Original Research Article

ROLE OF IRON DEFICIENCY ANEMIA IN EXACERBATION OF HEART FAILURE IN PATIENTS WITH DILATED CARDIOMYOPATHY

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Abstract: *Patients with heart failure (HF) frequently suffer from anemia. However, there are significant differences in the prevalence, prognostic factor, and clinical impact of anemia in individuals with heart failure. This study shows clinical characteristics and outcomes of severe heart failure patients with anemia who were admitted to Khyber Teaching Hospital Peshawar (KTH) in order to assess the incidence of worsening heart failure in anemic patients.* **Method:** *A cross-sectional study was carried out, and we evaluated the medical records of patients with heart failure who were admitted to Khyber Teaching Hospital between August 2023 to January 2024 All HF patients' independent predictors of mortality were examined using multivariate Cox regression. Statistical significance was defined as a P value of less than 0.05.* **Result:** *The study included one hundred patients. The study found that 70% of individuals had anemia, and 60% of the participants were female. The levels of salt, creatinine, and hemoglobin in anemic patients differed significantly. Based on hemoglobin level, a more significant difference was seen among research participants (Log rank test, P = 0.001). Additionally, multivariate Cox regression revealed that total mortality was independently predicted by advanced age, lower salt levels, and higher creatinine levels.* **Conclusion:** *Heart Failure patients with anemia tend to be older age, had lower hemoglobin and sodium level and higher creatinine value. Moreover, there was a significant difference in the prognosis of anemic Patients, tend to have a worse survival status. Even though, anemia is a significant risk marker, exacerbating heart failure, it is not an independent predictor of mortality in the current study.*

Keywords: Iron Deficiency Anemia, Heart Failure Exacerbation, Dilated Cardiomyopathy, Cardiac Function, Anemia-Heart Failure Link

Introduction

Patients with heart failure (HF) frequently suffer from anemia. Depending on the population taken into consideration and the cutoff value utilized to identify its presence, estimates of its prevalence among HF patients might vary from 30% to 70% in certain studies (1, 2). Despite the fact that anemia is frequently seen in HF patients and is linked to a much worse prognosis, no clear explanation exists for how it impacts mortality, causes HF exacerbations, and affects hospitalization (3–8). Iron deficiency brought on by decreased intestinal absorption or cytokine-related inflammatory alterations, decreased erythropoietin production, concurrent comorbidities such renal failure, or even hemodilution are some of the hypothesized mechanisms for anemia in HF (6, 9, and 10). Reduced (HFrEF) and preserved (HFpEF) ejection fraction patients seem to have similar risks of death, readmission, hospitalization, and loss of functional capacity, as well as similar prevalences of anemia and its effects on survival outcomes (11,12). Iron therapy has been shown to be useful in lowering the symptoms of heart failure, however regarding mortality in HF, there are currently no encouraging findings (13–16). Therefore, it is crucial to determine the clinical significance of anemia in HF patients. Although no study has shown the overall incidence of anemia in heart failure patients in Pakistan at the national level, several studies have shown that, depending on the diagnosis, the prevalence in cardiovascular patients at the institutional level ranges from 3 to 25% (17, 18).

This study compared baseline clinical characteristics and exacerbations of anemia in HF patients admitted to Khyber Teaching Hospital (KTH) in order to assess the prevalence of anemia in HF patients.

Methodology

Abebe et al.'s earlier study (18) served as the model for this one. Preliminary findings and the study methodology were previously published (18). Using their medical data, patients who had been admitted to the KTH Internal Medicine department between August 2023 to January 2024 with a diagnosis of HF were evaluated prospectively. Individuals who were 18 years of age or older, had a history of heart failure, and satisfied the modified Framingham criteria for heart failure diagnosis were included (19).

Exclusion criteria were patients

Who had infection in addition to HF on admission?

Who did not have full laboratory and echocardiography data in their medical records and,

Who were not symptomatic on admission (New York Heart Association (NYHA) Class I and class II) as adapted from a study conducted by Mozaffarian et al. (20).

The World Health Organization (WHO) defined anemia as having a hemoglobin concentration of less than 13 g/dl for

men and less than 12 g/dl for women (21). A radiologist used echocardiography to measure the patient's ejection fraction on their initial admission to the internal medicine ward. The study participants' survival status was evaluated using the vital status of their most recent hospital discharge or medication refill time. Definitions for HF etiologies were borrowed from an earlier study conducted by Abebe et al. (18). Blood pressure was found to be at least 140/90 mmHg.

The Statistical Package for Social Science, version 20.0 for Windows (SPSS, Chicago, IL, USA), was used to do the statistical analysis. Discrete data were displayed as percentages, whereas continuous variables were displayed as mean ± standard deviation and median (IQR). The Shapiro-Wilk and Levene test was used to evaluate the data for normality and homogeneity before further analysis. Patients were grouped according to their anemia status, and baseline characteristics, laboratory and echocardiography results, and medication prescriptions among the study groups were evaluated using the student t-test for continuous variables and the chi-square test for discrete variables. The Cox multivariate analysis included the variables whose univariate analysis P values were less than 0.2. The 95% CI and hazard ratio were displayed. A P value of less than 0.05 indicated a severe type I error.

  To preserve the privacy of medical records, patient data was de-identified during the study.

Results

Out of the 100 patients who were hospitalized to KTH with heart failure between, ALL patients satisfied the requirements for inclusion. The participants' average age was 55 (±15) years. Based on NYHA class, heart rate, or blood pressure, there was no discernible difference between HF patients with and without anemia, hypertension, or AF. (P < 0.001, 8.84% vs. 0.65%)

  Echocardiogram and laboratory analysis results According to Table 1, HF anemic patients had their hemoglobin (P = < 0.0001) levels assessed.

Table 2, Shows HF anemic patients MCV while table 3 show   siron   level.

Discussion

In patients with heart failure, anemia has recently gained recognition as a critical comorbidity and possible new treatment target (5). To the best of our knowledge, this study is the first to determine the prevalence of anemia in Ethiopian heart failure patients as well as how it affects their survival status. Anemia prevalence in HF patients was 37.2%, according to a meta-analysis by Groenveld HF et al. (5). Additionally, according to the WHO criteria for anemia, 34% of outpatients with chronic heart failure had anemia in a study of anemia in a population with heart failure (STAMINAHFP) (22). . Anemia was present in about 41.90% of HF patients in the current study. Compared to earlier investigations, our results were higher. Patients' characteristics, including gender, age, the inclusion of severely anemic patients in the study, and the use of varying definitions for anemia in heart failure patients (23, 24) were all responsible for this. Unlike in most randomized clinical

The median (IQR) follow-up period was 20 (8–36) months, and mortality was 12% in HF patients with anemia (12 patients). Additionally, when study participants were grouped according to their hemoglobin values (table 1), there were stronger significance differences (Log rank test, P = 0.001) in the survival status of HF patients.

Moreover According to multivariate cox regression analysis, mortality in HF patients was strongly predicted by advanced age, lower salt levels, and higher creatinine levels. In the current study, anemia is not an independent predictor of mortality, despite being a major risk factor.

TABLE 1

Number of patients with HF (N)	Hemoglobin (RANGE)
35	6—8
22	8—10
25	10—12
18	12—13

TABLE 2

Number of patients with HF (N)	MCV (RANGE)
25	LESS THEN 60
47	60—65
13	65—70
15	ABOVE 70
100 TOTAL	

TABLE 3

Number of patients with HF (N)	SERUM IRON(RANGE)
28	40—45
33	46—50
22	51—55
10	56—60
07	MORE THEN 60
100 TOTAL	

trials, severe anemia is an exclusion criterion, making it challenging to accurately evaluate this patient group (25, 26).

Age had a substantial relationship with anemia in HF patients in this study, as it does in the majority of studies (27–29). The average age of the anemic patients in this study was 56.47 ± 17.76 years, which is younger than the patients in the IN-CHF registry (32), the Swedish HF registry (30), the EVEREST trial (31), and the Valsartan heart failure (Val-HeFT) trial (25). The younger population and relatively small sample size of the current study may be the cause of this discrepancy. Additionally, there was a strong correlation between HF patients with anemia and higher creatinine levels, lower sodium, and hemoglobin levels; these results were consistent with other research (27–29, 33).

  The current investigation found no correlation between the degree of anemia and left ventricular ejection fraction (LVEF). Nonetheless, other research showed that the

prevalence of anemia is similar in individuals with lower left ventricular ejection fraction and those with intact ejection fraction (34, 35). Higher LVEF was linked to decreased hemoglobin levels in a study of the Candesartan in Heart Failure Assessment of Reduction in Mortality and Morbidity program (CHARM). (33). Nevertheless, in the Valsartan Heart Failure Trial, a study of patients with limited to impaired LVEF, It was unclear how hemoglobin and LVEF were related (25). To definitively determine the relationship between anemia and LVEF, more research is needed.

The long-term prognosis for anemia in HF patients varies significantly. Anaemia has a poor prognostic result in patients with heart failure, according to studies by Agata Tyminska et al., Asa Jonsson et al., and the CHARM program (28, 30, 33). Consistent with the previous research, the Kaplan Meier survival curve in the current investigation revealed a significant difference in survival status (Log Rank test, P = 0.042). The total mortality in the study group showed an even greater difference (Log rank test, P = 0.001) according to additional survival curve analysis depending on the patient's hemoglobin level. Numerous research' findings (29, 35, 37) further reinforced this conclusion because poor survival outcomes are significantly correlated with lower hemoglobin levels.

Our study's findings imply that while anemia is a reliable predictor of a poor prognosis in heart failure, it is not a risk factor for unfavorable outcomes on its own. The fact that the majority of anemia predictors, including advanced age, greater NYHA class at hospital admission, kidney illness, and diabetes, overlapped with clinical endpoint predictors may be the reason for this. (28) There are various limitations to our investigation. First, because the study was only carried out in one location, it may be challenging to accurately depict the prevalence and prognosis outcome across the country. Second, variables that could be statistically significant could not be visible because of the limited sample size. Finally, generalizability to the other center may be viewed with care due to the study's retrospective style and sample size. Notwithstanding these drawbacks, we think that our research offers important insights into the clinical characteristics and outlook of anemia-afflicted HF patients. Additionally, it will serve as a blueprint for additional clinical study in the field.

Conclusion

According to the current study, anemic HF patients tended to be older, had higher creatinine levels, and lower hemoglobin and salt levels. Additional survival analysis revealed that the overall prognosis for heart failure and anemia differed significantly. In the current study, anemia is not an independent predictor of mortality, despite being a major risk factor.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate

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Conflict of interest

The authors declared absence of conflict of interest.

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