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Original Article

Prevalence and spectrum of iron deficiency in heart failure patients in south Rajasthan

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ABSTRACT

Objective: To estimate the prevalence and pattern of iron deficiency (ID) in heart failure (HF) patients with or without anemia.

Methods: This is a single-center observational study, conducted at a tertiary care hospital of south Rajasthan. Patients admitted to hospital with clinical diagnosis of HF based on validated clinical criteria were included in the study. ID was diagnosed based on complete Iron profile, including serum iron, serum ferritin, total iron binding capacity, and transferrin saturation (TSAT). Anemia was defined as hemoglobin (Hb) <13 g/dl for males and <12 g/dl for females, based on World Health Organization definition. Absolute ID was taken as serum ferritin < 100 μg/L and functional ID was defined as normal serum ferritin (100–300 μg/L) with low TSAT (<20%).

Results: A total of 150 patients of HF (68% males and 32% females) were studied. Most of the patients were of high-functional NYHA class (mean NYHA 2.89 ± 0.95). ID was present in 76% patients with 48.7% patients having absolute and 27.3% patients having functional ID. Females were having significantly higher prevalence of ID than males (91.6% vs 68.6%; $p = 0.002$). Nearly one-fourth of the patients were having ID but without anemia, signifying importance of workup of ID other than Hb.

Conclusion: Our study highlights the yet underestimated and neglected burden of ID in HF patients in India. This study suggests further large-scale studies to better characterize this easily treatable condition and considering routine testing in future Indian guidelines.

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1. Introduction

Heart failure (HF) is a common problem with a prevalence of 1–2% in general population and a major cause of mortality, morbidity, and impaired quality of life (QoL).[1,2] Anemia is a frequent comorbidity in stable HF patients[3] and it increases morbidity in terms of frequent hospital admissions, impaired exercise capacity, poor QoL, and increased mortality. Iron deficiency (ID) with or without anemia has been commonly associated with HF. Although ID is the commonest nutritional deficiency worldwide, affecting more than one-third of the population,[4] its association with HF with or without anemia is of growing interest.[5–7] As iron supplementation improves prognosis in patients with HF, ID is an attractive therapeutic target – a hypothesis that has recently been tested in clinical studies.[8,9]

In 2012, the European Society of Cardiology (ESC) Guidelines for the diagnosis and treatment of acute and chronic HF recognized ID as a comorbidity in HF for the first time and recommended diagnosis of ID based on iron parameters in all patients suspected of having HF.[10,11]

Most of the studies of prevalence of ID associated with HF are from the western world. Few studies evaluated this association in Asian patients[12,13] but currently there are no data from India to permit an estimation of the prevalence of ID associated with HF. This study is intended to assess the prevalence of ID in HF and may help in formulating future guidelines in India for routine ID assessment in HF patients.

2. Material and methods

This study is a single-center observational study, conducted at a tertiary care hospital of south Rajasthan from January 2015 to July 2015. The objective of the study was to estimate the prevalence and spectrum of ID in HF patients.

Male or female patients above 18 years of age and clinically diagnosed with HF, who gave consent for the study, were included. Diagnosis of HF was established based on validated clinical criteria from the ESC,[10] the ESC guidelines for the diagnosis of HF with preserved ejection fraction (HFPEF),[14] and the Framingham criteria.[15] Excluded patients were those who had comorbid noncardiac conditions causing ID (e.g. hemorrhoids, malignancy, etc.) or confounding assignment of etiology for fluid overload (e.g. end-stage renal failure), as well as patients with specific etiologies (e.g. congenital heart disease), who would be expected to follow a different natural history compared with a 'typical' HF patient. All participants underwent thorough history (including dietary history) and clinical evaluation, blood sampling, and comprehensive transthoracic echocardiography using standardized equipment (Vivid 7 from General Electric Company). Patients were characterized as having normal Ejection Fraction (EF ≥ 50%) or mild (EF 45–50%), moderate (EF 31–44%), or severe (EF ≤ 30%) LV systolic dysfunction. Apart from routine hemogram, these patients were assessed for their iron status by measuring complete iron profile, including serum iron, serum ferritin, total iron binding capacity, and transferrin saturation (TSAT).

Anemia was defined as hemoglobin (Hb) < 13 g/dl for males and <12 g/dl for females, based on World Health Organization definition.[16] Although generally accepted serum ferritin cut-off level to diagnose absolute ID is 30 μg/L, in HF, both intracellular iron accumulation and inflammation stimulate the tissue expression of ferritin and increase its blood level. In such cases, for the diagnosis of absolute ID, a higher serum ferritin cut-off value is used (e.g. 100 μg/L).[4] In our study, absolute ID was taken as serum ferritin < 100 μg/L and functional ID was defined as normal serum ferritin (100–300 μg/L) with low TSAT (<20%).[6,8,17]

2.1. Statistical analysis

Categorical variables are expressed in numbers and percentages, whereas normally distributed data are presented as mean ± standard deviation. Chi-square test and Student's *t*-test were used to calculate *p*-value as appropriate.

3. Results

During the period of study, 150 patients admitted to hospital with clinical diagnosis of HF were studied, out of which 102 (68%) were males and 48 (32%) were females. Mean age of the study subjects was 63.3 ± 14.4 years, with mean NYHA class of 2.89 ± 0.95 and mean EF of 38 ± 12%. Baseline characteristics of these patients are shown in Table 1.

Absolute ID (serum ferritin < 100 μg/L) was present in 73 (48.7%) patients. Absolute ID with anemia (Hb < 13 g% for male and <12 g% for females) was present in 47 (31.3%) patients.

Table 1 – Characteristics of study population.

Total patients	150
Males	102 (68%)
Females	48 (32%)
Mean age (years)	63.3 ± 14.4
Males	62.2 ± 14.3
Females	65.4 ± 14.4
Age groups	
<50 Years	40 (26.7%)
51–70 Years	65 (43.3%)
>70 Years	45 (30.0%)
NYHA class – Mean	2.89 ± 0.95
NYHA-I	16 (10.7%)
NYHA-II	27 (18.0%)
NYHA-III	64 (42.7%)
NYHA-IV	43 (28.7%)
Ejection fraction – Mean (%)	38 ± 12
<30%	54 (36.0%)
31–44%	54 (36.0%)
45–50%	5 (3.4%)
>50%	37 (24.7%)
Diabetes	23 (15.3%)
Hypertension	65 (43.3%)
Ischemic Heart Disease	81 (54.0%)
Primary valvular heart disease	23 (15.3%)
Secondary mitral regurgitation	57 (38.0%)
Atrial fibrillation	32 (21.3%)
Wide QRS	19 (12.7%)