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Frequency of Anemia in Patients with Heart Failure Admitted to Cardiology Unit of Tertiary Care Hospital

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ABSTRACT

Background: Anemia is a common but often underdiagnosed comorbidity in patients with heart failure (HF), contributing to increased morbidity, hospitalizations, and reduced quality of life. **Objective:** This study aimed to determine the frequency of anemia among HF patients admitted to a tertiary care cardiology unit and explore associated clinical factors. **Methods:** This cross-sectional study was conducted at the Department of Cardiology, NICVD, Karachi, from 11 Feb 2025 to 11 May 2025. A total of 191 patients aged 40–80 years with a confirmed diagnosis of HF were enrolled using non-probability consecutive sampling. Patients with chronic kidney disease, blood dyscrasias, recent transfusions, malignancy, or iron supplementation were excluded. Hemoglobin levels were assessed to determine anemia status. **Results:** Among 191 patients, 89 (46.6%) were found to have anemia. Anemia was significantly more common in patients aged ≥60 years ($p = 0.01$), with longer disease duration ($p = 0.02$), BMI <25 kg/m^2 ($p = 0.03$), and NYHA class III–IV ($p < 0.001$). Although female patients had a higher prevalence of anemia, the association was not statistically significant ($p = 0.08$). **Conclusion:** Anemia is highly prevalent among heart failure patients, particularly in those who are elderly, underweight, or have advanced functional class or chronic disease. Routine screening and timely management of anemia should be integrated into heart failure care protocols to improve patient outcomes.

INTRODUCTION

Heart failure (HF) also termed congestive heart failure is the inability of the heart to pump blood to the body. According to the electronic data gathered by the Global Health Data Exchange (GHDx) registry, the global burden of HF stands at 64.34 million cases as of 2017, whereas the current global economic burden of HF can be measured at 346.17 billion US dollars, based on an American Heart Association (AHA) estimate of 5380 US dollars per heart failure case.[1] The World Health Organization classifies anemia as hemoglobin (Hb) levels <12 g/dL in women and <13 g/dL in men, however, the classification may differ when age, pregnancy status, altitude, and smoking status are considered.[2] The diagnostic criteria for anemia in heart failure patients are serum ferritin levels of less than 30 mcg/L in patients without kidney disease and less than 100 mcg/L in patients with chronic kidney disease or serum ferritin levels of 100–299 mcg/L with passing saturation of less than 20% in patients with chronic kidney disease.[3] The specific cause of anemia in heart failure patients is still unclear and has been thought to be multifactorial, with iron deficiency (IDA) and inflammation having the strongest evidence-based data. In the literature, the prevalence of anaemia is variable, from 4 to 61%, with the majority of studies finding it between 18 and 20%.[5] Anemia in patients with acute decompensated heart failure is quite common and also linked to poor survival and quality of life in hemoglobin (Hb) concentration is associated with less favorable outcomes. Higher rates of mortality have been reported in patients with anemic patients with heart failure. The p value for association between mortality and anemia was 0.04, RR 1.34 [1.02–1.77].[6] The presence of other co-morbid medical conditions like chronic kidney disease (CKD) and advanced age as well as the severity of heart failure has also been associated with an increased prevalence of anemia.[7] The frequency of anemia in heart failure patients was 63.5% in a study by Sharwan et al.[8] In another study, the prevalence of anaemia was 42% in heart failure patients.[5] Anemia in patients with is challenging as it could be either a cause of heart failure or complication of heart failure leading worst outcomes in the form of mortality.[6] Differentiation of the two is vital while managing a patient with heart failure. Studies on the frequency of anemia in heart failure patients is limited in our population as evident from thorough literature search. Therefore, this study has been planned. This study will generate local data and approximate burden of anemia in our population. Results of this study will benefit clinicians in better patient management leading to better outcomes. It will also help them in better patients counselling.

Objective

To determine the frequency of anemia in patients with heart failure admitted to a tertiary care hospital.

METHODOLOGY

This Cross-Sectional Study was conducted at Department of Cardiology, NICVD, Karachi from 11 Feb 2025 to 11 May 2025. Data were collected through Non-probability consecutive sampling technique. Sample is calculated using WHO sample size calculator taking the following assumptions:

- Anticipated frequency of anemia in patients with heart failure = 42%
- Margin of error = 7%
- Confidence Level = 95%

Sample size, n = 191

Inclusion Criteria

- Patient age 40 to 80 years
- Both genders
- Patients diagnosed as heart failure as per operational definitions

Exclusion Criteria

- Patients with chronic kidney disease (eGFR < 60 ml/min/1.73 m^2)
- Patients with history of blood transfusion in the last 3 months
- Patients with history of blood dyscrasias
- Patients with history of malignancy
- Patients taking iron supplements or multivitamins

Data Collection Procedure

Following approval from the Institutional Research Review Board and CPSP, eligible patients admitted to the indoor cardiology unit were enrolled after obtaining informed consent. Demographic and clinical details including age, gender, weight, height, body mass index (BMI), duration of disease, place of residence, education level, profession, and socioeconomic status were recorded on a pre-designed proforma. Anthropometric measurements were taken using standardized procedures: weight was measured using a digital scale (with patients barefoot and in light clothing) and height was measured with a stadiometer. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). To assess anemia, 5 cc of venous blood was drawn from the antecubital vein of the non-dominant arm into an EDTA tube and transported to the hospital laboratory within 30 minutes. Hemoglobin concentration was measured and anemia was recorded according to the operational definition.

Data Analysis Procedure

Data were analyzed using IBM SPSS Statistics version 24. Quantitative variables such as age, BMI, disease duration, and hemoglobin levels were expressed as mean ± standard deviation or median with interquartile range (IQR), depending on the data distribution assessed by the Shapiro-Wilk test. Qualitative variables such as gender, NYHA functional class, residence, education, profession, socioeconomic status, and presence of anemia were reported as frequencies and percentages. Anemia was stratified by potential effect modifiers including age, gender, BMI, duration of heart failure, and NYHA class. Post-stratification, the Chi-square test or Fisher's exact test was applied where appropriate. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The study included 191 patients with a mean age of 59.3 ± 9.4 years, and the majority were male (115, 60.2%). The mean BMI was 27.1 ± 4.2 kg/m^2. The median duration of disease was 18 months (interquartile range: 10–30 months), suggesting a relatively chronic population. Anemia was present in 89 individuals, accounting for 46.6% of the cohort, highlighting a substantial burden of hematologic impairment in this clinical population.

Table 1

Baseline Characteristics of Patients (n = 191)

Variable	Value
Mean Age (years)	59.3 ± 9.4
Gender: Male	115 (60.2%)
Gender: Female	76 (39.8%)
Mean BMI (kg/m^2)	27.1 ± 4.2
Median Disease Duration (months)	18 (IQR: 10–30)
Anemia (overall)	89 (46.6%)

Anemia was significantly more common in older patients: 58.4% of those aged ≥60 years (55 out of 94) versus 37.8% in those <60 years (34 out of 90), with a p-value of 0.01. Gender differences were not statistically significant, although anemia prevalence was higher in females (53.9%) compared to males (41.7%), p = 0.08. Notably, NYHA Class III–IV patients had a much higher anemia rate (64 out of 96; 66.7%) compared to Class I–II (25 out of 78; 32.1%), which was highly significant (p < 0.001), indicating a strong association between anemia and worsening heart failure severity.

Table 2

Frequency of Anemia by Age and gender

Age Group	Anemia Present (n, %)	p-value
<60 years	34 (37.8%)	0.01
≥60 years	55 (58.4%)	
Gender		
Male	48 (41.7%)	0.08
Female	41 (53.9%)	
NYHA Class		
Class I–II	25 (32.1%)	<0.001
Class III–IV	64 (66.7%)	

Patients with a BMI <25 kg/m^2 showed a significantly higher anemia prevalence (36 out of 63; 57.1%) compared to those with BMI ≥25 kg/m^2 (53 out of 129; 41.1%), with a p-value of 0.03. Anemia was also more frequent in patients with longer disease duration: 55.9% of those with >12 months duration (57 out of 102) compared to 38.1% with ≤12 months (32 out of 84), and this difference was statistically significant (p = 0.02). These results suggest that both underweight status and chronicity of illness are relevant contributors to anemia in this cohort.

Table 3

Frequency of Anemia by BMI Category

BMI Category	Anemia Present (n, %)	p-value
<25 kg/m^2	36 (57.1%)	0.03
≥25 kg/m^2	53 (41.1%)	
Disease Duration		
≤12 months	32 (38.1%)	0.02
>12 months	57 (55.9%)	

DISCUSSION

This cross-sectional study aimed to assess the frequency of anemia among patients admitted with heart failure and to identify associated clinical factors. Our findings reveal that anemia is a highly prevalent comorbidity in this population, affecting 46.6% of the patients. This is consistent with previous international literature where anemia prevalence in heart failure ranged from 30% to 50%, particularly in those with advanced disease stages. The high burden of anemia in this cohort reinforces its relevance as a critical modifier of disease progression and patient outcomes in heart failure management.[10] Our results demonstrate a statistically significant association between anemia and advancing age, with patients aged ≥60 years showing a higher prevalence. This aligns with existing studies suggesting that older heart failure patients are more likely to have reduced bone marrow responsiveness, renal dysfunction, and micronutrient deficiencies, all of which contribute to the development of anemia.[11] Female patients also exhibited a higher anemia rate, although this association did not reach statistical significance likely reflecting both physiological differences and dietary iron deficiencies more common in women in our region.[12]

NYHA functional class was strongly associated with anemia, with nearly two-thirds of patients in Class III–IV being anemic. This supports the hypothesis that anemia worsens cardiac performance through reduced oxygen-carrying capacity, resulting in more severe heart failure symptoms and poorer functional status. Similar patterns have been noted in both Western and South Asian heart failure cohorts.[13] Interestingly, a significant inverse relationship was observed between BMI and anemia, where underweight patients (<25 kg/m^2) had higher anemia rates. This may reflect chronic disease-related cachexia, malnutrition, or more severe systemic inflammation all common in advanced heart failure. Additionally, longer disease duration (>12 months) was associated with a higher risk of anemia, likely due to progressive decline in cardiac and renal function over time, combined with medication effects and chronic inflammation.[14]

The implications of these findings are clinically significant. Anemia in heart failure not only contributes to worsening symptoms but also increases the risk of hospitalization, reduces exercise tolerance, and negatively impacts survival. Yet, anemia often remains underdiagnosed or undertreated in routine heart failure management, especially in resource-limited settings.[15] Early identification and correction of anemia whether through iron supplementation, treatment of underlying causes, or erythropoiesis-stimulating agents in select cases may improve outcomes in this vulnerable population. This study has a few limitations. Being a single-center study with a cross-sectional design, it cannot establish causality or account for longitudinal changes in anemia status or treatment response.[16] Additionally, iron profiles and other biochemical markers were not assessed, which could have helped differentiate between types of anemia (e.g., iron deficiency vs. anemia of chronic disease). Despite these limitations, the study provides important insight into the burden of anemia among heart failure patients in a tertiary care cardiac center in Pakistan. It emphasizes the need for integrating anemia screening into routine heart failure protocols, particularly in high-risk subgroups such as older adults, those with advanced NYHA class, and patients with longer disease duration.

CONCLUSION

This study highlights a high frequency of anemia (46.6%) among patients admitted with heart failure in a tertiary care cardiology unit. Anemia was significantly associated with older age, lower BMI, longer disease duration, and advanced NYHA class. These findings underscore the importance of routine screening for anemia in heart failure patients, particularly in high-risk subgroups. Early detection and appropriate management of anemia may help improve functional outcomes, reduce hospitalizations, and potentially enhance survival in this vulnerable population. Integration of anemia assessment into standard heart failure care protocols is strongly recommended.

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