



Frequency of Anemia in Patients Admitted with Acute Decompensated Heart Failure in Tertiary Care Cardiac Hospital

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Anemia is one of the potential comorbid condition in patients with acute decompensated heart failure (ADHF) which is linked to higher morbidity and mortality rates. Worldwide, its prevalence ranges from 4% to >70% in hospitalized patients with ADHF. Unfortunately data is lacking from our region and hence we aimed to conduct this study to scientifically fill the present gap by evaluating the actual burden of anemia in patients hospitalized with ADHF in a tertiary care hospital of Karachi, Pakistan.

Patients and Methods: This was a hospital based study conducted in the Department of Cardiology, Tabba Heart Institute, Karachi From 1st November 2019 to 30th April 2020. A total of 203 patients with ADHF with age >35 years and <80 years were selected. A blood sample was taken to determine the hemoglobin levels and hemoglobin (Hb) levels <12.0 g/dL in women and <13.0 g/dL in men were taken as cut-off for anemia.

Results: Overall mean and SD of age was 63.70±10.53 years and among them most of were males (n = 116, 57.1%). The overall prevalence of anemia in patients with ADHF was quite high

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and 63.5% (n = 129). Only three condition, hypertension, diabetes mellitus, and current smoking habits had significant association with the occurrence of anemia in patients with ADHF, p value <0.05.

Conclusion: In conclusion, the results showed that anemia is an independent risk for HF. Anemia was observed in one-third of the study population. More prevalent in male gender, elderly patients of age above 60 years, and associated with other comorbidities.

Keywords: Anemia; predictors; acute decompensated heart failure; South-East Asia; Pakistan.

1. INTRODUCTION

Cardiovascular diseases particular heart failure is increasing in both developed and developing countries due to multiple reasons, most importantly, change in dietary habits, change in environmental (stress and pollution), and advances in diagnostic facilities. Currently, nearly more than 64.3 million people are suffering from heart failure worldwide and among them the annual mortality rate is greater than 9.1 million people [1,2]. In Pakistan the data is quite old but estimates a prevalence of 2.8 million people suffering from heart failure [3]. On the other due to better treatment facilities, mortality due to acute myocardial infarction and acute onset of cerebrovascular accident has reduced drastically because of available acute management strategies such as primary percutaneous coronary intervention (PPCI) [4-6]. The survival rate in patients with heart failure reduces each year from 75.9% at one year to 12.7% at 15 years [7].

Anemia in patients with acute decompensated heart failure (ADHF) is quite common and also linked to poor survival and quality of life. Even a small reduction in hemoglobin (Hb) concentration is associated with less favorable outcomes. Previously conducted study have shown the prevalence of anaemia in men (<13 g/dL) was 68% and in women (<12 g/dL) it was 52% [8]. In a Swedish study, comparison was made among anemic patients of ADHF with and without reduced ejection fraction (EF cut-off 50%). Patients who had ejection fraction <50% were more likely to have higher mortality rate than patients with ejection fraction >50% [9]. Another comparison was made by the Ralli and colleagues [10], in which they have observed higher rates of mortality in patients with raised pro-BNP levels with EF <40% and anemia vs. normal pro-BNP levels with EF <40% and without anemia. among them, the one year survival rate was more than 96% [11].

The objective of this study was to determine the frequency of anemia in patients admitted with

acute decompensated heart failure. This study will generate local data and actual prevalence of anemia in our population so that anemia can be diagnosed early & timely managed so the better outcome of such patients would be expected.

2. MATERIALS AND METHODS

This was a hospital based prospective clinical study conducted in the Department of Cardiology, Tappa Heart Institute, Karachi From 1st November 2019 to 30th April 2020 through a non-probability convenience sampling technique. A total of 203 patients were selected having age more than 35 years and less than 80 years and who were admitted with acute heart failure with NYHA class III & IV of both gender. Patients with acute ST segment elevation myocardial infarction (STEMI), patients on hemodialysis or having grade IV or V Chronic kidney disease, patients with hematologic malignancies, patients with history chronic liver disease & upper GI bleed, and patients with 2nd & 3rd degree hemorrhoids were excluded from the study.

The diagnosis of ADHF was made using the latest guidelines proposed by the American Heart Association in which patients who presented with acute sudden on-set decompensation of/sudden worsening of heart failure symptoms will be labeled as ADHF [12].

According to the World Health Organization (WHO), anemia is defined as hemoglobin (Hb) levels <12.0 g/dL in women and <13.0 g/dL in men. A 5 cc of blood sample were taken from patients to determine the levels of hemoglobin [13].

A questionnaire was used to collect all the baseline and clinical characteristics of patients. All the collected data entered and analyzed by using the SPSS version 21. Mean and standard deviation was calculated for continuous variables like age, hemoglobin level. Frequency & percentages were calculated for

categorical variables like gender, presence and categorization of anemia, diabetes mellitus, hypertension, educational status, economic status & smoking status. Effect modifier like diabetes mellitus, hypertension, smoking status, economic status, and educational status was controlled through stratification. Post stratification chi-square test was applied and a p value ≤ 0.05 was taken as statistically significant.

3. RESULTS

A total of 203 patients with acute decompensated heart failure were included for final analysis and among them most of them were males (n = 116, 57.1%) with a mean and SD of age was 63.70 ± 10.53 years. Majority of them were belongs to lower social economic class (n = 104,

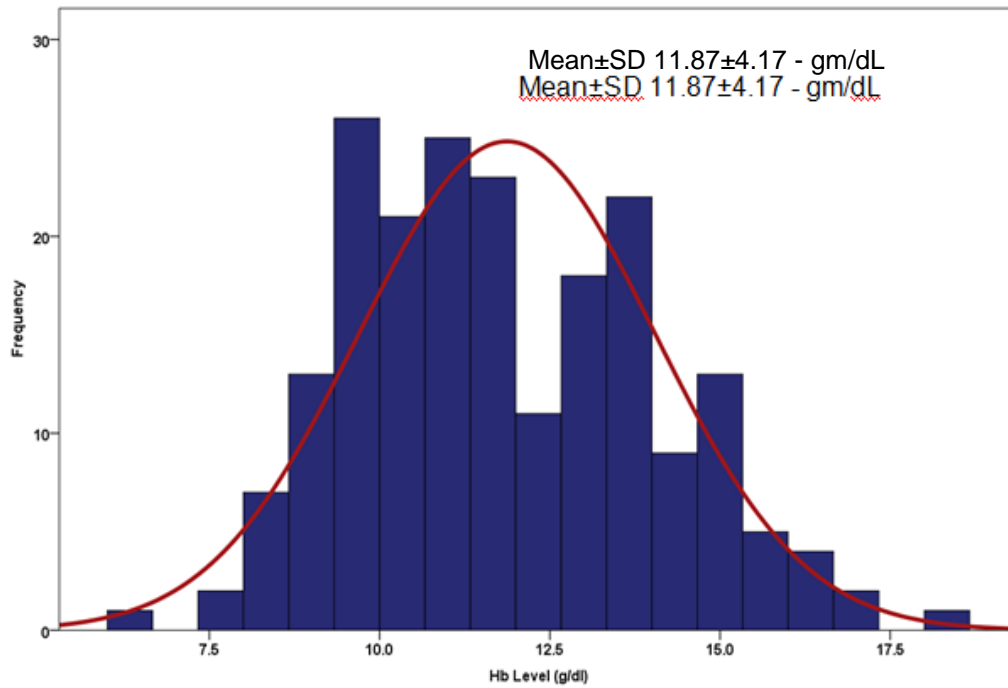
51.2%) but surprisingly illiterates were only 3.4% (n = 7). More than 72% (n = 147) had hypertension and 66.5% had type2 diabetes mellitus (n =135) Table 1.

The overall prevalence of anemia in patients with ADHF was quite high and 63.5% (n = 129) reported anemia at the time of study enrolment. The mean and SD of hemoglobin level was 11.87 ± 4.17 gm/dL Graph 1.

Table 2 shows association between baseline and other parameters of patients with ADHF with presence of anemia. Only three conditions condition, hypertension, diabetes mellitus, and current smoking habits had significant association with the occurrence of anemia, p value < 0.05 .

Table 1. Basic demographic characteristics of study participants (N = 203)

Age - years		
Mean±SD	63.70±10.53	
Minimum	35	
Maximum	80	
Range	45	
Gender	n	%
Male	116	57.1
Female	87	42.9
Socioeconomic Status		
Lower	104	51.2
Middle	94	46.3
Upper	5	2.5
Education Status		
Illiterate	7	3.4
Primary	74	36.5
Secondary	66	32.5
≥Graduation	56	27.6
Comorbids		
Hypertension	147	72.4
Diabetes Mellitus	135	66.5
Addiction		
Current smoker	37	18.2
Alcohol	3	1.4
Anemia		
Yes	129	63.5
No	74	36.5



Graph 1. Distribution of hemoglobin levels in patients with acute decompensated heart failure (N = 203)

Table 2. Association of anemia with baseline and other parameters of patients with ADHF (N = 203)

Variables	Anemia		Total (N = 203)	p value
	Yes (n = 129)	No (n = 74)		
Age - years				
<60	43	32	75	0.15
>60	86	42	128	
Gender				
Male	70	46	116	0.27
Female	59	28	87	
Socioeconomic Status				
Lower	71	33	104	0.064
Middle	57	37	94	
Upper	1	4	5	
Education Status				
Illiterate	5	2	7	0.43
Primary	48	26	74	
Secondary	37	29	66	
≥Graduation	37	17	56	
Comorbids				
Hypertension	100	47	147	0.03*
Diabetes Mellitus	93	42	135	0.02*
Addiction				
Current smoker	20	17	37	0.02*
Alcohol	2	1	3	0.07

*Chi-square test was used to determine the association between variables and a p value <0.05 was considered as statistically significant

4. DISCUSSION

Heart failure is a serious concern in developed and developing countries. The burden of this disease has exponentially doubled from 33.5 million in 1990 to 64.3 million in recent study published in 2017 [14]. In past it was mainly a disease of older population but in recent advances in diagnostic facilities and increase in the burden of ischemic heart disease, it can be seen in patients with younger age group (age <40 years) and middle age group (age <60 years). In a recently published study had shown prevalence of HF in younger population was 1.5%, in middle group was 6.6%, and among older population was 10.6% [15]. On the other hands, its prevalence is also lower in women than men but women face serious adverse effects and complications than men [16-18]. Once the patient is hospitalized due to ADHF, the rate of re-hospitalization increases with increased mortality rate that may reach up to 20% [19].

Besides other precipitating factors of hospitalization in patients with ADHF, anemia is particularly plays a pivot role in re-hospitalization, complications, and increase in mortality rate [20-22]. Timely corrections of anemia is crucial in reducing mortality and anemia related complications in patients with ADHF. Most of the patients (nearly >60%) at the time of hospitalization document anemia [23-25]. These findings are consistent with our study findings where more than 68% of our study subjects had anemia. In another study analysis, which examined more than 150,000 subjects, anemia was frequently observed, found in over one-third of CHF patients [26]. A randomized controlled trial conducted on 32 patients with NYHA class III and IV demonstrated that use of erythropoietin for the treatment of anemia in patients with ADHF is linked to reduced morbidity & mortality, increases left ventricular ejection fraction, quality of life, improve GFR, and subsequently helps in reducing the dose of diuretics [27]. There are multiple factors which may increase the prevalence of anemia in patients with ADHF irrespective of underlying cause such as increasing age, underlying chronic kidney or liver disease, and malignancy [28-30].

In our study, results showed most of the study subjects were belongs to older age group and of female population was less. Mean age of study subjects was 63.70±10.53 years. About one-third patients were more than 60 years of age.

Hypertension was found as the most common comorbid. No significant association of anemia was found with gender and age but the association was found significant with diabetes mellitus, hypertension, and smoking.

5. LIMITATION OF THE STUDY

There are multiple limitations in this study. Most importantly, we did not evaluated the cause of heart failure and type of anemia. Patients were selected from a single center which may reflect same group of population. Also, we did not analysed younger patients of age <35 years. Evaluation of anemia was only at baseline in all included studies. No evaluation of Hb was performed during the study or after patient's discharged; thus, it remains unknown whether anemia in the included studies was persistent or transient. One of the limitations of this study is that it was conducted in a single center with small sample size and also at urban environment, so the findings might not be generalizable to larger populations.

6. CONCLUSION

In conclusion, the results showed that anemia is an independent risk for HF. Anemia was observed in one-third of the study population. More prevalent in male gender, elderly patients of age above 60 years, and associated with other comorbid.

CONSENT

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Writing Group M, Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, et al. Heart Disease and Stroke Statistics-2016 Update: A Report From the American

- Heart Association. *Circulation*. 2016; 133(4):e38-360.
2. Sarmiento PM, Fonseca C, Marques F, Ceia F, Aleixo A. Acutely decompensated heart failure: characteristics of hospitalized patients and opportunities to improve their care. *Rev Port Cardiol*. 2006;25(1):13-27.
3. Martinez-Amezcuca P, Haque W, Khera R, Kanaya AM, Sattar N, Lam CSP, et al. The Upcoming Epidemic of Heart Failure in South Asia. *Circ Heart Fail*. 2020;13(10):e007218.
4. Stolfo D, Sinagra G, Savarese G. Evidence-based Therapy in Older Patients with Heart Failure with Reduced Ejection Fraction. *Card Fail Rev*. 2022;8:e16.
5. Usman MS, Van Spall HGC, Greene SJ, Pandey A, McGuire DK, Ali ZA, et al. The need for increased pragmatism in cardiovascular clinical trials. *Nat Rev Cardiol*; 2022.
6. Bottle A, Newson R, Faitna P, Hayhoe B, Cowie MR. Changes in heart failure management and long-term mortality over 10 years: observational study. *Open Heart*. 2022;9(1).
7. Taylor CJ, Ordonez-Mena JM, Roalfe AK, Lay-Flurrie S, Jones NR, Marshall T, et al. Trends in survival after a diagnosis of heart failure in the United Kingdom 2000-2017: population based cohort study. *BMJ*. 2019;364:l223.
8. Cohen-Solal A, Damy T, Terbah M, Kerebel S, Baguet JP, Hanon O, et al. High prevalence of iron deficiency in patients with acute decompensated heart failure. *Eur J Heart Fail*. 2014;16(9):984-91.
9. Savarese G, Jonsson A, Hallberg AC, Dahlstrom U, Edner M, Lund LH. Prevalence of, associations with, and prognostic role of anemia in heart failure across the ejection fraction spectrum. *Int J Cardiol*. 2020;298:59-65.
10. Ralli S, Horwich TB, Fonarow GC. Relationship between anemia, cardiac troponin I, and B-type natriuretic peptide levels and mortality in patients with advanced heart failure. *Am Heart J*. 2005;150(6):1220-7.
11. Listerman J, Geisberg C, Nading MA, Goring J, Huang R, Butler J. Blunted hemodynamic response and reduced oxygen delivery with exercise in anemic heart failure patients with systolic dysfunction. *Congest Heart Fail*. 2007; 13(2):71-7.
12. Heidenreich PA, Bozkurt B, Aguilar D, Allen LA, Byun JJ, Colvin MM, et al. 2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure: A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines. *Circulation*. 2022;145(18): e895-e1032.
13. Cappellini MD, Motta I. Anemia in Clinical Practice-Definition and Classification: Does Hemoglobin Change With Aging? *Semin Hematol*. 2015;52(4):261-9.
14. Roger VL. Epidemiology of Heart Failure: A Contemporary Perspective. *Circ Res*. 2021;128(10):1421-34.
15. Thomas S, Rich MW. Epidemiology, pathophysiology, and prognosis of heart failure in the elderly. *Heart Fail Clin*. 2007; 3(4):381-7.
16. Bui AL, Horwich TB, Fonarow GC. Epidemiology and risk profile of heart failure. *Nat Rev Cardiol*. 2011;8(1): 30-41.
17. Dunlay SM, Roger VL, Killian JM, Weston SA, Schulte PJ, Subramaniam AV, et al. Advanced Heart Failure Epidemiology and Outcomes: A Population-Based Study. *JACC Heart Fail*. 2021;9(10):722-32.
18. Guha K, McDonagh T. Heart failure epidemiology: European perspective. *Curr Cardiol Rev*. 2013;9(2):123-7.
19. Natella PA, Le Corvoisier P, Paillaud E, Renaud B, Mahe I, Bergmann JF, et al. Long-term mortality in older patients discharged after acute decompensated heart failure: A prospective cohort study. *BMC Geriatr*. 2017;17(1):34.
20. Groenveld HF, Januzzi JL, Damman K, van Wijngaarden J, Hillege HL, van Veldhuisen DJ, et al. Anemia and mortality in heart failure patients a systematic review and meta-analysis. *J Am Coll Cardiol*. 2008;52(10):818-27.
21. Oster HS, Benderly M, Hoffman M, Cohen E, Shotan A, Mittelman M. Mortality in heart failure with worsening anemia: a national study. *Isr Med Assoc J*. 2013; 15(7):368-72.
22. Gupta K, Kalra R, Rajapreyar I, Joly JM, Pate M, Cribbs MG, et al. Anemia, Mortality, and Hospitalizations in Heart Failure With a Preserved Ejection Fraction (from the TOPCAT Trial). *Am J Cardiol*. 2020;125(9):1347-54.
23. McCullough PA, Barnard D, Clare R, Ellis SJ, Fleg JL, Fonarow GC, et al. Anemia

- and associated clinical outcomes in patients with heart failure due to reduced left ventricular systolic function. Clin Cardiol. 2013;36(10):611-20.
24. Majmundar M, Doshi R, Zala H, Shah P, Adalja D, Shariff M, et al. Prognostic role of anemia in heart failure with preserved ejection fraction: A systematic review and meta-analysis. Indian Heart J. 2021;73(4): 521-3.
 25. Seko Y, Kato T, Morimoto T, Yaku H, Inuzuka Y, Tamaki Y, et al. Improved and new-onset anemia during follow-up in patients with acute decompensated heart failure: Characteristics and outcomes. Medicine (Baltimore). 2021;100(32): e26892.
 26. Silverberg DS, Wexler D, Iaina A. The role of anemia in the progression of congestive heart failure. Is there a place for erythropoietin and intravenous iron? J Nephrol. 2004;17(6):749-61.
 27. Jackevicius CA, Fan CS, Warner A. Clinical outcomes of erythropoietin use in heart failure patients with anemia of chronic kidney disease. J Card Fail. 2014; 20(5):327-33.
 28. Negi PC, Dev M, Paul P, Pal Singh D, Rathoure S, Kumar R, et al. Prevalence, risk factors, and significance of iron deficiency and anemia in nonischemic heart failure patients with reduced ejection fraction from a Himachal Pradesh heart failure registry. Indian Heart J. 2018;70 (Suppl 3):S182-S8.
 29. Chopra VK, Anker SD. Anaemia, iron deficiency and heart failure in 2020: facts and numbers. ESC Heart Fail. 2020;7(5): 2007-11.
 30. Xia H, Shen H, Cha W, Lu Q. The Prognostic Significance of Anemia in Patients With Heart Failure: A Meta-Analysis of Studies From the Last Decade. Front Cardiovasc Med. 2021;8:632318.

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