

Frequency of Iron Deficiency in Heart Failure Patients

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ABSTRACT

Background: People suffering from heart failure frequently face iron deficiency, which has been linked to higher mortality and more frequent hospital stays. People with symptomatic systolic heart failure and iron deficiency, iron supplementation significantly decreased the risk of hospitalization for heart failure and the combined endpoint of hospitalization for heart failure and mortality.

Aim: This research sought to determine the prevalence of iron insufficiency in people with chronic heart failure.

Design of the study: This study is cross-sectional.

Place of the study: Ayub Teaching Hospital Abbottabad from November 2019 to April 2020.

Methodology: After obtaining written informed permission, the research participants who met the inclusion criteria were chosen. Patients between the ages of 40 and 70, of either gender, were included in the research group if they had a documented history of CHF for less than six months and an echocardiogram showed an LVEF of less than 45%.

Results: Mean age of the patients was 55.79±9.926, ranging from 40 to 70 years and the mean BMI was 29.03±5.043 ranging from 19 to 49kg/m², mean serum ferritin level was 226.03±160.297 ranging from 70 to 500µg/L and mean transferrin saturation was 23.15±6.449 ranging from 15 to 38%. In the frequency of heart failure, patients of heart failure were 72(48%) and 78(52%) had no HF. In the frequency of iron deficiency, patients found with a deficiency were 82(54.7%) and 68(45.3%) had no deficiency.

Practical Implication: Patients with heart failure should have routine iron deficiency screenings regardless of the presence of anaemia or abnormal RCI. In order to improve risk-based selection of participants who are frequently not at risk for iron deficiency

Conclusion: Men with functional classes II–III were more likely to have iron deficiency anaemia (72% prevalence). Hypertension was the most prevalent comorbidity.

Keywords: Iron deficiency, Heart failure, Anemia

INTRODUCTION

Iron deficiency (ID), which has been connected to greater mortality and more frequent hospitalisations in individuals with heart failure (HF), is a common condition. People with symptomatic systolic heart failure and iron deficiency, iron supplementation significantly decreased the risk of hospitalisation for heart failure and mortality, without increasing the risk of adverse events^{1,2}.

Because of the ageing population and the greater lifespan of patients with complications of coronary artery disease, heart failure is a widespread disorder that is expected to become much more prevalent over the next several decades. By 2030, it is predicted that there will be a 50% rise in the number of Americans suffering from heart failure^{3,4}.

Up to 50% of heart failure patients have iron deficiency, which is linked to poor life quality, decreased exercise tolerance, and death in this patient population irrespective of haematopoietic effects^{5,6}.

Bone marrow aspiration and specific iron staining are the gold standard methods to diagnose iron deficiency, but they are restricted by their invasiveness, expense, and skill requirements. The systematic assessment of iron markers (serum ferritin and transferrin saturation) is advised in all patients suspected of having heart failure, as well as in follow-up visits for heart failure patients, according to the 2016 ESC recommendations for the diagnosis and management of heart failure^{7,8}.

Disordered iron status and its negative effects on heart failure symptomatology and prognosis have received a lot of attention recently. Iron deficiency (ID) affects individuals with chronic heart failure (HF) at rates ranging from 50% in Europe to 61% in a community of diverse ethnicities in Asia. Reduced exercise ability, a poorer prognosis, and, most significantly, what looks to be a viable therapeutic target are all predicted by iron has historically been thought of as an underlying cause of deficiency. Since adequate iron availability is necessary for unrestrained erythropoiesis in the bone marrow, Iron deficiency

anaemia. In fact, heart failure patients without anaemia and with normal RCI are seldom evaluated for iron deficiency since haemoglobin concentration and automatically determined RCI are thought to be sensitive indications of systemic iron status.⁹

In stable chronic heart failure, iron insufficiency is quite prevalent (30% to 50%), and much of it is absolute. In individuals without anaemia or aberrant hematologic indices, it is nonetheless common (>30%). Since heart failure is quite prevalent in our community and iron deficiency is one of its major precipitants, many patients who come with heart failure continue to exhibit symptoms even after receiving the best anti-failure treatment.¹⁰

MATERIALS AND METHODS

One hundred and fifty patients between the ages of 40 and 70, of either gender, who had a documented history of congestive heart failure (CHF) lasting less than six months and an echocardiogram-determined LVEF of less than 45% were enrolled. Before the study began, each patient's written informed permission was obtained. Before gathering data, the Ethical Committee gave its approval. Data were examined using SPSS version 20.

RESULTS

The mean age was 55.79±9.926, the mean BMI was 29.03±5.043, the mean serum ferritin level was 226.03±160.297, and the mean transferrin saturation was 23.15±6.449, ranging from 15 to 38% (Table 1).

Table 1: Descriptive statistics of patients with heart failure (n=150)

Variable	Mean±SD
Age (Years)	55.79±9.92
BMI (Kg/M ²)	29.3±5.04
Serum Ferritin (µg/L)	226.3±160.29
Transferrin Saturation(%)	23.15±6.44

Male patients had an iron deficiency at a frequency of 54(36%), whereas female patients had an iron deficiency at a frequency of 28(18.7%). Out of a total of 150 patients, this finding is statistically insignificant at p=0.482. In the frequency distribution

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of BMI regarding iron insufficiency, the deficiency was identified in individuals who were normal weight 21(14%), overweight 21(14%), and obese 40(26.7%). At $p=0.399$, this discovery is not statistically significant. Iron deficiency was observed in hypertensive individuals at a frequency of 61(40.7%) in the frequency

distribution of hypertension concerning iron deficiency. With 150 patients altogether, this finding is statistically insignificant ($p=0.101$). In the frequency distribution of heart failure in relation to iron deficiency, 82(54.7%) out of a total of 150 patients had a deficit (Table 2).

Table 2: Associations between iron deficiency and gender, BMI, hypertension in heart failure patients

Variable	Category	Iron deficiency	No iron deficiency	Total	P-value
Gender	Male	54 (36%)	41 (27.3%)	95 (63.3%)	0.482
	Female	28 (18.7%)	27 (18%)	55 (36.7%)	
BMI	Normal weight	21 (14%)	12 (8%)	33 (22%)	0.399
	Overweight	21 (14%)	16 (10.7%)	37 (24.7%)	
	Obese	40 (26.7%)	40 (26.7%)	80 (53.3%)	
Hypertension	Yes	61 (40.7%)	58 (38.7%)	119 (79.3%)	0.101
	No	21 (14%)	10 (6.7%)	31 (20.7%)	
Heart failure	Yes	82 (54.7%)	68 (45.3%)	150 (100%)	-
	No	-	-	-	

DISCUSSION

Iron is essential to both haematological and nonhematopoietic activities in the human body. Because of this, iron deficiency can result in decreased oxygen delivery and poor oxygen utilisation, both of which can increase dyspnea and lower exercise tolerance. Reduced intake, decreased dietary iron absorption due to increased hepcidin secretion, iron sequestration within the reticuloendothelial system because of inflammatory response, and loss of blood from GI tract - all of which may be common in people taking antithrombotic medications are just a few of the mechanisms causing ID in people ill with HF. Deficiency of iron has been one of the common trends in people suffering from heart failure. These conditions impair prognosis, lower aerobic capacity, and increase exercise intolerance¹¹. It is a chronic inflammatory process that affects the ability of many organs to function, including the liver, kidneys, and skeletal muscle¹².

Utilising IV iron to replenish iron storage just addresses the effect of ID; it does not treat its root cause. As recommended by the recommendations, it follows that the underlying aetiology should be looked into. However, it is unclear from these recommendations which reasons should be looked for and which tests should be carried out.

The root reasons for ID are not well understood. Numerous methods are probably in use. Beyond anaemia, several hypothesised causes have attracted a lot of interest in explaining the high frequency of ID in HF. Advanced age, renal disease, being a woman, malnutrition, chronic inflammation, decreased iron absorption, increased iron loss, and the severity of heart failure have all been demonstrated to be independently linked with ID in HF. It should be noted that many of the risk variables listed above are hypothesised based on observational research and have not yet been shown to cause HF in patients, therefore they are still speculative. Reduced iron intake, decreased iron absorption, and increased iron loss are the three main factors that contribute to iron insufficiency in HF since iron status is the sum of inflow and outflow. The next sections also go into certain reasons for myocardial iron insufficiency^{13,14}.

Both reduced and oxidized forms of iron, a crucial trace element, are found in our bodies. The body stores 30% of its total iron in macrophages and liver cells, 67% of it in erythrocytes (as haemoglobin) and muscle cells (as myoglobin), and 3% of it is lost through excretion in urine. Iron homeostasis is largely regulated by stomach iron absorption since iron is actively ejected from the body rather than metabolised¹⁴. A protein called hepcidin is released by the liver as a result of inflammatory conditions, such as heart failure^{15,16}.

Additionally, reduction in erythropoietin may cause iron insufficiency in the patients suffering from heart failure. The retention of salt and water may also contribute to hemodilution.¹⁷ This has an impact on the functional potential and prognosis of individuals with chronic heart failure. Patients suffering from heart

failure must be screened for the deficiency of iron. The deficiency must be identified and treated accordingly¹⁸.

According to the current study, chronic heart failure patients in Ayub Teaching Hospital Abbottabad had a frequency of 54.7% for iron deficiency. Our findings are consistent with those of a cohort study conducted in Alberta, Canada¹⁹, which found that "iron deficiency, whether absolute or functional, is a frequent finding in chronic heart failure patients presenting with anaemia as well, affecting up to 80% of these individuals," nearly have the same prevalence. To correct for iron deficiency, we compared our results with those of the Silverberg study¹⁷, which found that anaemia affects about 40% of heart failure patients.

The OPTIME-HF experiment found that anaemia occurred in heart failure patients on average between 50% and 60% of the time, with ID accounting for 21% of all cases. The disparity in the incidence of anaemia and iron deficiency may be explained by the diversity in the number of patients enrolled throughout different trials. 39 of the 41 male patients with chronic heart failure were anaemic, and 70.7% of them were iron deficient^{20,21}. Medical resources, diagnosis, and treatment must improve in developing countries. There are limited resources: access to medical and health resources; knowledge about disease; awareness, trainings, and awareness about health. The health literacy is mandatory for any disease and facilitates the patients with resources, databases, and trainings about disease²²⁻²⁸. Patients with an absolute iron shortage who had chronic heart failure had considerably decreased serum ferritin levels.

CONCLUSION

This study lends credence to the notion that iron deficiency in individuals with heart failure should be seen as a cause of anaemia as well as a concurrent condition that may exist without haematological abnormalities. It's significant to note that declining red cell indices (RCI) only partially mitigate the detrimental impact of the iron deficiency on long-term survival in heart failure patients. Patients with heart failure should have routine iron deficiency screenings regardless of the presence of anaemia or abnormal RCI. In order to improve the risk-based selection of participants who are frequently not at risk for iron deficiency, it is yet another justification for routinely monitoring iron parameters in heart failure patients, if doctors found additional patients who would benefit from intravenous iron therapy.

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