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A Prospective Study on Risk Factors and Management among Heart Failure with Preserved Ejection Fraction Patients

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Abstract: ***Background*: Heart failure with preserved ejection fraction (HFpEF) is associated with multiple cardiovascular and metabolic comorbidities. Understanding its clinical characteristics and management patterns may support appropriate patient care. *Objective*: To evaluate the risk factors, clinical characteristics, and management patterns among hospitalized patients with HFpEF. *Methods*: A six-month prospective observational study was conducted in a tertiary care teaching hospital in Bangalore. Adult inpatients meeting the eligibility criteria were included. Demographic characteristics, comorbidities, clinical manifestations, laboratory findings, prescribed medications, and adverse drug reactions were assessed using descriptive statistics. *Results*: Among 3,863 hospital admissions, 71 patients (1.83%) met the study criteria for HFpEF. Most patients were older than 60 years (77.4%), and 63.4% were female. Hypertension and type 2 diabetes mellitus were prominent comorbidities. Dyspnea and other cardiopulmonary symptoms were frequently reported. Most patients (84.5%) had a left ventricular ejection fraction between 50% and 55%. Laboratory investigations showed variable biomarker abnormalities. Management commonly involved antihypertensive medications, antiplatelet agents, statins, and combination therapies. Three patients (4.2%) experienced reported adverse drug reactions. *Conclusion*: HFpEF was predominantly observed among older adults, particularly women, with substantial cardiovascular and metabolic comorbidity. The findings highlight the importance of recognizing associated risk factors, reviewing medication patterns, and monitoring treatment safety in hospitalized patients.***

Keywords: Heart failure with preserved ejection fraction; HFpEF; Risk factors; Comorbidities; Pharmacotherapy; Adverse drug reactions

1. Introduction

Heart failure is a major global concern impacting individuals who suffer from its symptoms. It currently affects not only the elderly but also younger adults. Nearly fifty percent of all heart failure cases are categorised as heart failure with preserved ejection fraction (HFpEF), which has become the most common type. Despite having a preserved left ventricular ejection fraction (>50%), HFpEF is characterised by typical heart failure symptoms such as dyspnoea, fatigue, and fluid retention, HFpEF is becoming increasingly common, especially among young women and older adults. The rise in cases is primarily due to the increasing prevalence of comorbid conditions such as obesity, atrial fibrillations, hypertension, and type 2 diabetes mellitus.

Epidemiology

Heart failure (HF) is a pandemic affecting over 60 million individuals worldwide. Approximately one in four people will experience heart failure at some stage in their lives, indicating a 24% lifetime risk. In populations with high hospitalizations and mortality rates, the prevalence of heart failure with preserved ejection fraction (HFpEF, with EF>50%) is on the rise, reaching up to 80%. [1]

Pathophysiology of Heart Failure with Preserved Ejection Fraction

Diastolic dysfunction is a primary characteristic of heart failure with preserved ejection fraction (HFpEF), a complex condition marked by elevated left ventricular (LV) filling pressure due to increased ventricular stiffness and impaired cardiac relaxation. The pathophysiology of HFpEF is influenced by endothelial dysfunction. Oxidative stress and

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reduced nitric oxide bioavailability result from systemic inflammation, which is directly associated with obesity, hypertension, insulin resistance and age factors.[2]

Risk Factors

The American Heart Association has identified seven modifiable risk factors, referred to as Life's simple 7, to improve cardiovascular health through lifestyle modifications. These factors include blood pressure, cholesterol levels, blood glucose management, physical activity, dietary habits, body weight, and smoking cessation.

Sign and Symptoms

Symptoms of HFpEF can include:

- Shortness of breath
- Fatigue
- Reduced exercise tolerance
- Leg/ankle swelling (edema)
- Palpitations (fast or irregular heartbeat)
- wheezing
- decreased urine output [3]

2. Methodology

The research was conducted in the Inpatient departments of a tertiary care teaching hospital in Bangalore over a duration of six months. Approval for the prospective observational study was secured from the hospital's institutional Ethics committee. The design of the study was observational. All in-patients of both sexes aged over 18 years with confirmed heart failure from any cause and an Ejection fraction exceeding 50% were included in the study. Patients suffering from sepsis and those who chose not to participate were excluded from the study.[4]

3. Results

The study was conducted for a period of six months after obtaining ethical clearance from the hospital. During the study period, 3863 patients were admitted, among which 71 patients fulfilled the inclusion criteria for HFpEF.

Table 1: Distribution of Patients with respect to Incidence Rate

Condition	No. of patients	Total no. of patients	Incidence Rate
HFpEF	71	3863	1.83%

In the study cohort of 71 patients, 26 individuals were male, representing 36.6 % of the total. The remaining 45 patients were female, constituting 63.0 % of the cohort. Thus, out of all patients examined, more than two-thirds (63 %) were women, while just over one-third (37 %) were men. Out of the 71 patients examined, only one patient (1.4 %) was between 31 and 40 years old. The next age bracket, 41 to 50 years, included five patients, making up 7.0 % of the cohort. The 51 to 60 years group contained ten patients, equivalent to 14.1 %. A larger proportion—sixteen patients or 22.5 %—fell into the 61 to 70 years range. The most substantial group comprised 25 patients (35.2 %) aged between 71 and 80 years, while the remaining fourteen patients (19.7 %) were older than 80 years.[5]

In the cohort of 71 patients, 8.5 % were underweight (3 men, 3 women), 77.5 % had a normal BMI (20 men, 35 women), 9.9 % were overweight (3 men, 4 women), and 4.2 % were obese (1 man, 2 women). The majority of both males and females fell into the normal BMI category.

Regarding social history, 11.2% of patients were smokers, 9.85% consumed alcohol, and 14.08% had both smoking and alcohol habits, whereas 63.3% had no significant social history. Hypertension and type 2 diabetes mellitus were the most common comorbidities, with 49.3% of patients having both conditions. Other associated comorbidities included hypothyroidism, dyslipidemia, and chronic kidney disease. Advanced age (64.78%) and gender (35.21%) were identified as major non-modifiable risk factors, while combinations of diabetes mellitus, hypertension, obesity, smoking, alcoholism, and cardiovascular disease were common modifiable risk factors.[6]

71 patients presented with complaints. Common respiratory symptoms dominated: shortness of breath, dyspnea, orthopnoea, cough and chest pain/discomfort appeared alone or in combinations across many cases, often accompanied by sweating, fever, or nausea. Giddiness and vomiting were frequent single or accompanying complaints. Several patients had peripheral edema or reduced urine output suggestive of fluid overload or renal issues. Other presentations included headache, abdominal pain with vomiting or distension, urinary symptoms, ataxia, and acute limb/radicular pain; a few cases combined multiple systemic symptoms (for example fever, cough, chest pain, vomiting, and weakness). Overall the cohort shows a predominance of cardiopulmonary and gastrointestinal/neuro-vestibular symptoms, with many patients presenting multi-system complaints.

Table 2: Distribution of Patients with Respect to Ejection Fraction

S. No	Ejection Fraction	No. of patients	Percentage
1	50-55%	60	84.5%
2	56-60%	11	15.49%
Total		71	100%

Table 3: Distribution of Patients with Respect to Mayo Clinic Score

S.no	Mayo clinic score	No. of patients	Percentage
1	0	1	1.4%
2	1	4	5.53%
3	2	11	15.49%
4	3	10	14.08%
5	4	25	35.21%
6	5	7	9.85%
7	6	4	5.63%
8	7	3	4.22%
9	8	3	4.22%
10	9	3	4.22%
Total		71	100%

The laboratory assessments of the 71 patients showed variable testing rates and abnormality frequencies across biomarkers. Troponin was measured in 47 patients, with 27 (38.0% of the cohort) having values 0.01–0.03 mg/ml and 20 (28.2%) >0.03 mg/ml; 24 patients (33.8%) were not tested. C-reactive protein (CRP) was performed in 58 patients: 30 (42.3%) had CRP <5 mg/L, 28 (39.4%) had CRP >5 mg/L, and 13 (18.3%)

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were not tested. NT-pro-BNP results were available for 64 patients, with 40 (56.3%) <125 pg/ml, 24 (33.8%) >125 pg/ml, and 7 (9.9%) not performed. D-dimer was elevated (>0.5 µg/ml) in the majority (54/71, 76.1%), 16 patients (22.5%) had values <0.5 µg/ml, and 13 (18.3%) were not tested. Blood urea nitrogen (BUN) was >20 mg/dl in 51 patients (71.8%), 12 (16.9%) had BUN 7–20 mg/dl, and 8 (11.3%) were not performed. Cholesterol testing was infrequent: only 17 patients were tested, with 7 (9.8%) <200 mg/dl and 10 (14.1%) >200 mg/dl; 52 patients (73.2%) had no cholesterol measurement. Overall, testing completeness varied by marker, with D-dimer and BUN showing a high prevalence of abnormal elevations while cholesterol had the largest proportion of unperformed tests.[7]

Table 4: Distribution of Patients with Respect to Medication

Sl. No	Medications	No. of patients	Percentage
1	Anti Platlets	5	7.04%
2	Anti-Arrythmics	1	1.4%
3	Antihypertensives	27	38.02%
4	Statins	1	1.4%
5	Antiplatlets + Antihypertensives	14	19.71%
6	Statins+ Antihypertensives	6	8.45%

Among the 64 hypertensive patients, ARBs and CCBs were the most commonly used antihypertensive classes, each accounting for about 12.5% of patients, either as monotherapy or in combination. Diuretic-containing regimens, especially with ARBs or beta blockers, were frequent, while triple-drug and four-drug combinations were less common, together involving only a small proportion of the cohort. On antiplatelets, Aspirin was most common (34.37%, 11 patients), followed by Clopidogrel + Atorvastatin (28.12%, 9 patients), Ticagrelor (25%, 8 patients), and Clopidogrel alone (12.5%, 4 patients). Among 17 patients on statins, Atorvastatin was more frequently prescribed (64.7%, 11 patients) over Rosuvastatin (35.29%, 6 patients). For the 5 patients on anticoagulants, Heparin was preferred (60%, 3 patients) versus Enoxaparin (40%, 2 patients), indicating aspirin, atorvastatin, and heparin were the most prescribed medications in their respective categories.[8]

Table 5: Distribution of ADR'S with Respect to Causality Assessment

S. No	Drug	Reaction Observed	Number of Patients	Naranjo Scale	WHO Scale	Percentage
1	AMLODIPINE	PITTING EDEMA	1	PROBABLE	PROBABLE	33.33%
2	LASIX	HYPOKALEMIA	1	PROBABLE	PROBABLE	33.33%
3	HEPARIN	HEMOPTYSIS	1	PROBABLE	PROBABL	33.33%
	TOTAL		3			100.00%

4. Discussion

A six-month prospective study at tertiary Hospital identified 71 HFpEF cases among 3,863 admissions (1.83%). HFpEF was more common in elderly females, with hypertension and diabetes as major comorbidities**.** Patients commonly presented with symptoms such as shortness of breath, edema, sweating, weakness, cough, and breathing difficulty. Social habits including smoking and alcohol consumption were identified as important risk factors. Among the patients, 11.2% were smokers, 9.85% consumed alcohol, and 14.08% had both smoking and alcohol habits, while the majority had no significant social history. Most patients had preserved ejection fraction between 50–55%. Laboratory investigations commonly showed elevated D-dimer, BUN, CRP, NT-proBNP, and troponin levels. Mayo Clinic scoring revealed that most patients had moderate scores, indicating varying severity of HFpEF among the study population. Management mainly included antihypertensive therapy either alone or in combination with antiplatelets, statins, beta-blockers, ARBs, calcium channel blockers, and diuretics. Aspirin was the most commonly prescribed antiplatelet drug.[9] Only 3 patients experienced ADRs, including amlodipine-induced edema, furosemide-induced hypokalemia, and heparin-induced hemoptysis, all of which were classified as probable according to WHO and Naranjo causality assessment scales.

5. Conclusion

The present prospective observational study identified HFpEF in 71 patients among 3,863 hospital admissions. The condition was predominantly observed in older adults, particularly women, with hypertension and type 2 diabetes mellitus representing important associated comorbidities. Patients exhibited diverse clinical manifestations and laboratory findings, highlighting the heterogeneous nature of HFpEF. Pharmacological management primarily involved antihypertensive medications and combination therapies, while relatively few adverse drug reactions were reported. These findings emphasize the importance of recognizing cardiovascular risk factors, managing associated comorbidities, and monitoring medication safety in patients with HFpEF. Further studies involving larger patient populations and longitudinal follow-up may help clarify treatment outcomes and support evidence-based management strategies.[11][12]

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