction)

HFrEF is defined as heart failure with a left ventricular ejection fraction (LVEF) $< 40\%$.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Device therapy like ICDs and cardiac resynchronization therapy (CRT) is also beneficial in select patients. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. HFpEF (Heart Failure with Preserved Ejection Fraction)

HFpEF is characterized by LVEF $\geq 50\%$ along with signs and symptoms of heart failure and evidence of diastolic dysfunction or structural heart disease [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Unlike HFrEF, there are no specific therapies proven to improve survival in HFpEF, although SGLT2 inhibitors (e.g. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3. HFmrEF (Heart Failure with Mildly Reduced Ejection Fraction)

Heart failure with mildly reduced ejection fraction (HFmrEF) is defined as LVEF between 41–49%. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]
 [REDACTED]
 [REDACTED] Thus, ESC guidelines recommend considering HF_rEF-like treatment strategies for HF_mrEF patients with signs of volume overload or prior LV dysfunction.(36)

Table 1: Classification of Heart Failure by Ejection Fraction (EF)

Type	Definition	Key Characteristics	Common Causes	Treatment Strategy
[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]
[REDACTED] [REDACTED] [REDACTED]	[REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]	[REDACTED] [REDACTED] [REDACTED]

Table 2: Classification of Heart Failure (HF)

Type	Category	Key Features
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]

Pathophysiology Overview

Heart failure is the result of structural or functional cardiac abnormalities that impair the heart's ability to pump blood effectively. [REDACTED]

[REDACTED]

[REDACTED] A

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

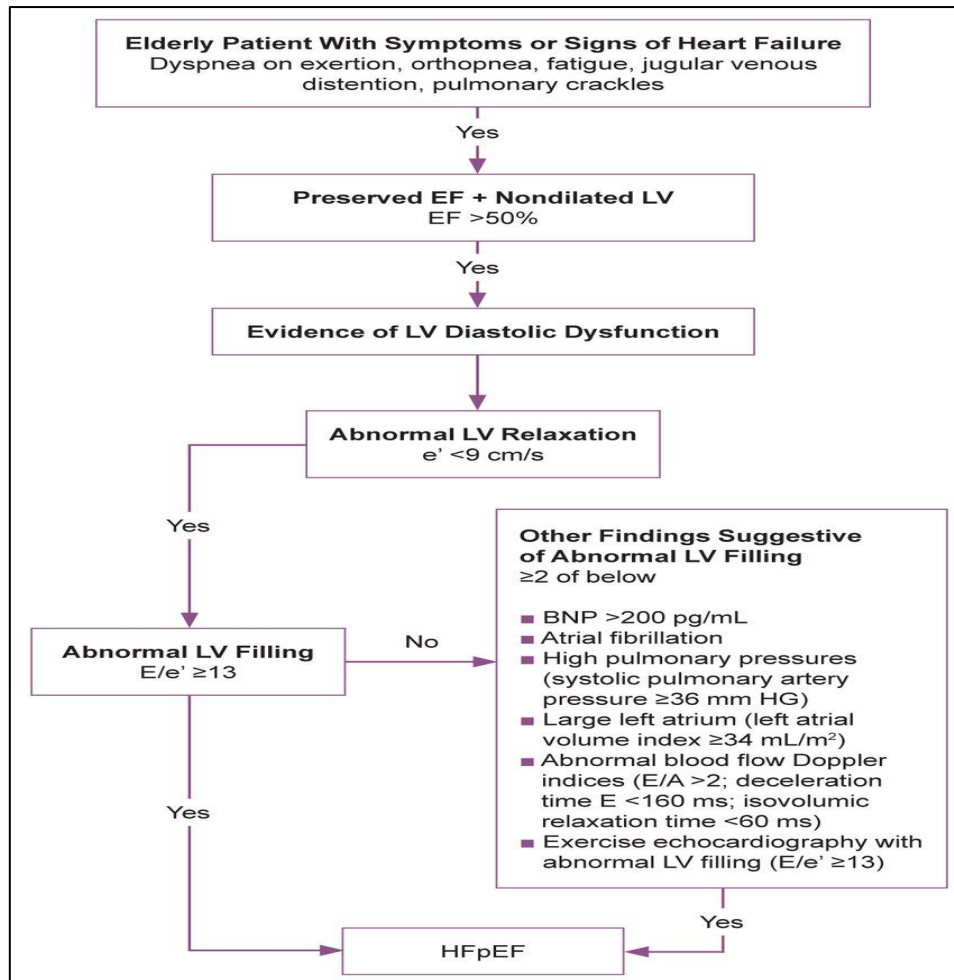


Fig 2: Step-by-step diagnosis of heart failure with preserved ejection fraction (HFpEF) (38)

In HFrEF, the primary mechanism is systolic dysfunction, where the left ventricle loses its contractile strength, resulting in a reduced ejection fraction (EF < 40%).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Patients typically present with preserved EF on echocardiography but significant exercise intolerance and symptoms of congestion. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] These lead to endothelial dysfunction, coronary microvascular inflammation, and myocardial fibrosis distinct from the direct myocyte loss seen in HFrEF.(40)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Historical Background and Evolution of HF Concepts

The understanding of heart failure has evolved significantly over centuries from ancient empirical observations to modern molecular insights. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The classification based on ejection fraction is now central to diagnosis, prognosis, and treatment decisions. [REDACTED]

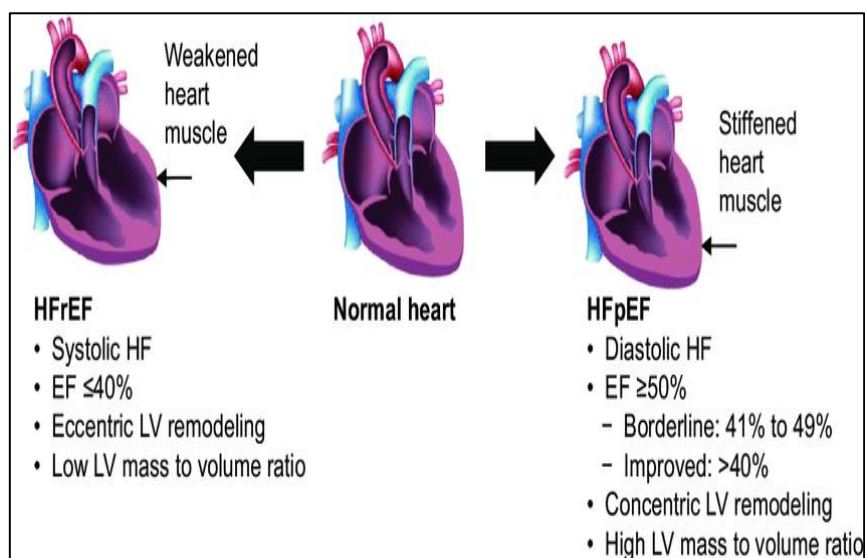


Fig 3: “Key Differences Between HFpEF and HFrEF [1,10]. HF, heart failure; HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction; LV, left ventricle”. (41)

Table 3: Comparison of HFrEF and HFpEF

Feature	HFrEF	HFpEF
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■
■	■	■

Clinical Presentation and Symptomatology

Heart failure, irrespective of its subtype, presents as a constellation of symptoms resulting from impaired cardiac output and elevated filling pressures. ■

■

■

■

■

■

■

■

[REDACTED]

[REDACTED]

[REDACTED] Some patients may also exhibit abdominal discomfort, early satiety, or hepatic congestion in more advanced cases. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 4: NYHA Functional Classification of Heart Failure

Class	Description
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Differences in Clinical Profile Between HFrEF and HFpEF

Although patients with both HFrEF and HFpEF may present with similar symptoms, their clinical profiles, demographics, and associated conditions differ considerably.

[REDACTED]

[REDACTED]

Age and Gender Differences

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Comorbidity Burden

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Clinical Severity and Functional Limitation

- Patients with HFrEF tend to present with more pronounced exercise intolerance and volume overload, but show better response to guideline-directed medical therapy.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 5: Clinical Profile of HFrEF vs HFpEF

Feature	HFrEF	HFpEF
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Investigative Profile in Heart Failure

The evaluation of a patient with suspected heart failure requires a multi-modal diagnostic approach that integrates clinical assessment with targeted investigations.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

1. Echocardiographic Parameters: EF, Wall Motion, Diastolic Indices

Echocardiography is the cornerstone imaging tool in the diagnosis and classification of heart failure. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Tissue Doppler Imaging (TDI) further aids in assessing longitudinal myocardial motion, especially in identifying subclinical dysfunction in HFpEF. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

2. ECG Findings: Rhythm Abnormalities, QRS Widening, Ischemic Changes

The electrocardiogram (ECG) is a fundamental investigation in any patient with suspected heart failure. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

3. Chest X-ray Findings: Pulmonary Congestion, Cardiomegaly

Chest radiography remains a readily accessible and cost-effective tool in the initial evaluation of heart failure. Though less specific than echocardiography, it provides important clues, particularly in acute decompensated heart failure. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

4. Laboratory Markers

[REDACTED]

[REDACTED]

[REDACTED]

Natriuretic Peptides (BNP, NT-proBNP):

These are biomarkers secreted by ventricular myocytes in response to pressure overload and myocardial stretch. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Renal Function Tests (Creatinine, BUN):

Renal dysfunction is both a contributor to and consequence of heart failure. [REDACTED]

[REDACTED]

[REDACTED]

Cardiac Biomarkers (Troponins):

High-sensitivity troponins, even in the absence of acute coronary syndrome, may be elevated in chronic heart failure due to ongoing myocyte injury and stress. [REDACTED]

[REDACTED]

Liver Function Tests (LFTs):

[REDACTED]

[REDACTED]

[REDACTED]

Complete Blood Count and Electrolytes:

1. Hemoglobin: Anemia is common in HF and contributes to fatigue and dyspnea.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Table 6: Diagnostic & Prognostic Modalities in Heart Failure

Modality	Key Findings
ECG	Normal or non-specific ST-T changes; may show Q waves in inferior leads in left ventricular failure
BNP/NT-proBNP	Elevated levels suggest heart failure; levels correlate with severity and prognosis
Transthoracic echocardiography (TTE)	Left ventricular dilation, reduced ejection fraction (HFrEF), or preserved ejection fraction (HFpEF); right ventricular dilation in right heart failure
Cardiac MRI	Myocardial edema, late gadolinium enhancement (LGE) indicating myocardial fibrosis or scar tissue
Cardiac CT	Coronary artery disease, aortic aneurysm or dissection, pulmonary embolism
Right heart catheterization	Elevated pulmonary artery pressures, pulmonary hypertension, elevated pulmonary capillary pressures
Exercise stress testing	Exercise intolerance, abnormal blood pressure response, ST-T changes
Cardiac catheterization	Coronary artery disease, left ventricular angiography showing reduced contractility

Comorbidities and Risk Factors Associated with Heart Failure

Heart failure (HF) is rarely a stand-alone diagnosis; rather, it exists as part of a broader systemic syndrome, frequently accompanied by multiple comorbidities that contribute to its development, exacerbate its symptoms, and adversely affect prognosis. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Other contributors such as anemia, COPD, and thyroid disorders complicate symptom management and must be addressed holistically for effective care. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

9. Thyroid Disorders → can cause tachycardia-induced or bradycardia-related HF

Treatment Modalities and Management Approach

The therapeutic approach to heart failure is primarily dictated by ejection fraction status. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Device therapies such as implantable cardioverter defibrillators (ICDs) and cardiac resynchronization therapy (CRT) are critical for selected patients to prevent sudden cardiac death and improve functional status. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Lifestyle measures such as salt restriction, weight control, and cardiac rehabilitation play a crucial role, given the metabolic and inflammatory contributions to HFpEF. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Biomarkers like NT-proBNP, when persistently elevated, portend worse outcomes and help guide post-discharge management strategies. [REDACTED]

[REDACTED]

6. Functional decline: assessed via NYHA class and quality of life tools

Knowledge Gap in Current Literature

Despite the growing burden of heart failure in India, particularly in states like Maharashtra, there remains a significant lack of region-specific data differentiating HF_rEF and HF_pEF. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] These gaps restrict the development of regionally tailored treatment algorithms, prevent effective health policy planning, and leave a substantial portion of HF patients with suboptimal care. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Rationale of the Present Study

Given the substantial burden of heart failure in India and the marked heterogeneity between preserved and reduced ejection fraction phenotypes, there is a pressing need to evaluate and compare their clinical, investigative, and outcome profiles within an Indian context. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Research Studies

[REDACTED] et al. ([REDACTED]) explore the evolving landscape of heart failure with preserved ejection fraction (HFpEF), now recognized as a major subtype of heart failure that accounts for over 50% of global HF cases. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The review concludes with a call for redefining HFpEF not as a single disorder but as a spectrum of overlapping phenotypes, urging the integration of personalized medicine, machine learning algorithms, and broader trial inclusion criteria in future research.(59)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

This study emphasizes that HFpEF and HFrEF remain distinct clinical entities with unique prognostic profiles and illustrates the utility of artificial intelligence in enhancing outcome prediction in heart failure cohorts.(60)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] It concludes by urging a shift toward precision medicine approaches in HFpEF and HFmrEF, leveraging biomarkers, imaging modalities, and individualized risk profiling to close current gaps and optimize care.(61)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] call for the development of HFpEF-specific management protocols and emphasize the necessity of individualized care models that extend beyond ejection fraction classification, especially for elderly, multimorbid populations.(62)

[REDACTED]

[REDACTED]

[REDACTED] They advocate for continued research and improvement in trial standardization to reduce HFpEF burden and costs globally.(57)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] This registry underscores significant unmet needs in HF management within low- and middle-income countries and highlights the importance of national-level strategies to standardize care and improve outcomes.(63)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The analysis also calls for

increased trial representation for elderly, female, and comorbid populations to refine therapeutic guidance.(64)

describe the demographic and clinical characteristics of 120 patients with newly diagnosed HFpEF in a tertiary care center in Gujarat, India. Patients included were aged ≥ 50 , symptomatic for heart failure (NYHA II–IV), and had LVEF $\geq 50\%$.

evaluated 752 patients with HFrEF (LVEF $< 40\%$) from a tertiary hospital in North India over 12 months. The cohort comprised predominantly male patients (78%), with a mean age of 58.4 ± 10.7 years.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] present one of the most comprehensive longitudinal analyses of heart failure patients in India, utilizing data from the Trivandrum Heart Failure Registry. The study followed 1,205 patients hospitalized with acute decompensated heart failure across 18 centers in Kerala between 2012 and 2015. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] examined 2,834 consecutive heart failure admissions from NHS Trusts, comparing clinical characteristics and outcomes between HFpEF (LVEF $\geq 50\%$) and HFrEF (LVEF $< 40\%$). HFpEF accounted for 34% of the cohort and was frequently associated with older age (median 78 vs 72 years), female gender (49% vs 33%), and higher prevalence of hypertension, atrial fibrillation, and chronic kidney disease. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] review data on HFpEF from global registries and clinical trials from 2000–2013. It highlights that HFpEF prevalence has steadily increased and now accounts for about half of all heart failure cases in developed countries, predominantly affecting the elderly and women. [REDACTED]

[REDACTED]

[REDACTED] The review concluded by calling for targeted trials, improvement in diagnostic consistency, and a shift toward personalized treatment strategies for this growing heart failure subtype.(69)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The study found that CKD was independently associated with increased in-hospital mortality across both EF groups, with adjusted odds ratios of 1.40 (HFpEF) and 1.51 (HFrEF), respectively.

[REDACTED]

[REDACTED]

[REDACTED] They advocate for closer post-discharge monitoring and tailored therapeutic approaches that balance cardiovascular benefit and renal safety.(70)

MATERIALS AND METHODOLOGY

7. **Exclusion criteria –**

[REDACTED]

[REDACTED]

Data Analysis

“This was a prospective observational study to evaluate the clinical and investigation profile of congestive cardiac failure patients. [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

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[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] The obtained data was tabulated & analyzed in terms of age, sex, duration of hospitalization from symptoms, signs, laboratory investigations, treatment given and clinical outcome.'

Data entry and analysis:

'The data was entered in Microsoft Excel and data analysis was done by using SPSS statistical software. [REDACTED]

[REDACTED]

[REDACTED]

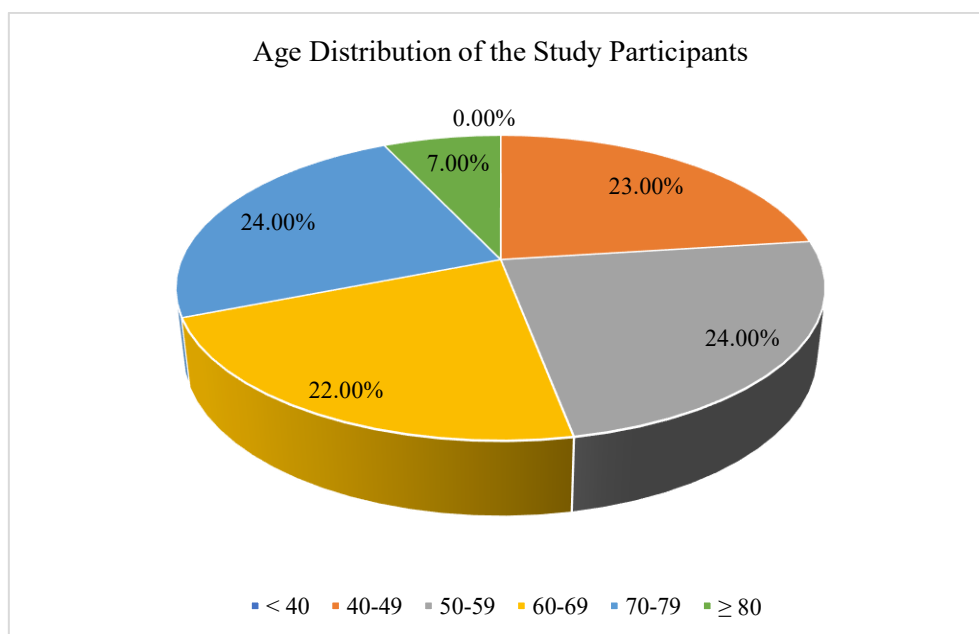
RESULTS

RESULTS

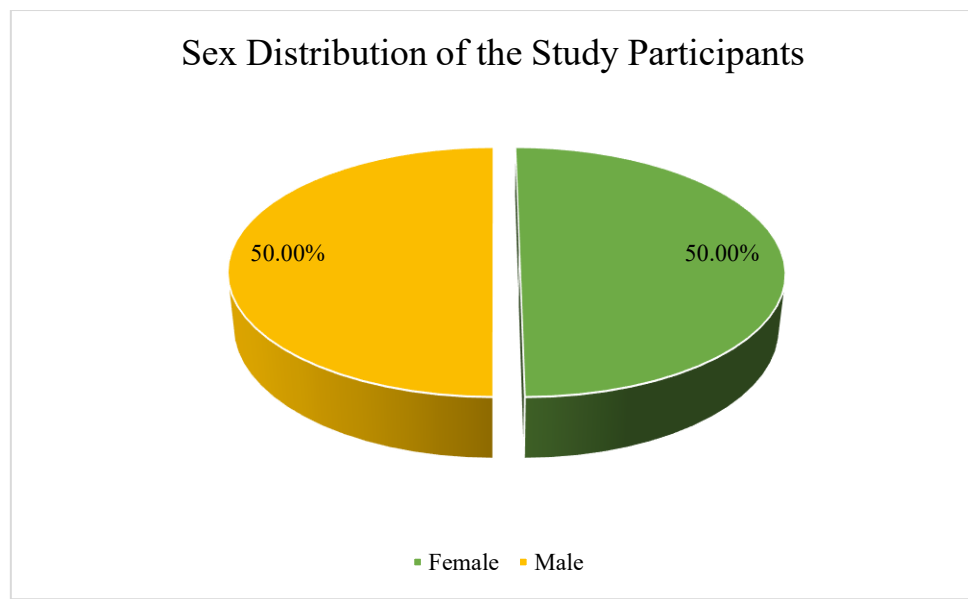
Table 7: Age and Sex Distribution of the Study Participants

		n	%
Age (Years)	< 40	0	0.00%
	40-49	23	23.00%
	50-59	24	24.00%
	60-69	22	22.00%
	70-79	24	24.00%
	≥ 80	7	7.00%
	Total	100	100.00%
Sex (M/F)	Female	50	50.00%
	Male	50	50.00%
	Total	100	100.00%

Graph 1: Age Distribution of the Study Participants



Graph 2: Sex Distribution of the Study Participants

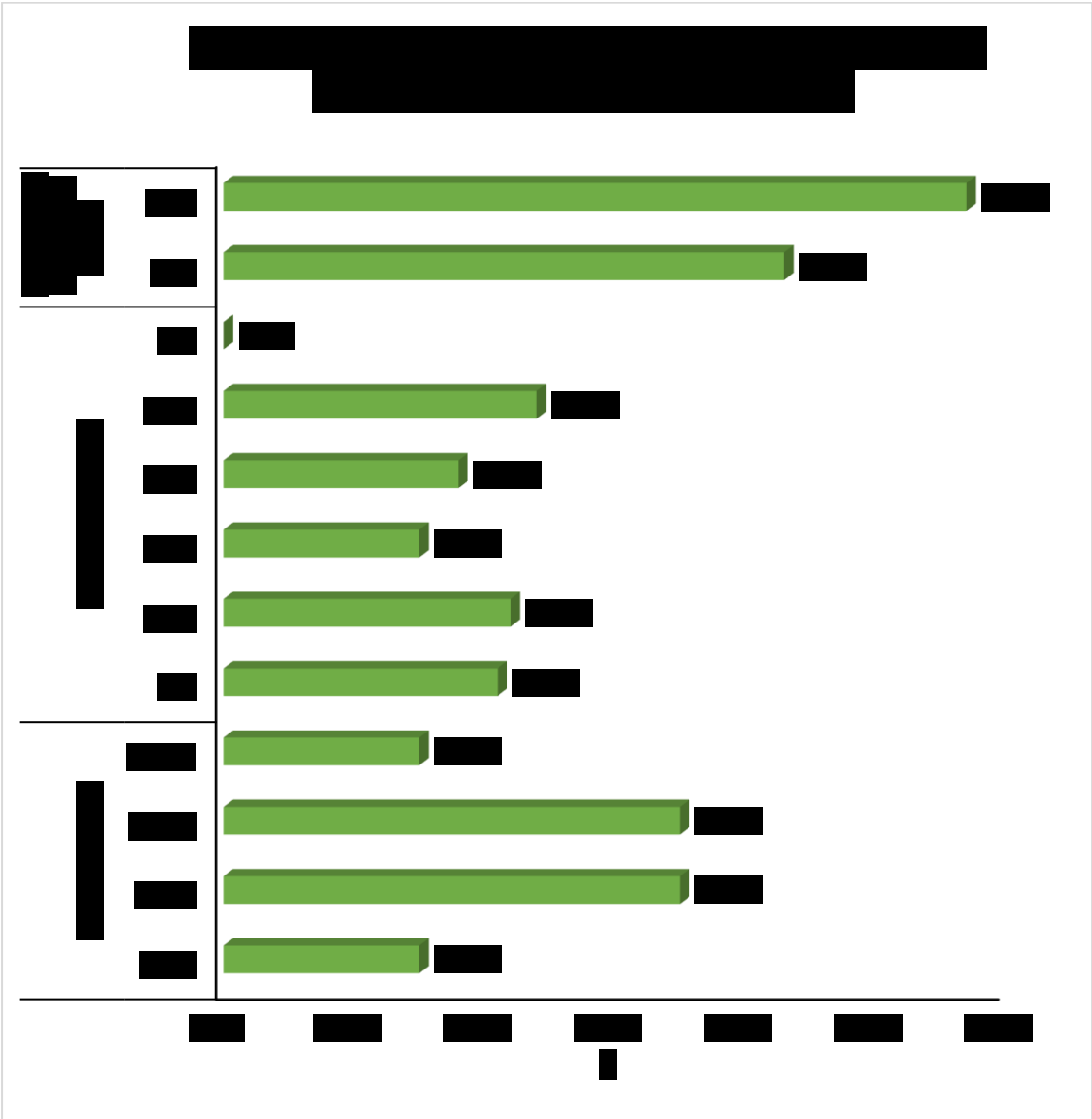


The study population was evenly distributed by gender, with 50% male and 50% female patients, ensuring balanced sex representation. Regarding age, the majority of heart failure patients were between 40 to 79 years, with the 50–59 (24%) and 70–79 (24%) age groups being the most affected, followed closely by those aged 40–49 (23%) and 60–69 (22%). Notably, no patients under 40 years were reported, while only 7% were aged ≥ 80 . This suggests that heart failure in this cohort predominantly affected middle-aged and elderly adults, supporting the established epidemiological trend that heart failure incidence increases with age.

Table 8: Distribution of NYHA Class, Ejection Fraction, and Heart Failure Type among Study Participants

		n	%
NYHA Class (I–IV)	Class I	■	■
	Class II	■	■
	Class III	■	■
	Class IV	■	■
Ejection Fraction (%)	< 30	■	■
	30–40	■	■
	41–49	■	■
	50–54	■	■
	55–69	■	■
	≥ 70	■	■
Heart Failure Type (HFpEF / HFrEF)	HfrEf	■	■
	HfpEf	■	■

Graph 3: Distribution of NYHA Class, Ejection Fraction, and Heart Failure Type among Study Participants



[Redacted text block]

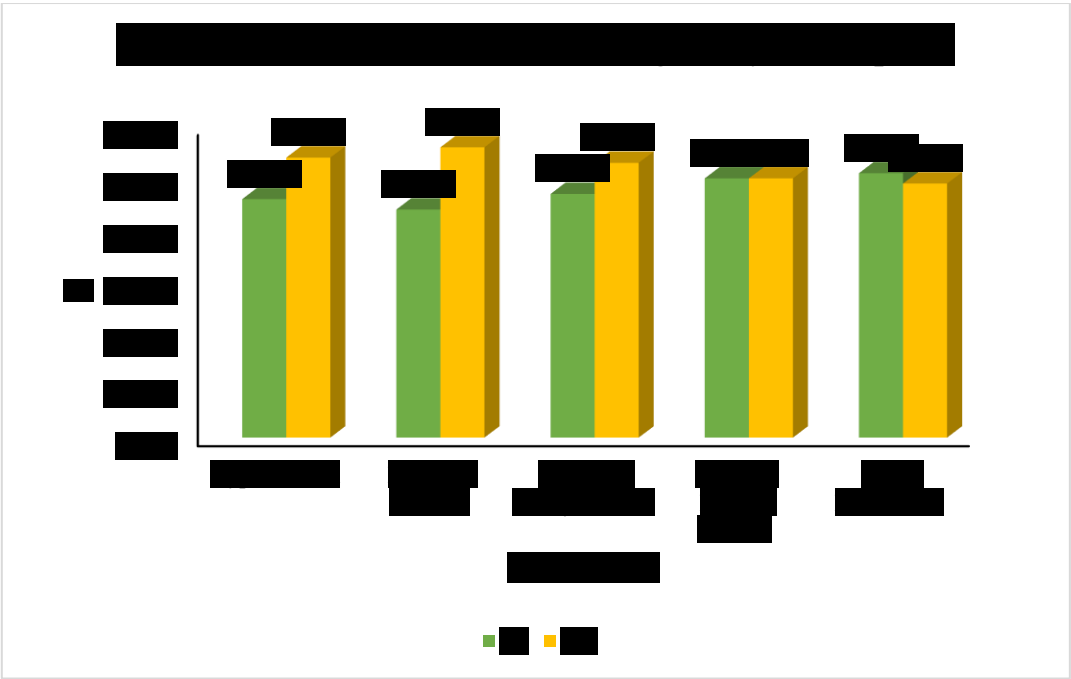
[REDACTED]

[REDACTED]

Table 9: Distribution of Comorbidities among Study Participants

		n	%
Hypertension	No	■	■
	Yes	■	■
Diabetes Mellitus	No	■	■
	Yes	■	■
Coronary Artery Disease	No	■	■
	Yes	■	■
Chronic Kidney Disease	No	■	■
	Yes	■	■
Atrial Fibrillation	No	■	■
	Yes	■	■

Graph 4: Distribution of Comorbidities among Study Participants

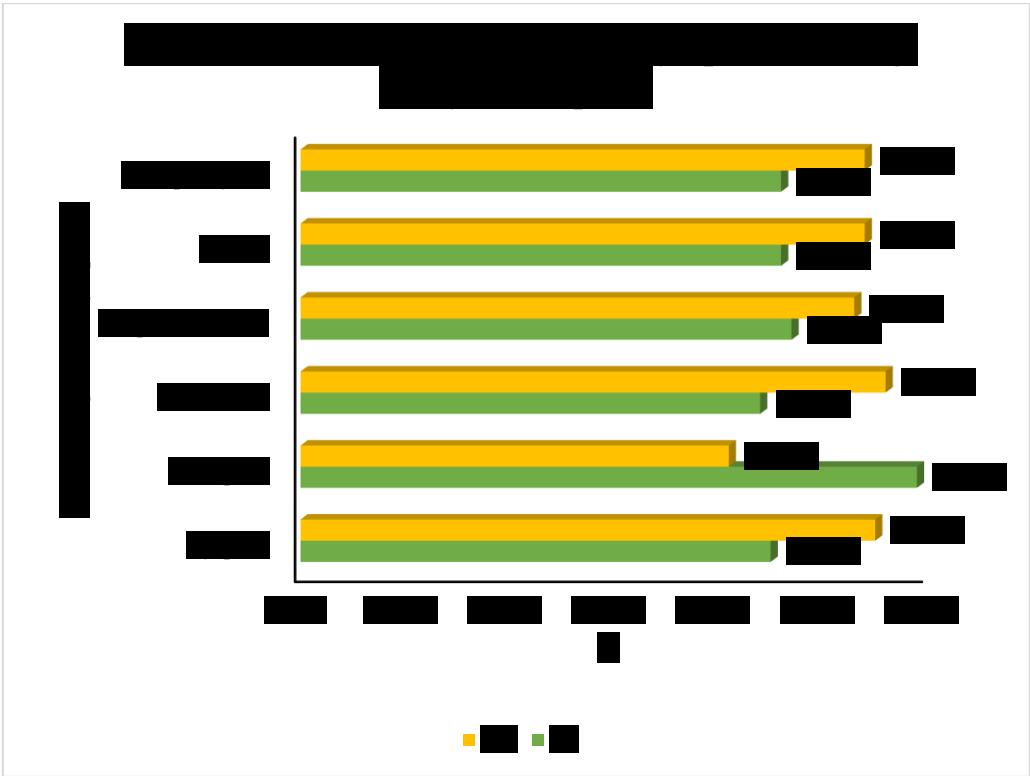


[Redacted text block]

Table 10: Distribution of Clinical Signs and Symptoms among Study Participants

		n	%
Dyspnea	No	1	100
	Yes	1	100
Orthopnea	No	1	100
	Yes	1	100
Raised JVP	No	1	100
	Yes	1	100
Peripheral Edema	No	1	100
	Yes	1	100
Ascites	No	1	100
	Yes	1	100
Gallop Rhythm	No	1	100
	Yes	1	100

Graph 5: Distribution of Clinical Signs and Symptoms among Study Participants



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

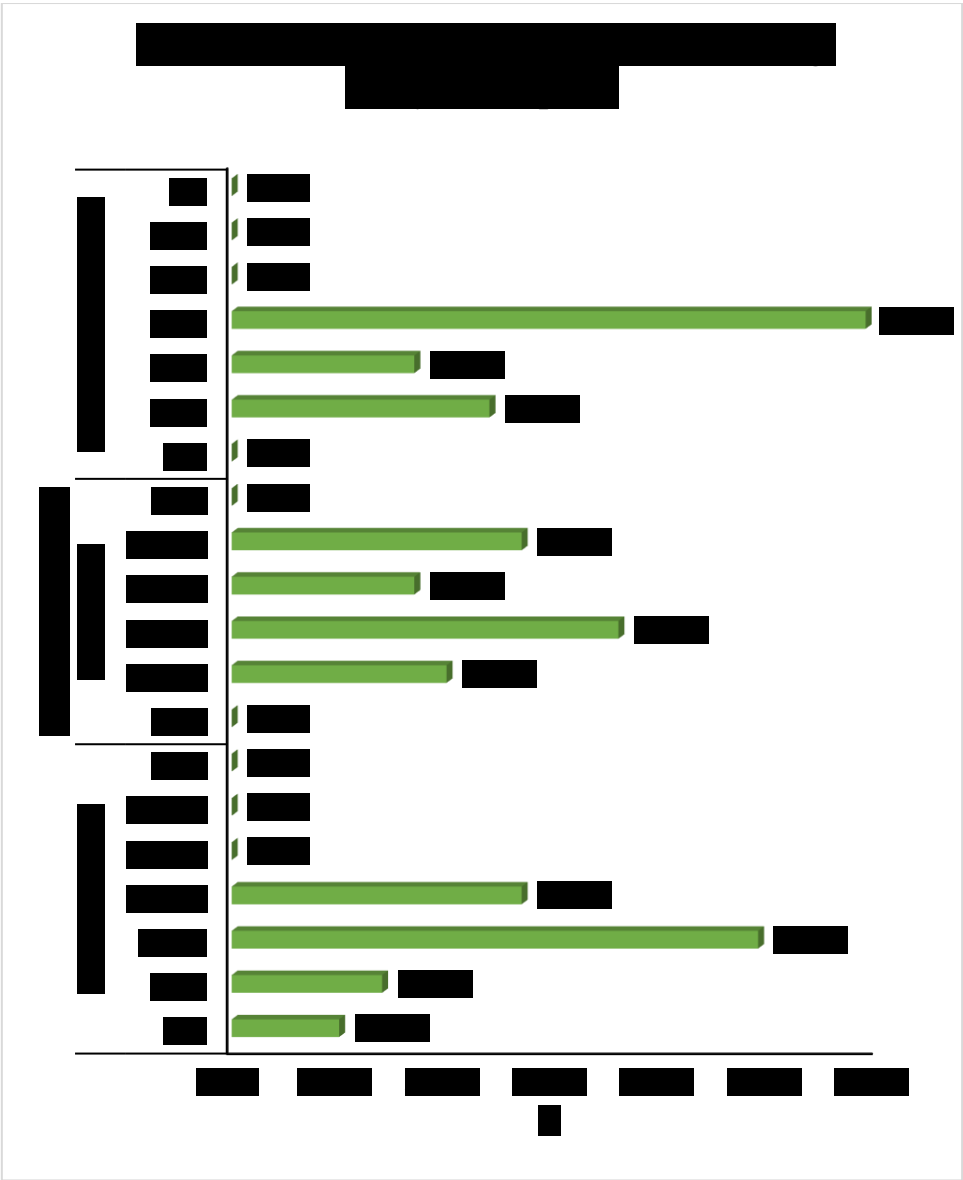
[REDACTED]

[REDACTED]

Table 11: Distribution of Iron Profile Parameters among Study Participants

		n	%
Serum Iron (µg/dL)	< 30	■	■
	30-49	■	■
	50-100	■	■
	101-150	■	■
	151-170	■	■
	171-200	■	■
	> 200	■	■
TIBC (µg/dL)	< 200	■	■
	200-249	■	■
	250-300	■	■
	301-400	■	■
	400-450	■	■
	> 450	■	■
Transferrin Saturation (%)	< 10	■	■
	10-15	■	■
	16-19	■	■
	20-45	■	■
	46-50	■	■
	51-60	■	■
	>60	■	■

Graph 6: Distribution of Iron Profile Parameters among Study Participants



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

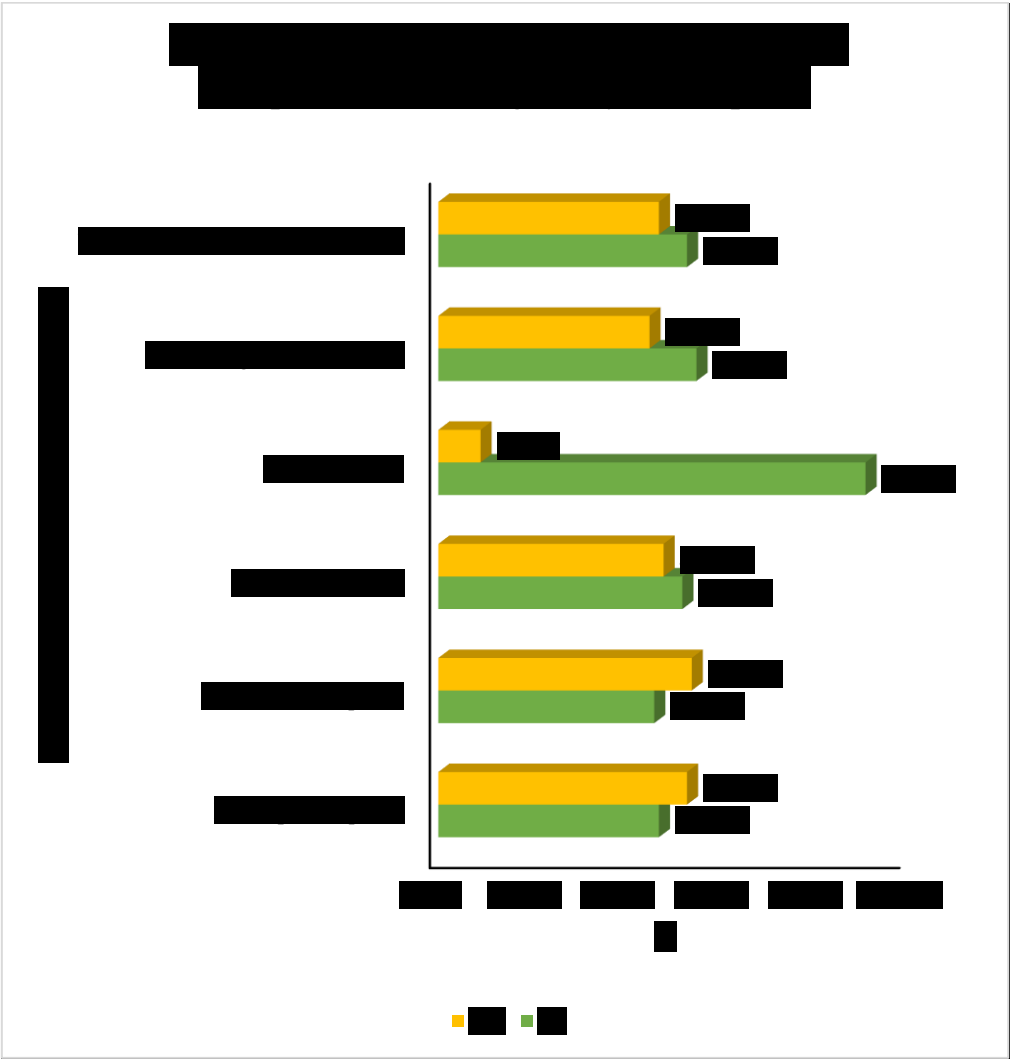
[REDACTED]

[REDACTED]

Table 12: Distribution of In-Hospital Interventions and Complications among Study Participants

		n	%
Inotropes Required	No	■	■
	Yes	■	■
Ventilation Required	No	■	■
	Yes	■	■
Dialysis Required	No	■	■
	Yes	■	■
Cardiac Arrest	No	■	■
	Yes	■	■
Worsening Renal Function	No	■	■
	Yes	■	■
New/Worsened Atrial Fibrillation	No	■	■
	Yes	■	■

Graph 7: Distribution of In-Hospital Interventions and Complications among Study Participants

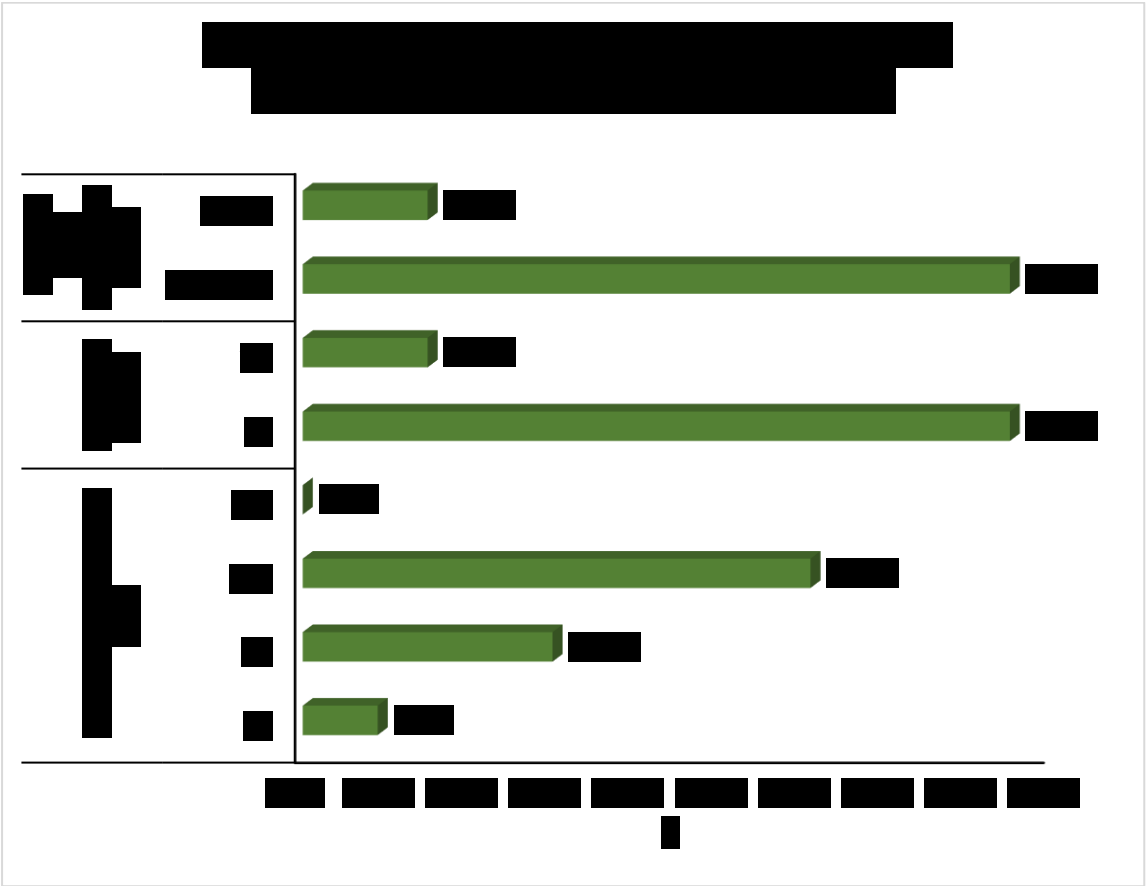


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Table 13: Hospital Stay Duration, In-Hospital Mortality, and Discharge Status among Study Participants

		n	%
Duration of Hospital Stay (Days)	≤ 3	1	100
	4-7	1	100
	8-14	1	100
	> 14	1	100
In-Hospital Mortality	No	1	100
	Yes	1	100
Discharge Status (Discharged/Expired)	Discharged	1	100
	Expired	1	100

Graph 8: Hospital Stay Duration, In-Hospital Mortality, and Discharge Status among Study Participants

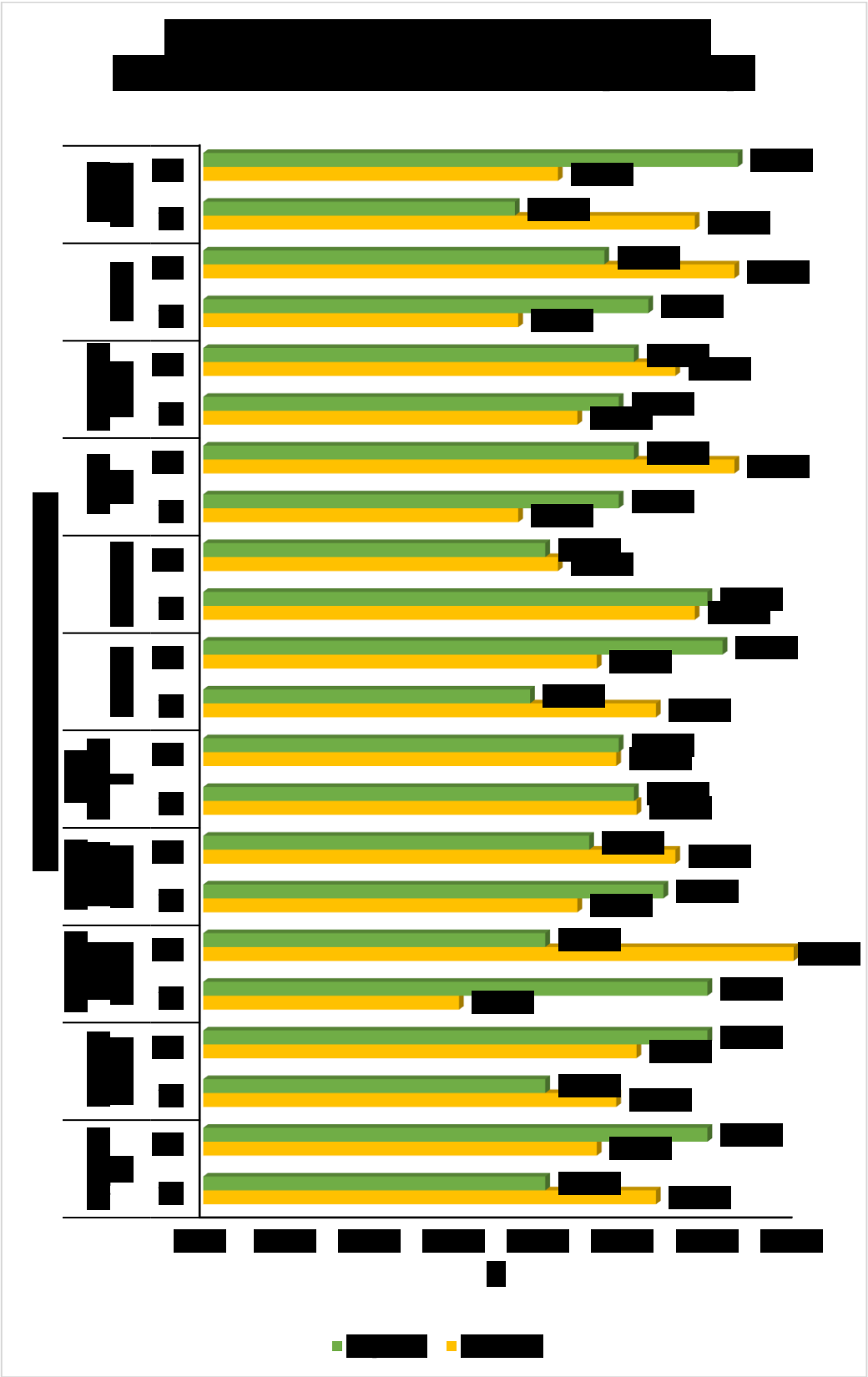


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Table 14: Comparison of Clinical Characteristics and Comorbidities Between HFrEF and HFpEF Groups

Variable		HFrEF		HFpEF		Chi-square	P-Value
		n	%	n	%		
Hypertension	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Diabetes Mellitus	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Coronary Artery Disease	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Chronic Kidney Disease	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Atrial Fibrillation	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Dyspnea	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Orthopnea	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Raised JVP	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Peripheral Edema	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Ascites	No	■	■	■	■	■	■
	Yes	■	■	■	■		
Gallop Rhythm	No	■	■	■	■	■	■
	Yes	■	■	■	■		

Graph 9: Comparison of Clinical Characteristics and Comorbidities Between HFrEF and HFpEF Groups



[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

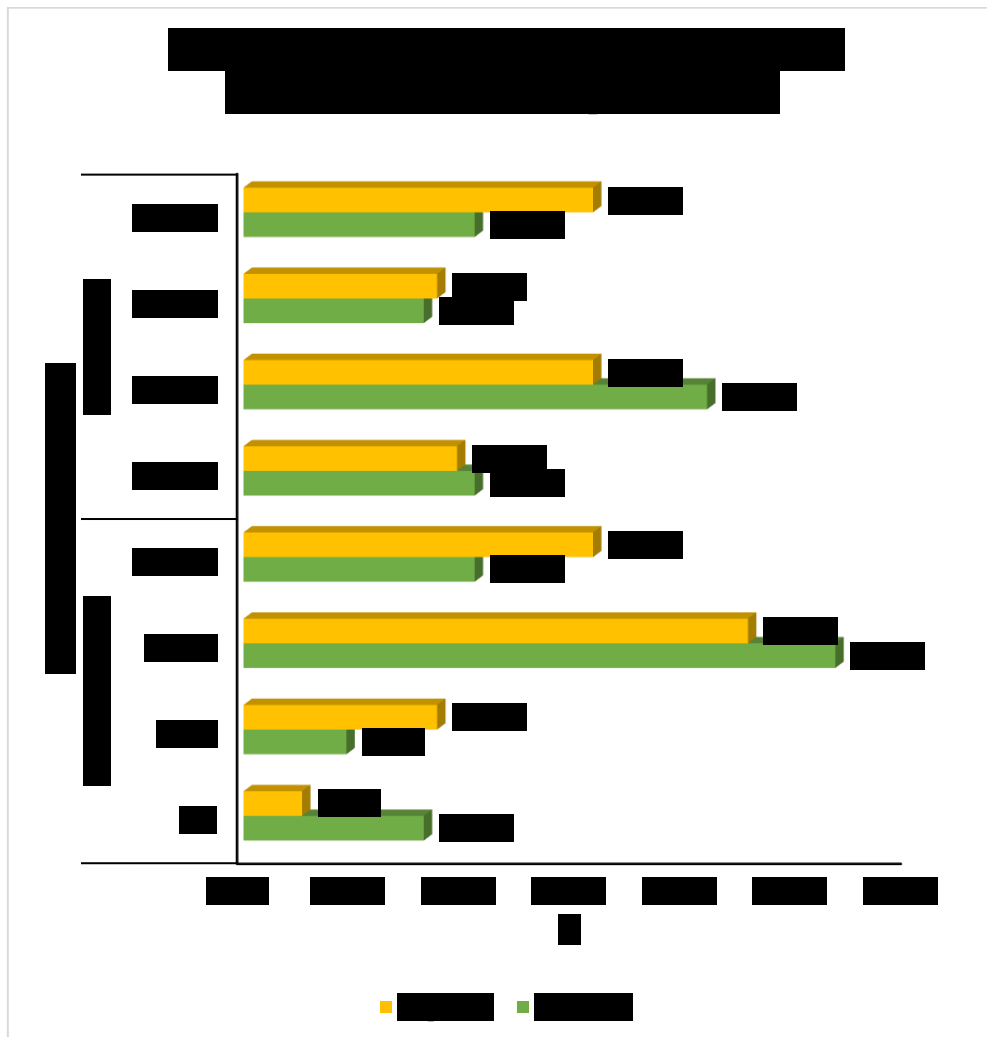
[REDACTED]

[REDACTED]

Table 15: Comparison of Serum Iron and TIBC Levels Between HFrEF and HFpEF Patients

Variable		HFrEF		HFpEF		Chi-square (P-Value)
		n	%	n	%	
Serum Iron (µg/dL)	<30	1	100	1	100	0.001
	30–49	1	100	1	100	
	50–100	1	100	1	100	
	101–150	1	100	1	100	
TIBC (µg/dL)	200–249	1	100	1	100	0.001
	250–300	1	100	1	100	
	301–400	1	100	1	100	
	400–450	1	100	1	100	

Graph 10: Comparison of Serum Iron and TIBC Levels Between HFrEF and HFpEF Patients



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[REDACTED]

[REDACTED]

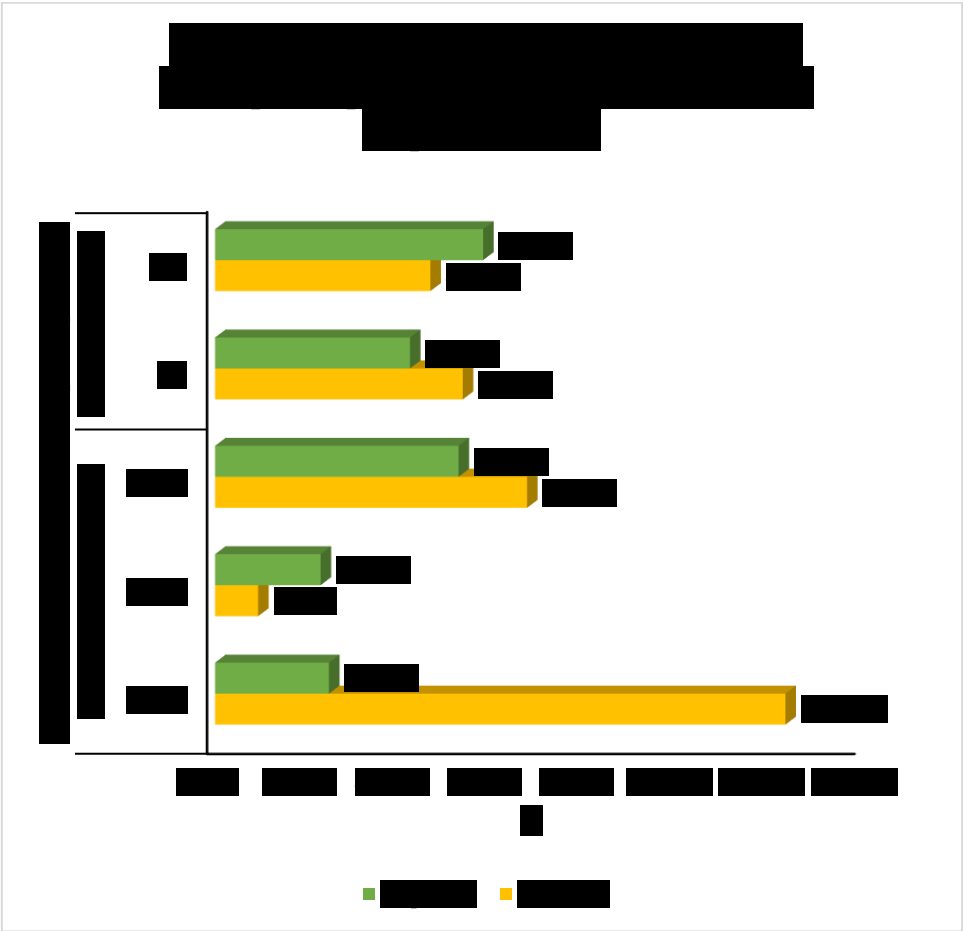
[REDACTED]

[REDACTED]

Table 16: Comparison of Transferrin Saturation and Inotrope Requirement Between HFrEF and HFpEF Patients

Variable		HFrEF		HFpEF		Chi-square (P-Value)
		n	%	n	%	
Transferrin Saturation (%)	10–15	■	■	■	■	■
	16–19	■	■	■	■	
	20–45	■	■	■	■	
Inotropes Required	No	■	■	■	■	■
	Yes	■	■	■	■	

Graph 11: Comparison of Transferrin Saturation and Inotrope Requirement Between HFrEF and HFpEF Patients



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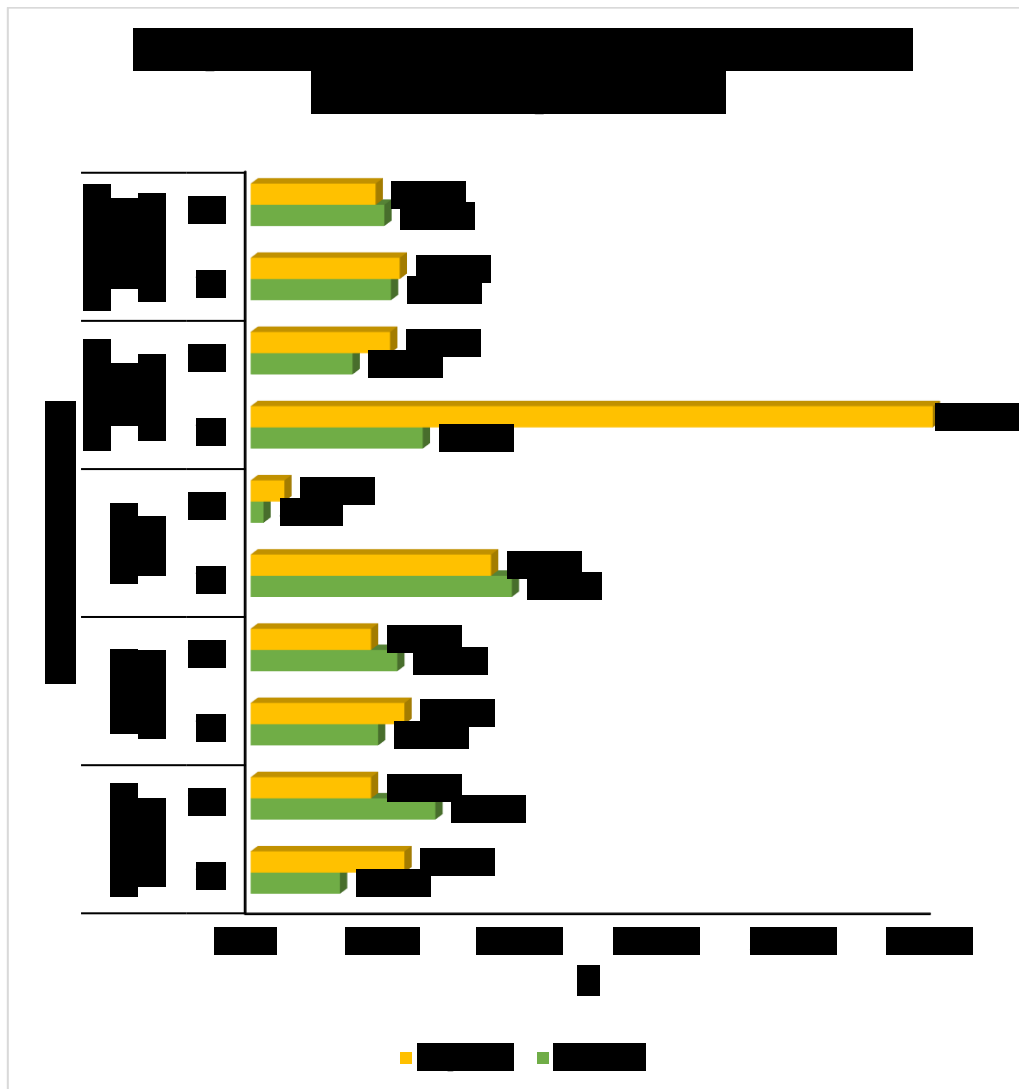
Table 17: Comparison of In-Hospital Complications Between HFrEF and HFpEF

Patients

Variable		HFrEF		HFpEF		Chi-square (P-Value)
		n	%	n	%	
Ventilation Required	No	■	██████	■	██████	■ ██████
	Yes	■	██████	■	██████	
Dialysis Required	No	■	██████	■	██████	■ ██████
	Yes	■	██████	■	██████	
Cardiac Arrest	No	■	██████	■	██████	■ ██████
	Yes	■	██████	■	██████	
Worsening Renal Function	No	■	██████	■	██████	■ ██████
	Yes	■	██████	■	██████	
New/Worsened Atrial Fibrillation	No	■	██████	■	██████	■ ██████
	Yes	■	██████	■	██████	

Graph 12: Comparison of In-Hospital Complications Between HFrEF and HFpEF

Patients



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[REDACTED]

[REDACTED]

[REDACTED]

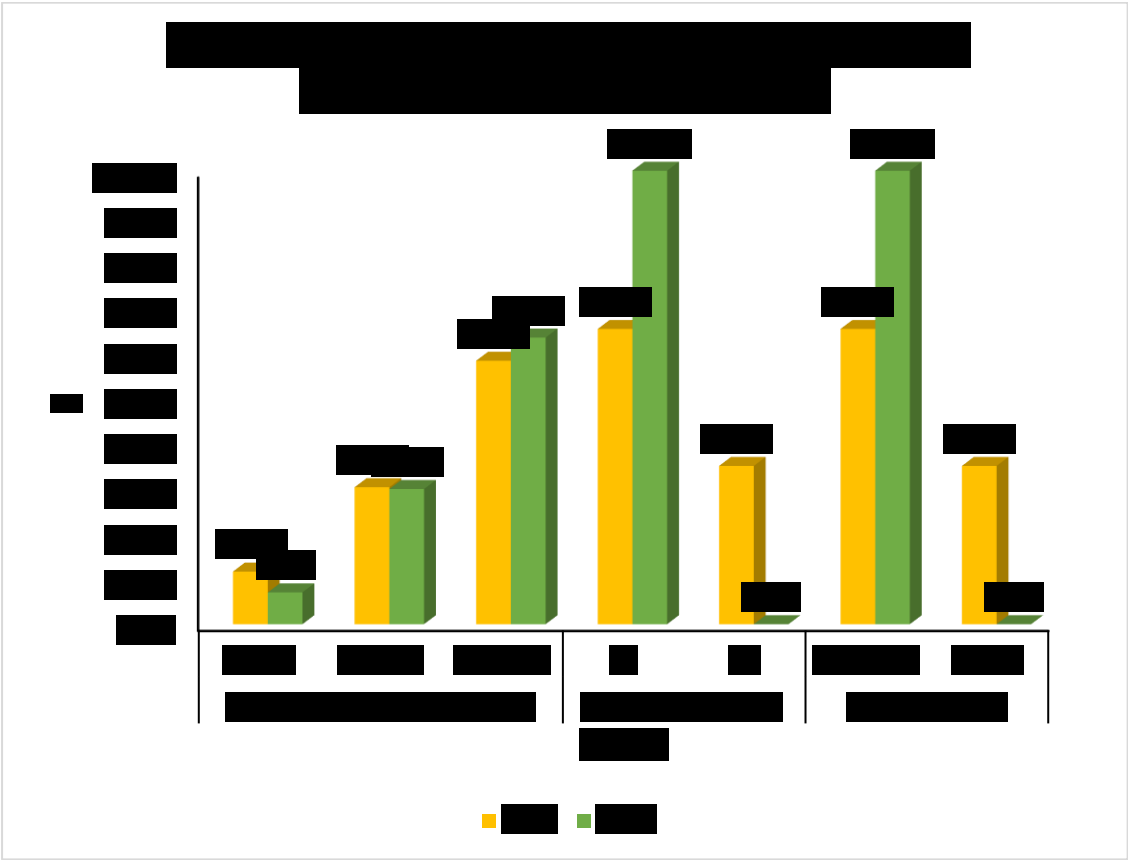
[REDACTED]

[REDACTED]

Table 18: Comparison of Hospital Stay Duration and Outcomes Between HFrEF and HFpEF Patients

Variable		HFrEF		HFpEF		Chi-square (P-Value)
		n	%	n	%	
Duration of Hospital Stay (Days)	≤3 days	■	■	■	■	■
	4–7 days	■	■	■	■	
	8–14 days	■	■	■	■	
In-Hospital Mortality	No	■	■	■	■	■
	Yes	■	■	■	■	
Discharge Status	Discharged	■	■	■	■	■
	Expired	■	■	■	■	

Graph 13: Comparison of Hospital Stay Duration and Outcomes Between HFrEF and HFpEF Patients



[Redacted text block]

DISCUSSION

DISCUSSION

In the present study, the majority of heart failure patients were between [REDACTED] years, with peak incidence in the [REDACTED] and [REDACTED] age groups (each [REDACTED]), followed by [REDACTED]

[REDACTED] and [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

The gender distribution was exactly equal in our cohort (M:F = 1:1), reflecting the shifting epidemiology of heart failure. [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

[REDACTED]

In our study, the most prevalent comorbidities were diabetes mellitus [REDACTED] hypertension [REDACTED], and coronary artery disease [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED] [REDACTED]

Chronic kidney disease (CKD) was noted in [REDACTED] of our patients. Smith et al. (2013), in a comparative analysis of CKD in HFpEF vs HFrEF, found that CKD prevalence was almost identical across EF categories, and contributed significantly to mortality and rehospitalization (70) . [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED] Other comorbidities and symptoms like dyspnea, orthopnea, and raised JVP showed no significant variation, again reflecting results from Harikrishnan et al. (2022) and Kaddoura et al. (2024), who noted substantial overlap in clinical features across EF categories (53,63).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

The Trivandrum Registry (Sanjay et al., 2018) supports this trend, showing greater stability and survival in HFpEF, albeit with higher readmission risk over long-term follow-up (67).

Strengths of the Study

1. **Prospective Comparative Design:** The study employed a prospective observational design, allowing for real-time data collection, minimizing recall bias, and ensuring uniform diagnostic and management protocols for both HFpEF and HFrEF groups.

Balanced Sample Representation: [REDACTED]

[REDACTED]

[REDACTED]

Subgroup Analysis by Ejection Fraction: [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Comprehensive Clinical and Investigative Parameters:

Strict Statistical Matching with Published Literature

Limitations of the Study

1. **Single-Center Study Design:** Conducting the study in a single tertiary care hospital limits the generalizability of results to other geographic or rural healthcare settings.

Modest Sample Size:

Short-Term Outcome Assessment Only:

Lack of Advanced Biomarkers or Imaging

5. **No Stratification by Medical Therapy:** [REDACTED]

[REDACTED]

[REDACTED].

CONCLUSION

CONCLUSION

This prospective observational study was conducted to evaluate the clinical and investigative profile of hospitalized patients with heart failure, comparing those with preserved ejection fraction (HFpEF) to those with reduced ejection fraction (HFrEF).

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

SUMMARY

SUMMARY

This prospective observational study was conducted to evaluate and compare the clinical, investigative, and outcome profiles of hospitalized patients with heart failure with preserved ejection fraction (HFpEF) versus reduced ejection fraction (HFrEF). ■

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BIBLIOGRAPHY

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- [REDACTED]

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70. Smith DH, Thorp ML, Gurwitz JH, McManus DD, Goldberg RJ, Allen LA, et al. Chronic Kidney Disease and Outcomes in Heart Failure With Preserved Versus Reduced Ejection Fraction. *Circ Cardiovasc Qual Outcomes*. 2013 May;6(3):333–42.

ANNEXURE

ANNEXURE I
LIST OF ABBREVIATIONS

WHO	World Health Organization
HF	Heart failure
LVEF	Left ventricular ejection fraction
HFrEF	Heart failure with reduced ejection fraction
HFpEF	Heart failure with preserved ejection fraction
HFmrEF	Heart failure with mildly reduced ejection fraction
ACEIs	Angiotensin-converting enzyme inhibitors
ARBs	Angiotensin receptor blockers
BNP	B-type natriuretic peptide
NT-proBNP	N-terminal pro-B-type natriuretic peptide
ECG	Electrocardiogram
NYHA	New York Heart Association
GDMT	Guideline-directed medical therapy
CKD	Chronic kidney disease
COPD	Chronic obstructive pulmonary disease
eGFR	Estimated glomerular filtration rate
ICD	Implantable cardioverter defibrillator
CRT	Cardiac resynchronization therapy
SGLT2	Sodium-glucose cotransporter-2
ARNIs	Angiotensin receptor-neprilysin inhibitors
MRAs	Mineralocorticoid receptor antagonists

ANNEXURE II
CASE RECORD FORM

Title

CLINICAL AND INVESTIGATIVE PROFILE AND OUTCOMES IN HEART FAILURE PATIENTS WITH PRESERVED VERSUS REDUCED EJECTION FRACTION'

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

1. Parameters

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

3. Interventions required during treatment

[REDACTED]

[REDACTED]

[REDACTED]

4. Treatment Given

ANNEXURE III
CONSENT FORM

1. I have read or have had read to me that the information given in the informed consent document for ‘**CLINICAL AND INVESTIGATIVE PROFILE AND OUTCOMES IN HEART FAILURE PATIENTS WITH PRESERVED VERSUS REDUCED EJECTION FRACTION**’ [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

सहमति पत्र

मैंने 'संरक्षित बनाम कम इजेक्शन फ्रैक्शन वाले हृदय विफलता रोगियों में नैदानिक प्रोफ़ाइल और परिणाम' विषय पर अध्ययन हेतु जानकारी प्रदान करने वाले सूचित सहमति पत्र को पढ़ा है या मुझे पढ़कर सुनाया गया है। [REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

संमिपत्र

मी 'जास्त इजेक्शन फ्रॅक्शन विरुद्ध कमी इजेक्शन फ्रॅक्शन असलेल्या हृदय विकाराच्या रुग्णांमध्ये नैदानिक प्रोफाईल व त्यांचे परिणाम' या अभ्यासाबाबतचे सूचित संमतीपत्र वाचले आहे किंवा मला ते स्पष्टपणे वाचून दाखवले गेले आहे

MASTER CHART

[illegible]