RESEARCH PAPER

Correlation Of Admission Hemoglobin Levels With Length Of Hospital Stay In Acute Decompensated Heart Failure: A Case Series

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Abstract

Background: Anemia can have a negative impact on outcomes and is a common comorbidity in patients with acute decompensated heart failure (adhf). However, there is still a lack of research on how much baseline hemoglobin (hb) affects hospital stay duration.

Aim: To investigate the association between the length of hospital stay for patients with adhf and their hemoglobin level at admission.

Methods: Thirty-five consecutive patients with adhf were admitted as part of this retrospective observational case series, which was conducted at a single center. The length of hospital stay (in days) and hemoglobin (hb) levels were taken from medical records. Three hb groups were created from the patients: <7 g/dl, 7–10 g/dl, and >10 g/dl. Pearson's correlation was used to evaluate the relationship between hb and length of stay, and one-way anova was used to examine group differences.

Findings: The median length of hospital stay was 8 days (range: 4–14 days), and the mean hemoglobin level was 9.9 ± 1.8 g/dl. Patients with lower hb stayed in the hospital longer, according to a moderately significant negative correlation between hb and hospital stay ($r = -0.503$, $p = 0.002$). Anova comparing hb categories revealed a marginally significant difference in the length of stay between groups ($f = 3.29$, $p = 0.050$).

Conclusion: Patients with adhf who have lower hemoglobin at admission have a significantly longer hospital stay. In order to potentially lower inpatient burden and enhance outcomes, these findings highlight the necessity of early detection and treatment of anemia in heart failure admissions.

Keywords: Prognostic Indicator, Hemoglobin, Anemia, Acute Decompensated Heart Failure, Hospital Stay.

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Introduction

Heart failure (HF) remains a leading cause of hospitalization and mortality worldwide, with acute decompensated heart failure (ADHF) representing a frequent and severe clinical presentation. Comorbid conditions significantly influence the course and outcomes of ADHF, among which anemia is particularly prevalent. In HF, anemia arises from multiple mechanisms, including iron deficiency, hemodilution, chronic inflammation, and renal dysfunction, and has been consistently associated with adverse outcomes such as increased mortality and rehospitalization.

While the prognostic implications of anemia are well recognized, its impact on the duration of hospital stay—an important marker of clinical instability and healthcare burden—

has not been well characterized in Indian and South Asian populations. Prolonged hospitalization increases healthcare costs and the risk of hospital-acquired complications, emphasizing the need to identify modifiable risk factors.

This study aimed to evaluate the association between baseline hemoglobin levels at admission and length of hospital stay in patients with ADHF, with the goal of informing risk stratification and optimizing inpatient management in this population.

Methods:

Study Design-

This observational, retrospective, single-center case series was carried out in a tertiary care hospital's medical department. Included were 35 consecutive patients who were admitted with acute decompensated heart failure (ADHF) over a predetermined time frame.

Data Collection:

Clinical and demographic information was taken from electronic medical records. For every patient:

- Hospital stay duration (days)
- Hemoglobin (Hb) (g/dL) at admission

The patients were divided into:
Group 1: Hb < 7 g/dL
Group 2: Hb 7–10 g/dL
Group 3: Hb > 10 g/dL

Statistical Analysis:

Standard statistical software was used for all analyses. The association between Hb and length of stay was ascertained using Pearson's correlation. Differences in stay duration between Hb categories were examined using ANOVA. Statistical significance was defined as a p-value <0.05.

Results

Baseline Findings:

The mean hemoglobin level among 35 ADHF patients was 9.9 ± 1.8 g/dL. Hospital stays ranged from 4 to 14 days, with an average of 8.3 ± 3.0 days.

The Hb categories were distributed as follows:

Table 1: Distribution of patients by hemoglobin category and mean hospital stay

Hb Category	n	Mean Hb (g/dL)	Mean Duration of Stay (days)
<7 g/dL	2 (5.7%)	5.4	**11.0 ± 2.8**
7–10 g/dL	14 (40%)	8.7	**8.9 ± 3.1**
>10 g/dL	19 (54.3%)	11.2	**7.2 ± 2.4**

There was a statistically significant negative correlation (r = -0.503, p = 0.002) between Hb and length of stay. Longer hospital stays were more common among patients with lower hemoglobin levels, suggesting a connection between the severity of anemia and the clinical recovery delay.

Group-wise comparision:

The cohort includes 35 participants aged 39 to 98 years, representing a predominantly older adult population. The age distribution clusters around the late 60s to mid-70s, indicating a primarily geriatric sample. Both sexes are represented with a slight female predominance. Overall, the cohort is appropriate for studies examining aging-related trends or outcomes.

Table 2: Left Ventricular EF by Hemoglobin Category

Hb Category	Mean EF	Reduced EF (n)	Mildly Reduced EF (n)	Preserved EF (n)
Hb >10	50.3	4	3	12
Hb 7–10	51.0	2	3	9
Hb <7	42.5	0	2	0

Patients were stratified by hemoglobin levels (>10, 7–10, and <7 g/dL), and left ventricular ejection fraction (EF) was compared across these groups. The mean EF was slightly lower in the Hb <7 g/dL group (42.5%) compared with the other categories (≈50%). However, the distribution of EF categories—reduced, mildly reduced, and preserved—was similar across hemoglobin strata, indicating no clinically meaningful differences in systolic function between groups.

Table 3: NT-proBNP Levels by Hemoglobin Category

Hb Category	NT-ProBNP (Mean)
Hb >10	12236.6
Hb 7–10	14839.5
Hb <7	15000

NT-proBNP levels were similar across hemoglobin categories. Patients with Hb <7 g/dL had slightly higher levels (15,000 pg/mL) than those with higher Hb (around 12,200 and 14,800 pg/mL), but these differences were likely due to chance given the small sample sizes, indicating no meaningful association between hemoglobin status and NT-proBNP in this cohort.

Discussion

In this case series, we observed that lower hemoglobin levels at admission were associated with longer hospital stays in patients with acute decompensated heart failure (ADHF). This finding aligns with previous studies that have consistently demonstrated the negative prognostic impact of anemia in both acute and chronic HF, including increased mortality, higher rates of rehospitalization, and prolonged recovery periods. Our results emphasize that anemia is not merely a comorbid laboratory abnormality but a clinically significant factor that may influence the course and resource utilization in hospitalized HF patients.

Several pathophysiological mechanisms may underlie this association. Reduced hemoglobin leads to decreased oxygen-carrying capacity, resulting in tissue hypoxia and delayed hemodynamic stabilization. Additionally, anemia can exacerbate neurohormonal activation, promote fluid retention, and impede the resolution of congestion, which are key determinants of clinical improvement in ADHF. Co-morbid conditions such as chronic kidney disease and systemic inflammation may further compound these effects, contributing both to anemia and to prolonged hospitalization. This interplay highlights the multifactorial nature of delayed recovery in anemic HF patients.

Although our study cannot establish causality, the findings underscore the importance of assessing hemoglobin levels as part of routine risk stratification in ADHF admissions. Early identification of anemia may allow clinicians to implement targeted interventions, such as iron supplementation, erythropoiesis-stimulating agents, or management of underlying contributors, which could potentially shorten hospital stay and improve overall patient outcomes. Furthermore, these findings are particularly relevant in the Indian and South Asian context, where the prevalence of anemia and associated comorbidities is high, and optimizing inpatient care is critical to reducing healthcare burden.

Future prospective studies with larger sample sizes are warranted to clarify whether correction of anemia can directly reduce hospital stay and improve clinical outcomes in this population. Nevertheless, our report highlights the prognostic significance of hemoglobin in ADHF and supports its inclusion in comprehensive patient assessment.

Limitations:

- Generalizability is limited by the small, single-center cohort
- Confounding variables (such as renal function and treatment differences) are not controlled for in a retrospective design.
- Hemoglobin levels were only assessed upon admission; they were not continuously monitored throughout the stay.
- The moderate, statistically significant correlation that was found supports the clinical significance of baseline hemoglobin despite these drawbacks

Conclusion

A longer hospital stay was significantly associated with lower hemoglobin at admission in this 35-patient ADHF case series ($r = -0.50$, $p = 0.002$). Patients with lower hemoglobin levels tended to stay almost twice as long as those with higher hemoglobin levels. In order to potentially lessen hospital burden and enhance outcomes, routine hemoglobin monitoring and prompt anemia correction should be given priority in ADHF management.

DECLARATIONS

Ethics Approval and Consent to Participate

This study was approved by the Institutional Ethics Committee of Sharda University, Greater Noida. Written informed consent was obtained from all participants prior to enrollment. The study was conducted in accordance with the Declaration of Helsinki.

Consent for Publication

Not applicable. No identifying patient information is included in this manuscript.

Competing Interests

The authors declare that they have no competing interests.

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Author's Contributions

Monty Bansal and Pokala Sai Bhadrinath: Conceptualization, methodology, data collection, formal analysis, writing – original draft. Deepak Sharma: Supervision, conceptualization, methodology, writing – review and editing. Pinjari Dawood and Pulkit Singh: methodology, writing – review and editing. All authors read and approved the final manuscript.

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