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A STUDY OF PREVALENCE OF IRON DEFICIENCY IN PATIENTS WITH CHRONIC HEART FAILURE WITH REDUCED EJECTION FRACTION

Medicine

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ABSTRACT

Introduction: Iron deficiency (ID) is a significant comorbidity of heart failure (HF). However, ID remains insufficiently detected(Manceau et al., 2022). The symptoms of ID are non-specific and often confused with those of HF or comorbidities. HF patients with ID are often re-hospitalized and have decrease life expectancy. **Aim:** Evaluation of iron status in patients with chronic heart failure with reduced ejection fraction. **Method:** It is a cross sectional study of 80 adult patients of chronic heart failure with reduced ejection fraction attending medicine outpatient department in SSG hospital, Vadodara, India. **Result:** Prevalence of ID in heart failure patients was 43.8% in this study. In ID group 40.0% of patients had two past history of hospitalization and in non-ID group majority (64.4%) of patients had only 1 past history of hospitalization. In ID group most (82.9%) of patients had <30% LVEF (left ventricular ejection fraction) and 17.1% of patients had LVEF between 31% and 40%. **Conclusion:** This study reinforces the usefulness of iron status evaluation in the routine assessment of chronic heart failure with reduced ejection fraction as it is common to have iron deficiency in them and it is amenable to correction reducing morbidity.

KEYWORDS

Iron Deficiency, Heart Failure

INTRODUCTION

HF is a complex clinical syndrome with symptoms and signs that result from any structural or functional impairment of ventricular filling or ejection of blood(Heidenreich et al., 2022).

HF caused by Left Ventricular(LV) dysfunction is commonly categorized according to LV ejection fraction (LVEF)(Heidenreich et al., 2022):
- HF with reduced Ejection Fraction(HFrEF): LVEF<=40%
- HF with preserved Ejection Fraction(HFpEF): LVEF>=50%
- HF with mid-range Ejection Fraction(HFmrEF): LVEF 41-49%

ID in HF is frequently both absolute and functional(van Veldhuisen et al., 2011). Absolute ID may result from appetite loss, decreased absorption due to intestinal edema, or long-term hemorrhages related to antiplatelet agents, nonsteroidal anti-inflammatory drugs, or anticoagulants. HF is also characterized by systemic inflammation leading to functional ID.

ID is often missed because the causative disease or comorbidities may mask it. Before iron-deficiency anemia, ID manifests itself via nonspecific symptoms like fatigue. Therefore, ID remains under screened despite its high frequency in HF (nearly 50% of patients) and poor prognosis(Ponikowski et al., 2016). The correction of iron deficiency in HF patients is associated with improved functional capacity, quality of life, and re-hospitalization rates(Manceau et al., 2022).

AIM

Evaluation of iron status in patients with chronic heart failure with reduced ejection fraction.

Correlation between iron deficiency in heart failure with frequency of hospitalization.

METHOD:

A cross sectional study of 80 patients of chronic heart failure attending medical OPD at SSG Hospital, Vadodara after obtaining ethical clearance and due consent.

Inclusion Criteria:

Adult with chronic heart failure with reduced ejection fraction (<40%)

Exclusion Criteria:

Ejection fraction: >40%
Age <18 year
Anemia (due to causes other than iron deficiency)

A detailed history was taken and clinical examination was performed. Past history of hospitalization due to heart failure was asked in each patient. Complete blood count, Serum ferritin and transferrin saturation and 2D ECHO were done in all patients. Patients with serum ferritin of <100μg/L were considered to have absolute iron deficiency and those with S. ferritin between 100-299μg/L with transferrin saturation of <20% were considered to have relative iron deficiency. All data was analyzed using appropriate descriptive statistics such as frequency, percentage and chi square test.

RESULT

Majority (33.8%) of patients were among the age group 60 to 69 years followed by 22.5% of patients 40 to 49 years and 50 to 59 years, 15.0% among >70 years and 6.3% among 30 to 39 years of age group. (Figure 1)

Majorities (66.2%) of patients were male and 33.8% of patients were female. (Figure 2)

In our study, 43.8% of patients had Iron deficiency and 56.2% of patients had no iron deficiency. (Table 1)
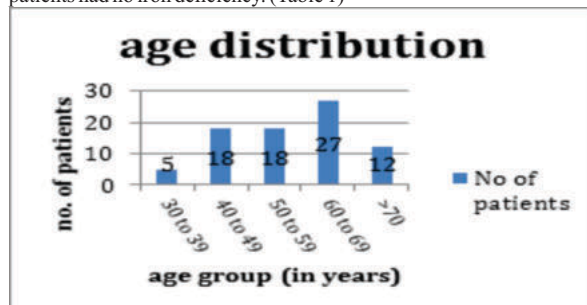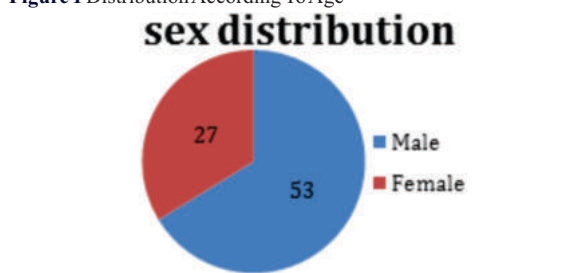

Figure 1 Distribution According To Age

Figure 2 Distribution According To Sex

Table 1 Distribution According To ID

Iron Deficiency	No of patients	Percentage
Yes	35(absolute deficiency: 30 Relative deficiency: 5)	43.8
No	45	56.2
Total	80	100

Table 2 Association Between Age Group And ID

Age group (in years)	ID	Non ID	Total
30 to 39	0 (0.0%)	5 (11.1%)	5 (6.2%)
40 to 49	8 (22.9%)	10 (22.2%)	18 (22.5%)
50 to 59	9 (25.7%)	9 (20.0%)	18 (22.5%)
60 to 69	12 (34.3%)	15 (33.3%)	27 (33.8%)
>70	6 (17.1%)	6 (13.4%)	12 (15.0%)
Total	35 (100.0%)	45 (100.0%)	80 (100.0%)

$\chi2 = 4.374$; p=0.358

In ID group, majority (34.3%) of patients belong to 60 to 69 years of age followed by 25.7% among 50 to 59 years, 22.9% among 40 to 49 years and 17.1% among >70 years. In non-ID group, majority (33.3%) of patients belong to 60 to 69 years of age followed by 22.2% among 40 to 49 years, 20.0% among 50 to 59 years, 13.4% among >70 years and 11.1% of patients among 30 to 39 years of age group. Difference between age group and iron deficiency is statistically not significant. (p=0.358)(Table 2)

Table 3 Association Between Sex And ID

Sex	ID	Non ID	Total
Male	25 (71.4%)	28 (62.2%)	53 (66.3%)
Female	10 (28.6%)	17 (37.8%)	27 (33.7%)
Total	35 (100.0%)	45 (100.0%)	80 (100.0%)

$\chi2 = 0.746$; p=0.388

In ID group 71.4% of patients were male and 28.6% of patients were female. In the non-ID group, 62.2% of patients were male and 37.8% of patients were female (Table 3). This difference is statistically not significant (p=0.388).

Table 4 Association Between Past History Of Hospitalization And ID

Past H/o hospitalization	ID	Non ID	Total
1 time	13 (37.2%)	29 (64.4%)	42 (52.5%)
2 times	14 (40.0%)	13 (28.9%)	27 (33.7%)
>2 times	8 (22.8%)	3 (6.7%)	11 (13.8%)
Total	35 (100.0%)	45 (100.0%)	80 (100.0%)

$\chi2 = 7.269$; p=0.026

In ID group, majority (40.0%) of patients had 2 past history of hospitalization followed by 37.2% had one and 22.8% had >2 time past history of hospitalization. In contrast non-ID group majority (64.4%) of patient had only 1 past history of hospitalization followed by 28.9% had two and only 6.7% of patient had more than 2 past history of hospitalization (Table 4).This difference is statistically significant (p=0.026).

In ID group most (82.9%) of patients had <30% LVEF and 17.1% of patients had LVEF between 31% and 40%. In Non-ID group 51.1% of patients had <30% LVEF and 48.9% of patients had LVEF between 31% and 40%. This difference is statistically significant (p=0.003) (Table 5)

Table 5 Association Between LVEF And ID

LVEF	ID	Non ID	Total
31% to 40%	6 (17.1%)	22 (48.9%)	28 (35.0%)
<30%	29 (82.9%)	23 (51.1%)	52 (65.0%)
Total	35 (100.0%)	45 (100.0%)	80 (100.0%)

$\chi2 = 8.721$; p=0.003

DISCUSSION

In our study the mean age of the patient was 57 ± 11.65 years. Rangel I et al found that the mean age was 62.0 (53.0-68.0) years in the study(Rangel et al., 2014).

In our study 66.2% of patients were male and 33.8% of patients were female. Rangel I et al found that 81.0% of patients were male and 19.0% of patients were female(Rangel et al., 2014).

In our study 43.8% of patients had ID and 56.2% of patients do not had ID. Out of 43.8% of ID patients, 17.1% had functional iron deficiency and 82.9% had absolute iron deficiency. Rangel I et al found that out of 36.0% ID patients, 57% presented absolute ID and 43% had functional ID(Rangel et al., 2014). Similar findings were seen in Schou M et al study that 44.9% of patients had Iron deficiency with heart failure(Schou et al., 2015). Anand IS et al shows that 50.0% of patients had Iron deficiency with heart failure in their study(Anand & Gupta, 2018).

In ID group, majority (34.3%) of patients belong to 60 to 69 years of age. In non-ID groups also, the majority (33.3%) of patients belong to 60 to 69 years of age. Rangel I et al found mean age in ID was 63.0 (56.5 – 68.2) years and in non-ID was 61 (51.5 – 67.0) years(Rangel et al., 2014). Schou M et al shows in their study that the mean age in ID was 71 (65–77) year and in non-ID were 69 (64–74) year(Schou et al., 2015). This suggests no significant correlation of age and ID in HF.

In ID group 71.4% of patients were male and 28.6% of patients were female. In the non-ID group, 62.2% of patients were male and 37.8% of patients were female. However, Schou M et al shows in their study that in the ID group 53.7% of patient were female and in the non-ID group, 19.5% of patients were female(Schou et al., 2015). Thus definite relation between sex and ID in HF was not established.

In this study majority (40.0%) of patients had 2 past history of hospitalization followed by 37.2% had one and 22.8% had >2 times past history of hospitalization in the ID group. In contrast, the non-ID group majority (64.4%) of patients had only 1 past history of hospitalization followed by 28.9% had two, and only 6.7% of patients had more than 2 past history of hospitalization, implying frequent history of hospitalization in ID group.

In ID group, most (82.9%) of patients had <30% LVEF and 17.1% of patients had LVEF between 31% and 40%. In the Non-ID group 51.1% of patients had <30% LVEF and 48.9% of patients had LVEF between 31% and 40%. However this lower LVEF was solely secondary to iron deficiency was not evaluated. Rangel I et al found in ID patients mean LVEF was 26.7 ± 9.9 % and in Non ID patients, LVEF was 28.2 ± 8.6%(Rangel et al., 2014). Schou M et al shows in their study that in ID patient mean LVEF 32 (28–38) % and in Non ID patient 34 (25–41)%(Schou et al., 2015).

LIMITATIONS OF THE STUDY
- The sample size of 80 cases is small, and larger studies may be required for accuracy.
- Iron supplementation and re-assessment for symptomatic improvement were not attempted.
- Follow-up and evaluation of the effects of iron deficiency on mortality were not possible.
- Iron kinetics parameters were the base for the absolute and functional ID definition, and we did not collect inflammatory markers.

CONCLUSIONS
Iron deficiency was a common finding affecting 43.8% (in our study) of the patients of chronic heart failure with reduced ejection fraction. Patients with iron deficiency tended to have lower ejection fraction and recurrent hospitalization. This study reinforces that iron status evaluation can be useful in the routine assessment of chronic heart failure with reduced ejection fraction population and can stratify the prognosis.

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