Prevalence of Iron Deficiency in Chronic Heart Failure Patients in a Tertiary Care Hospital: An Observational Study

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Abstract

Introduction: This is an observational study to explorethe prevalence of irondeficiency (ID) and the relationship between the severity of chronic heart failure (CHF) and the degree of ID in CHF patients.

Objective: The objective of the study was to assess the extent of ID and its adverse effects on patients with CHF. This study was intended to assess the prevalence and effect of ID in anaemic as well as, non-anaemic subjects.

Methodology: Study subjects were from OPDs and IPD patients with the diagnosis of CHF, based on clinical and 2D echo findings. ID was diagnosed by basing on iron profile along with transferin saturation (TSAT). The study period was from January 2017 to March 2018; from which 109 patients were included. In those cases, trans-thoracic echocardiography, chest X-Ray, necessary blood biochemistry and CBC were done. Data collected on 109 cases of CHF were analyzed using IBM SPSS 24.0 software.

Results: Iron deficiency was present in 86.2% of patients, 40.3% had functional ID (ferritin 100-300 and TSAT less than 20%) and 45.9% had absolute ID (ferritin less than 100). Interestingly, out of those who had no anaemia clinically or laboratory report wise approximately one-fourth of the patients had iron deficiency.

Conclusion: This study reveals that ID in HF is a hugely ignored area in India. This study brings out the need for large-scale studies in India so that this easily treatable condition can be well characterized and routine testing for ID could be introduced in the guidelines of our country.

Keywords: Chronic heart failure, Iron deficiency, Ejection fraction, New York Heart Association

Introduction

Heart failure (HF) is not acommonplace problem and is increasing rapidly due to the prevalence ofcoronary artery diseases temming from the sedentary population. In cases of HF, the frequency of reduced exercise and reduced quality of life(QoL), in the form of frequent intake of carbohydrate/trans-

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fat rich food; indeed, lead to frequent hospitalization and mortality significantly, if anaemia co-exists. Moreover, anaemia is a common comorbidity among HF patients; which worsens the outcome of HF patientsin terms of recovery, from frequent hospital admissions.[1,2] Iron Deficiency can exist without anaemia in chronic HF.[3,4] With anaemia or non-anaemia, the aerobic performance capability does reduce the frequency of heart attacks.[3,5] Particularly, this had been demonstrated recently in chronic HF.[6]

Indeed, during exercise patients develop some degree of severity in heart attacks; in the last few years, studies have revealed that corrections of iron level by parenteral ironin patients with chronic HF improved exercise tolerance with abnormal QoL.[7-12] It was observed in both anaemic and non-anaemic subjects of chronic HF that when shifted the focus from anaemia in HF to ID, there was a drastic moratorium in heart failure.[12] These studies had conflicting conclusions as to the prognostic importance of ID in Chronic HF, irrespective ofthe presence or absence of anaemia. To carry out a study to evaluate iron deficiency in HF and then compare the HF severity in iron deficient and non-iron deficient was the intention of the study.

Materials and Methods

The sample size was calculated as per Danial Sample Size Formula, according to which, the number obtained was 96.04. However, there were 109 cases included in the study. Patients detected to have CHF according toclinical criteria were included. Then, Iron Profile and transferin saturation (TSAT) were done to establish ID statuses. Serum ferritin < 100 mg/L was taken as the absolute and serumferritin(100–300 mg/L) with low TSAT (<20%) was functional ID. Patients presenting from January 2017 to March 2018 with Chronic Heart Failure (CHF) to OPD and IPD units of the Department of Cardiology and OPD of Health checkup units constituted the study population. In all the cases and transthoracic echocardiography, Chest X-Ray, necessary blood biochemistry including ntPRO BNP and CBC were done.

The data obtained were analyzed;the study subjects were divided into two groups e.g., Iron Deficient and Non-Iron Deficient. Thus, two separate sets of data were created foranalysis using IBM SPSS 24.0 statistics.

Inclusion criteria

Patients of either gender aged > 18 years

Diagnosis of chronic heart failure in NYHA functional classII-IV

The echocardiographic finding of LVEF value, ≤45%

At least 3 months' history of HF.

HF is on treatment for a minimum of 1 month

Patients who understood the study procedure and gave informed consent.

Exclusion criteria

Those who had MI in the last 3 months according to history

CHF secondary to severe valvular diseases

Known cases of systemic inflammatory and collagen tissuedisease

Clinically significant renal dysfunction (EGFR<30mL/min per1.73m^2)

Severe anaemia (haemoglobin <7g/dL)

Patients on iron replacementtherapy

Pregnancy or activebreast-feeding

All data collected were analyzed using IBM SPSS 24.0 statistics.

Observations

In this study, it was established that ID can exist without anaemia. This studycame across 30.9% of non-anaemic subjects having ID.

Table 1. Relation of iron deficiency with anaemia

Iron deficiency	No.	%
ID without Anemia	29	30.9
ID with Anemia	65	69.1
Total	94	100.0

The prevalence ofiron deficiency was 90.3% among anaemic CHF patients; which was 78.4% amongn on-anaemic CHF patients. This result revealed that iron deficiency state increasingly prevalent among CHF patients; nevertheless, clinical and laboratory investigations did not show anaemia (Table 2).

Table 2. Iron deficiency among anaemic and non-anaemic CHF patients

Iron deficiency							X^2, p
Anaemia	Present		Absent		Total		
	No.	%	No.	%	No.	%	
No	29	78.4	8	21.6	37	100	X^2=2.916
Yes	65	90.3	7	9.7	72	100	*P*=0.888
Total	94	86.2	15	13.8	109	100	

Since the X^2 values are below 0.95 (i.e., 0.888), the statistical test indicated that there is no effect of ID in chronic heart failures. Association of ejection fraction (EF) with ID This study revealed a trend that the lesser the ID is, the better would be the EF (Table 3). However, this was not statistically significant (*p*=0.465). Hence, there could be a chance factor.

Table 3. Association of ejection fraction with iron deficiency.

Iron deficiency							X^2,p
Ejection fraction percentage	Present		Absent		Total		
	No.	%	No.	%	No.	%	
20-25	24	92.3	2	7.7	26	100	X^2=1.532
26-39	59	85.5	10	14.5	69	100	*P*=0.465
>=40	11	78.6	3	21.4	14	100	
Total	94	86.2	15	13.8	109	100	

Relationship of New York Heart Association (NYHA) functional class with LVEF among CHF with ID patients. With NYHA functional classes and LVEF among CHF with iron deficiency patients, of 94 cases 12.8% presented with NYHA II, 74.5% with NYHA III and 12.8% with NYHA functional class IV present (Table 4).

Table 4.Classification and its details

New York Heart Association Classification	Male		Female		Total		X^2, p
	No.	%	No.	%	No.	%	
II	8	11.6	4	16	12	12.8	
III	52	75.4	18	72	70	74.5	X^2=0.323
IV	9	13	3	12	12	12.8	p=0.851
Total	69	100	25	100	94	100	

There were some other observations concerningiron deficiency HF; which were not clinically/statistically not significant, hence not included here.

Discussion

Progression of CHF symptoms and outcomes depend to quite an extent on co-morbidities (1,2). Important comorbidity in CHF is an iron deficiency that affects about 50% of patients (3). The present study aims at profiling the serum iron profile among CHF patients in Odisha's population in a tertiary care corporate hospital. Besides, the association of serum iron profile with LVEF and NT proBNP, with different parameters and grades had been studied. Based on the observations from our study, a comparison with the findings of the related research along with a critical review has been attempted in this chapter (Table 5).

Table 5. Iron deficiency and anaemia among CHF patients in other studies

Study	Prevalence of ID		
	The whole group (%)	Non-anaemic patients (%)	Anaemic patients (%)
Rangel et al 2013 [13]	36	26	10
Klip et al 2013[14]	50	15	35
Sohankumar Sharma et al 2016[2]	76	24.7	51.3
Von Haeling et al 2017[12]	42.5	32.7	9.8
Present study	86.2	26.6	59.6

In this study, it is found that the presence of ID in HF was quite high. ID was present in 26.6% of HF patients even without anaemia. Recently, awareness of ID being important in the management of HF has been increasing worldwide. In the USA one prospective study in the community was done where HF was self-reported. This study detected 61.3% of HF patients had ID (9). In Europe, prevalence rates of ID in 37% to 50% of cases of HF indifferent studies.[3,6,10] Our study revealed ID prevalence to be 86.2% and anaemia prevalence to be 59.6%. Thus, 26.6% were having ID but no anaemia. That the ID burden in HF patients in Odisha is higher than in other studies cited was seen in our study. The reason could be that Odisha, India, is characterized by a high prevalence of malnutrition, anaemia and poverty.

A higher rate of ID in HF patients of Indian origin as compared to patients of other ethnicity was reported.[4] It is observed that only Hb levels should not be taken into account in the workup of anaemia if a patient is having HF. By doing so, we can miss the number of cases of ID in cases of HF. Functional ID being 42.3%, is a significant portion of the disease burden. These cases can remain undetected if care is not taken to do TSAT and serum ferritin at the very beginning of the management of Chronic Heart Failure.

Conclusion

In conclusion, our study brings out the underestimated and ignored burden of ID in HF patients in India. The iron deficiency prevalence of 86.2% is extremely high among CHF in our study populations in comparison to the studies in other places outside India. Iron deficiency prevalence is higher in CHF patients even without anaemia. Hence iron profile should be taken as a routine investigation along with haemoglobin in all the suspected CHF patients. This is also the present ESC-2016-guidelines.

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