Vol.19, No.6, Page 387- 392, 2025 http://dx.doi.org/10.59628/jchm.v19i6.2168 ISSN 2958-7476 JMCH

Sana'a University Journal of Medical and Health Sciences

Prevalence of anaemia among adult heart failure patients in cardiac centres, Sana'a, Yemen

Marwan Motea Naje Mosleh[1], Ahmed Kaid Salem [2], Mohammed Ahmed Hajar[1] and Hassan Abdulwahab Al-Shamahy [3,4] *

[1]**Department of Haematology, Faculty of Medicine and Health Sciences, Sana'a University, Yemen,**
[2]**Department of Internal Medicine, Faculty of Medicine and Health Sciences, Sana'a University, Yemen,**
[3]**Department of Basic Sciences, Faculty of Dentistry, Sana'a University, Republic of Yemen,**
[4]**Medical Microbiology and Clinical Immunology Department, Faculty of Medicine and Health Sciences, Sana'a University, Republic of Yemen.**

*Corresponding author: E-mail: h.shmahe15@su.edu.ye

Abstract

Background and objective: Heart failure is a debilitating clinical syndrome associated with high rates of morbidity and mortality. Anemia is common among patients with heart failure, significantly impacting their prognosis and contributing to increased hospitalization and mortality. This study aimed to assess the prevalence of anemia among adults with heart failure at cardiac centers in Sana'a, Yemen.

Materials and Methods: This cross-sectional study included 183 adult patients with heart failure from two major cardiology centres in Sana'a. Data were collected on demographic characteristics and haematological parameters, including complete blood count. Anemia was classified according to the World Health Organization criteria (hemoglobin <12 g/dL for women and <13 g/dL for men). Statistical analyses were performed using SPSS version 27, with a significance level of <0.05.

Results: The mean age of the patients was 43.4 ± 3.8 years, and 77.6% were male. The overall prevalence of anemia among patients with heart failure was 28.9% (95% CI: 28.6–29.2%). Among the patients with anemia, 75.5% had mild anemia and 24.5% had moderate anemia, with no severe cases observed.

Conclusion: Anaemia is a notable comorbidity among heart failure patients in Sana'a, Yemen, affecting nearly a third of the studied population, primarily as mild or moderate cases. These findings highlight the importance of routine anemia screening and management in patients with HF in this region to improve clinical outcomes.

Article Info

Keywords:
anaemia, haemoglobin, Heart failure, prevalence, Yemen

Article History:
Received: 27-August-2025,
Revised: 3-September-2025,
Accepted: 22-October-2025,
Available online: 28-November-2025

1. INTRODUCTION

Heart failure (HF) is a clinical syndrome characterized by typical symptoms such as shortness of breath, fatigue, and ankle swelling, often accompanied by physical signs such as elevated jugular venous pressure, lung crackles, and peripheral edema [1]. These manifestations stem from structural and/or functional abnormalities in the heart, resulting in reduced cardiac output and/or increased intracardiac pressure, either at rest or during exertion [1]. HF is a chronic and debilitating condition affecting approximately 1–2% of the global population, with a prevalence of over 10% among those aged 65 years. Notably, there is a growing recognition of HF in younger individuals as well [2]. Both acute and chronic HF are leading causes of recurrent hospital admissions

and early readmissions, significantly contributing to the morbidity, economic impact, and diminished quality of life. Moreover, HF poses a substantial threat to patient survival [3, 4].

Anemia is frequently observed in patients with heart failure and significantly impacts their prognosis [5]. Anemia is an independent prognostic factor for mortality in chronic HF and is associated with increased rates of mortality, hospitalization, and readmission [6]. Furthermore, anemia is a strong, independent predictor of death and hospitalization in both systolic and diastolic dysfunctions [6]. The prevalence of anemia in patients with heart failure (HF) varies based on factors such as age, sex, HF severity, and the presence of other comorbid conditions [7]. Anemia is linked to higher rates of hospitalization, complications, and mortality, making early detection and treatment crucial for improving patient quality of life and clinical outcomes [8]. According to the World Health Organization, anemia is defined as hemoglobin levels below 12 g/dL in women and below 13 g/dL in men. However, these thresholds can differ depending on factors such as age, pregnancy, altitude, and smoking habits [9].

The reported prevalence of anemia in patients with HF ranges from 9% to 69.6%, and approximately 46.8% of patients with anemic HF are at increased risk of hospitalization and mortality, compared to 29.5% among those without anemia [10]. Other factors, such as chronic kidney disease, older age, and greater HF severity, also contribute to the higher incidence of anemia in this population [11].

Currently, there is a lack of research from Yemen regarding the prevalence of anemia among patients with heart failure. This study aimed to assess the prevalence of anemia in patients with HF within the Yemeni population, which may help inform the development of national guidelines for the routine evaluation of anemia status in individuals with HF. national guidelines for the routine evaluation of anemia status in individuals with HF.

2. SUBJECTS AND METHODS

2.1. Study Design

This cross-sectional study was conducted to determine the prevalence of anemia among adult patients with heart failure at the major cardiac centers in Al-Thawra General Hospital and Military General Hospital, Sana'a, Yemen.

2.2. Study Population

The study population included adult patients with heart failure who presented to the two major cardiac centers at Al-Thawra General Hospital and Military General Hospital in Sana'a, Yemen.

2.3. Sample Size

The sample size was 183 participants (males and females aged 19 years and above), calculated using the Open Epi program (Version 2.3.1) with a 95% confidence level. The expected frequency of anemia among patients with heart failure was set at 66.1% based on Panda et al. [12], with a design effect of 1 and a study power of 80%. Sampling was performed using a simple random sampling technique.

2.4. Data Collection

Data were collected using a standardized, structured questionnaire. It captured demographic information and clinical histories. Complete blood counts (CBC) and red blood cell indices, such as hemoglobin, packed cell volume (PCV), red blood cell count, mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), red cell distribution width (RDW), white blood cell count, differential leukocyte count, and platelet count, were also recorded.

2.5. Blood Sample Collection

A total of 4 mL venous blood was collected using sterile disposable syringes. and placed in an EDTA tube for CBC analysis.

2.6. Statistical Analysis

Data were analyzed using SPSS software version 27 (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to compute the percentages, proportions, means, and standard deviations.

2.7. Ethical Statement

All participants provided written informed consent after receiving complete information about the study procedures. Ethical approval was obtained from the Postgraduate Studies and Scientific Research Committee of the Faculty of Medicine and Health Sciences.

3. RESULTS

A total of 183 patients with heart failure were recruited for this study. The participants had a mean age of 43.4 ± 3.8 years, average weight of 74.7 ± 6.3 kg, and mean height of 1.7 ± 0.05 m. The calculated mean body mass index (BMI) was 25.9 ± 2.9 kg/m². Of the study population, 142 (77.6%) were male and 41 (22.4%) were female. In terms of employment status, the majority of the participants were unemployed (153; 83.6%), while only 30 (16.4%) were employed. Regarding family history, 27 participants (14.8%) reported a positive family history of

Table 1. Demographic Characteristic of Study Population

Characteristics		Frequency(%)
Age (years) (mean ± SD)		43.4±3.8
Weight (kg)		74.7±6.3
Height (m)		1.7±0.05
BMI (kg/m$^{2)}$		25.9±2.9
Gender	Male	142(77.6%)
	Female	41(22.4%)
Occupation	Employed	30(16.4%)
	Unemployed	153(83.6%)
Family History of heart disease	Yes	27(14.8%)
	No	156(85.2%)
Family History of diabetes mellitus	Yes	74(40.4%)
	No	109(59.6%)
Family History of hypertension	Yes	91(49.7%)
	No	92(50.3%)
Smoking	Yes	81(44.3%)
	No	102(55.7%)

heart disease, whereas 156 (85.2%) did not. A total of 74 participants (40.4%) had a family history of diabetes mellitus, and 91 (49.7%) had a family history of hypertension. Regarding smoking status, 81 participants (44.3%) were smokers, whereas 102 (55.7%) were non-smokers (Table 1).

Patients with heart failure demonstrated a mean hemoglobin (Hb) concentration of 13.9 ± 2.9 g/dL, and the mean packed cell volume (PCV) was 41.1 ± 6.4%. The red blood cell (RBC) count averaged 5.1 ± 0.5 million/µL. The mean corpuscular volume (MCV) was 79.3 ± 6.8 fL, while the mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were 26.7 ± 2.1 pg and 33.1 ± 0.6 g/dL, respectively. The red cell distribution width (RDW-CV) was 15.5 ± 1.3%.

The total white blood cell count (WBCs) was 6.8 ± 1.3 x10^{3}/µL. Among the white cells, the average neutrophil percentage was 53.3 ± 5.7%, lymphocytes 34.7 ± 5.4%, monocytes 7.5 ± 1.2%, eosinophils 4.2 ± 1.2%, and basophils 0.3 ± 0.2%. The mean platelet count was 328.2 ± 52.3 x10^{3}/µL (Table 2).

The prevalence of anemia among patients with heart failure was 28.9% (95% CI: 28.6–29.2%). Among the patients with heart failure and anemia (n = 53), the majority (75.5%) had mild anemia, while 24.5% had moderate anemia. No cases of severe anemia (hemoglobin <8 g/dL) were observed in the study population (Table 3).

4. DISCUSSION

The current study investigated the prevalence of anemia among patients with heart failure, revealing that 28.9% of patients were anemic. In contrast, Abdullah et al. [13] reported a higher anemia prevalence of 59.3% among Yemeni patients with congestive heart failure. This finding is relatively close to that reported in the STAMINA-HFP study, which found a prevalence of anemia of 34%

Table 2. Hematological Parameter in Heart Failure Patients

Variable	Mean ±SD
HB	13.9±2.9
PCV	41.1±6.4
RBC	5.1±0.5
MCV	79.3±6.8
MCH	26.7±2.1
MCHC	33.1±0.6
RDW-CV	15.5±1.3
WBCS	6.8±1.3
Neutrophil	53.3±5.7
Lymphocyte	34.7±5.4
Monocytes	7.5±1.2
Eosinophil	4.2±1.2
Basophil	0.3±0.2
Platelet	328.2±52.3

Table 3. prevalence and Severity of anemia in heart failure patients

Variable	**Number (%)**	**95% CI**
Hemoglobin		
Anemia	53(28,9)	28.9 (28.6 -29.2)
Severity of anemia (n=53)		
Mild	40	75.5
Moderate	13	24.5
Severe	0	0

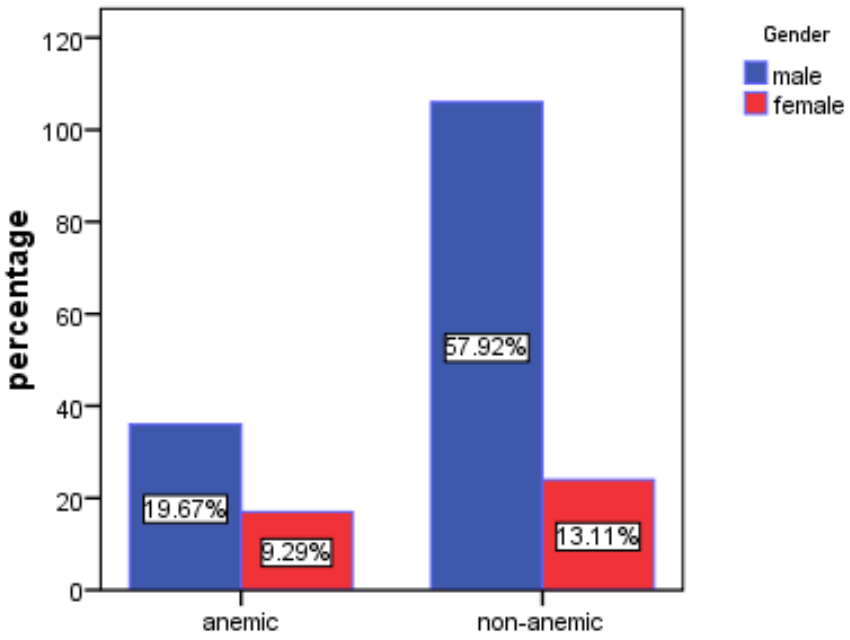

Figure 1. anemia status among heart failure patients

among outpatients with chronic heart failure using the WHO criteria [14]. Similarly, a meta-analysis conducted by Groenveld et al. [15] reported the prevalence of anemia to be 37.2% in patients with heart failure. These results, although slightly higher than ours, are within a comparable range and support our findings. Slight differences may be attributable to variations in sample size, patient characteristics, or healthcare access.

The current finding is also relatively lower than the prevalence reported in the study conducted by Tegene et al. [7] and Abassade et al. [16], where 49.8% and 49% of patients with heart failure were found to have anemia, respectively. Additionally, studies from Gondar and Congo reported anemia prevalence rates of 41.9% and 42%, respectively [5, 17]. Moreover, a study conducted in Uganda showed an even higher prevalence of 64.3% [18], further emphasizing the variation in anemia rates among patients with HF across different regions.

In contrast, our findings are consistent with reports from the broader literature, where the prevalence of anemia in patients with heart failure has been found to range widely, from as low as 4% to as high as 61%, with the majority of the literature indicating a prevalence between 18% and 20% [19, 20].

This variability across studies may largely be attributed to differences in the definitions and diagnostic criteria for anemia, the clinical characteristics of the patient populations, and differences in the severity and duration of heart failure [21–23]. For instance, some studies may use different hemoglobin thresholds or exclude patients with coexisting conditions that influence hemoglobin levels. Furthermore, regional differences in nutritional status, access to healthcare, and the presence of infectious diseases, such as malaria or HIV, may also impact the prevalence of anemia.

5. CONCLUSION

This study demonstrated a notable prevalence of anemia (28.9%) among patients with HF in cardiac centers in Sana'a, Yemen. Most of the anemic cases were categorized as mild or moderate. These findings underscore the importance of routine screening for anemia in patients with this population. Implementing standardized protocols for the assessment and management of anemia in patients with HF is crucial for improving their clinical outcomes and quality of life in Yemen.

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