



IMPACT OF SERUM FERRITIN AND TRANSFERRIN SATURATION ON FUNCTIONAL STATUS IN PATIENTS WITH HEART FAILURE WITH REDUCED EJECTION FRACTION (HFrEF): A PROSPECTIVE OBSERVATIONAL STUDY

Cardiology

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ABSTRACT

Background: Iron deficiency is common in patients with HFrEF and contributes to fatigue, exercise intolerance, and poor quality of life. This study aimed to assess the prevalence of iron deficiency and its association with functional capacity and NYHA class in patients with HFrEF. **Methods:** Fifty patients with HFrEF (LVEF $\leq 40\%$) were enrolled. Iron studies including serum ferritin and transferrin saturation (TSAT) were performed. Functional capacity was evaluated using the 6-minute walk test (6MWT) and NYHA. **Results:** Iron deficiency (ferritin <100 ng/mL or ferritin $100\text{--}299$ ng/mL with TSAT $<20\%$) was observed in 60% of patients. These patients had significantly reduced 6MWT distance (mean 220 ± 58 m vs 310 ± 62 m, $p < 0.01$) and higher NYHA class (III/IV in 76% vs 32%, $p = 0.02$) compared to iron-replete patients. **Conclusion:** Iron deficiency is prevalent in HFrEF and is associated with worse functional status. Routine iron evaluation and correction may improve outcomes in this population.

KEYWORDS

HFrEF, iron deficiency, serum ferritin, transferrin saturation, NYHA class, 6-minute walk test

INTRODUCTION

Heart failure with reduced ejection fraction (HFrEF) remains a significant cause of morbidity and mortality. Recent studies have emphasized the role of iron deficiency — even in the absence of anemia — in limiting exercise capacity and worsening symptoms. The European Society of Cardiology recommends routine screening for iron deficiency in HF patients. This study was conducted to evaluate the prevalence of iron deficiency in HFrEF patients and correlate it with functional impairment.

MATERIALS AND METHODS

Study Design:

Prospective observational study conducted at a tertiary care cardiology center at UN mehta Cardiac centre, Ahmedabad between October 2024 to December 2024

Inclusion Criteria

- Age 18–75 years
- LVEF $\leq 40\%$ (by 2D echo)
- Clinically stable HFrEF patients

Exclusion Criteria

- Acute decompensated HF
- Active infection or malignancy
- Recent IV iron or blood transfusion

Investigations

- Serum ferritin
- Transferrin saturation (TSAT)
- Hemoglobin
- NT-proBNP
- 6-minute walk test
- NYHA classification

Definitions

Iron deficiency defined as:

- Serum ferritin <100 ng/mL
- OR
- Ferritin $100\text{--}299$ ng/mL with TSAT $<20\%$

RESULTS

- Mean Age: 60.2 ± 8.5 years
- Male: 72%
- Mean LVEF: $32.6 \pm 5.1\%$

Iron Status

- Iron-deficient: 30 patients (60%)
- Iron-replete: 20 patients (40%)

Functional Comparison

Parameter	Iron Deficient (n=30)	Iron Replete (n=20)	p-value
Mean 6MWT (meters)	220 ± 58	310 ± 62	<0.01
NYHA Class III/IV (%)	76%	32%	0.02
Hemoglobin (g/dL)	12.2 ± 1.4	12.8 ± 1.1	0.09
NT-proBNP (pg/mL)	1560 ± 780	940 ± 550	0.03

DISCUSSION

This study highlights the high prevalence of iron deficiency (60%) among HFrEF patients, consistent with prior findings such as the FAIR-HF and CONFIRM-HF trials. Notably, even in the absence of overt anemia, iron-deficient patients had significantly worse exercise tolerance and higher symptom burden.

Iron plays a central role in oxygen transport and mitochondrial energy production. In HF patients, impaired absorption, inflammation, and increased hepcidin levels contribute to functional iron deficiency. The findings support the need for routine iron status evaluation and timely correction, potentially using IV ferric carboxymaltose.

Limitations include small sample size, short follow-up, and lack of iron repletion therapy evaluation.

CONCLUSION

Iron deficiency is a common, modifiable factor associated with poor functional outcomes in HFrEF patients. Screening and treatment should be incorporated into standard heart failure care pathways.

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