Investigation of ANEMIA Risk Factors and its Related Outcomes in Patients with St-Elevation Myocardial Infarction

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ABSTRACT:

Background: Anemia is one of the symptoms and indicators of ST-elevation myocardial infarction (STEMI) in hospitalized patients, and it may be predictive of issues in the short- or long-term. Finding the short- and long-term effects of anemia risk factors in STEMI patients was the aim of this study.

Aims: To determine the risk factors and in-hospital clinical outcomes related to anemia among STEMI patients Nil Ratan Sircar Medical College & Hospital, Kolkata

Methods: The present study was a Comparative Study. This Study was conducted for 1year at Department of Cardiology, Nil Ratan Sircar Medical College & Hospital, Kolkata, West Bengal 700014. Total 100 patients were included in this study.

Results: In Nonanemic No, 28(56.00%) patients had Hyperlipidemia In anemic No, 26(52.00%) patients had Hyperlipidaemia. Association of Hyperlipidemia with anemia was not statistically significant (p=0.6882).

Conclusion: Anemia increases the risk of adverse outcomes for STEMI patients while they are in the hospital. Moreover, anemia-related variables such as female gender, hyperglycemia and MI history may have a significant influence in the consequences of STEMI.

Introduction

The term "acute coronary syndrome" (ACS) refers to a wide range of illnesses, from unstable angina to myocardial infarction (MI). MI is diagnosed with clinical evidence such as imaging, increased blood biomarker levels, and electrocardiography (ECG). Based on ECG patterns, MI classified as either ST-segment elevation MI

(STEMI) or non-ST-segment elevation MI (non-STEMI) is displayed [1]. Although the frequency of STEMI has declined over the past 10 years, it still accounts for 25% to 40% of MI patients. [2].

One issue associated with ACS patients is anemia, which may be a good indicator of long-term or in-hospital prognosis [3]. Several studies have shown a relationship between hemoglobin level and problems that arise when a patient is in the hospital when they suffer a STEMI. [4], [5]. Iron deficiency is one of the most common causes of anemia in adults. Furthermore, it has been shown that the epidemiological evaluation of STEMI patients varies significantly from that of industrialized countries in terms of risk variables and methods used. For patients with STEMI, preferred percutaneous coronary intervention (P.PCI) has not yet been acknowledged as the best course of treatment. As a result, it becomes critical to assess how anemia relates to MI outcomes and risk factors in developing nations. With the exception of a small study that looked at the relationship between serum ferritin and iron and the presence of diabetes in STEMI patients, there was no comprehensive study conducted in Iran, particularly in Kermanshah, to assess the relationship between in-hospital risk factors (such as low ejection fraction, streptokinase uptake) and in-hospital outcomes (such as cardiopulmonary resuscitation (CPR), mortality from anemia) [6]. In light of this, this study was carried out at N.R.S. Medical College and Hospital, Kolkata identify the risk variables and in-hospital clinical outcomes associated with anemia among STEMI patients.

Materials and Method

Study Type: Comparative Study

Study Duration: 1year

Study Place: Department of Cardiology, Nil Ratan Sircar Medical College & Hospital, Kolkata, West Bengal 700014.

Sample Size: 100

Inclusion Criteria:

1. Patients diagnosed with ST-elevation myocardial infarction (STEMI) based on clinical and electrocardiographic criteria.
2. Patients aged 18 years and above.
3. Availability of complete medical records and follow-up data.
4. Ability to provide informed consent or consent from a legally authorized representative.
5. Patients with documented hemoglobin levels at the time of STEMI diagnosis.
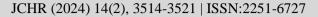
Exclusion Criteria:

1. Patients with non-ST-elevation myocardial infarction (NSTEMI) or other types of myocardial infarction.
2. Patients with pre-existing chronic anemia, such as those with chronic kidney disease, hematologic disorders, or active bleeding disorders.
3. Patients with a history of recent blood transfusion within a specified period prior to STEMI diagnosis.
4. Patients with incomplete medical records or missing follow-up data.
5. Patients with significant comorbidities or conditions that may affect the interpretation of the study results, such as advanced cancer, severe liver disease, or severe infections.
6. Patients who are pregnant or breastfeeding at the time of STEMI diagnosis.
7. Patients with a history of recent major surgery or trauma within a specified period prior to STEMI diagnosis.

Result

Table 1. Demographic characteristics of ST-elevation myocardial infarction patients according to the presence of anaemia

Parameter	Variables	Nonanemic No.		Anemic No.		Total		P value
		N	%	N	%	N	%	

Parameter	Variables							P value
Age group(year)	< 60	24	48.00	17	34.00	41.00	41.00	0.1546
	≥ 60	26	52.00	33	66.00	59.00	59.00	
	Total	50	100.00	50`	100.00	100.00	100.00	
Gender	Female	30	60.00	32	64.00	62.00	62.00	0.6803
	Male	20	40.00	18	36.00	38.00	38.00	
	Total	50	100.00	50	100.00	100.00	100.00	
History of HTN	No	20	40.00	25	50.00	45.00	45.00	0.3148
	Yes	30	60.00	25	50.00	55.00	55.00	
	Total	50	100.00	50	100.00	100.00	100.00	
History of Diabetes	No	23	46.00	29	58.00	52.00	52.00	0.2297
	Yes	27	54.00	21	42.00	48.00	48.00	
	Total	50	100.00	50	100.00	100.00	100.00	
Hyperlipidemia	No	22	44.00	24	48.00	46.00	46.00	0.6882
	Yes	28	56.00	26	52.00	54.00	54.00	
	Total	50	100.00	50`	100.00	100.00	100.00	
Current Smoker	No	20	40.00	12	24.00	32.00	32.00	0.0863
	Yes	30	60.00	38	76.00	68.00	68.00	
	Total	50	100.00	50	100.00	100.00	100.00	
History of MI	No	15	30.00	34	68.00	49.00	49.00	<0.0001
	Yes	35	70.00	16	32.00	51.00	51.00	
	Total	50	100.00	50	100.00	100.00	100.00	
History of CVA	No	29	58.00	28`	56.00	57.00	57.00	0.8399
	Yes	21	42.00	22	44.00	43.00	43.00	
	Total	50	100.00	50	100.00	100.00	100.00	

Table 2 . The in-hospital outcomes and 1-year mortality in patients presenting for ST-elevation myocardial infarction according to the presence of anemia

Parameter	Variables	Nonanemic No.		Anemic No.		Total		P value
		N	%	N	%	N	%	

Cardiogenic shock	**No**	18	36.00	20	40.00	38.00	38.00	0.6803
	Yes	32	64.00	30	60.00	62.00	62.00	
	Total	50	100.00	50	100.00	100.00	100.00	
In hospital CPR	**No**	30	60.00	32	64.00	62.00	62.00	0.6803
	Yes	20	40.00	18	36.00	38.00	38.00	
	Total	50	100.00	50	100.00	100.00	100.00	
Ejection fraction	**≤ 40**	10	20.00	39	78.00	49.00	49.00	6.5861
	> 40	40	80.00	11	22.00	51.00	51.00	
	Total	50	100.00	50	100.00	100.00	100.00	
Streptokinase	**No**	29	58.00	23	46.00	52.00	52.00	0.2297
	Yes	21	42.00	27	54.00	48.00	48.00	
	Total	50	100.00	50	100.00	100.00	100.00	
P.PCI	**No**	35	70.00	28	56.00	63.00	63.00	0.1470
	Yes	15	30.00	22	44.00	37.00	37.00	
	Total	50	100.00	50	100.00	100.00	100.00	
In-hospital mortality	**No**	34	68.00	20	40.00	54.00	54.00	0.0049
	Yes	16	32.00	30	60.00	46.00	46.00	
	Total	50	100.00	50	100.00	100.00	100.00	
One-year mortality	**No**	39	78.00	15	30.00	54.00	54.00	<0.0001
	Yes	11	22.00	35	70.00	46.00	46.00	
	Total	50	100.00	50	100.00	100.00	100.00	

Table 1

Age group (year)

In Nonanemic No, 24(48.00%) patients were < 60 years of age and 26(52.00%) patients were ≥ 60 years of age. In anemic No, 17(34.00%) patients were < 60 years of age and 33(66.00%) patients were ≥ 60 years of age. Association of Age group (year) with anemia was not statistically significant (p=0.1546).

Gender

In Nonanemic No, 30(60.00%) patients were Female and 20(40.00%) patients were Male. In anemic No, 32(64.00%) patients were Female and 18(36.00%) patients were Male. Association of Gender with anemia was not statistically significant (p=0.6803).

History of HTN

In Nonanemic No, 30(60.00%) patients had History of HTN In anemic No, 25(50.00%) patients had History of HTN Association of History of HTN with anemia was not statistically significant (p=0.3148).

History of Diabetes

In Nonanemic No, 27(54.00%) patients had History of Diabetes. In anemic No, 21(42.00%) patients had History of Diabetes. Association of History of Diabetes with anemia was not tatistically significant (p=0.2297).

Hyperlipidemia

In Nonanemic No, 28 (56.00%) patients had Hyperlipidemia In anemic No, 26(52.00%) patients had

Hyperlipidemia Association of Hyperlipidemia with anemia was not statistically significant (p=0.6882).

Current Smoker

In Nonanemic No 30(60.00%) patients had Current Smoker. In anemic No, 38(76.00%) patients had Current Smoker. Association of Current Smoker with anemia was not statistically significant (p=0.0863).

History of MI

In Nonanemic No 35(70.00%) patients had History of MI In anemic No, 16(32.00%) patients had History of MI Association of History of MI with anemia was not statistically significant (p=<0.0001).

History of CVA

In Nonanemic No 21(42.00%) patients had History of CVA In anemic No, 22(44.00%) patients had History of CVA Association of History of CVA with anemia was not statistically significant (p=0.8399).

Table 2

Cardiogenic shock

In Nonanemic No 32(64.00%) patients had cardiogenic shock. In anemic No, 30(60.00%) patients had cardiogenic shock. Association of Cardiogenic shock with anemia was not statistically significant (p=0.6803).

In hospital CPR

In Nonanemic No 20(40.00%) patients had In hospital CPR. In anemic No, 18(36.00%) patients had In hospital CPR. Association of In hospital CPR with anemia was not statistically significant (p=0.6803).

Ejection fraction

In Nonanemic No 10(20.00%) patients had ≤ 40 Ejection fraction, 40(80.00%) patients had > 40 Ejection fraction. In anemic No, 39(78.00%) patients had ≤ 40 Ejection fraction, 11(22.00%) patients had > 40 Ejection fraction. Association of Ejection fraction with anemia was not statistically significant (p=6.5861).

Streptokinase

In Nonanemic No 21(42.00%) patients had Streptokinase. In anemic No, 27(54.00%) patients had Streptokinase. Association of Streptokinase with anemia was not statistically significant (p=0.2297).

P.PCI

In Nonanemic No 15(30.00%) patients had Streptokinase. In anemic No, 22(44.00%) patients had Streptokinase. Association of Streptokinase with anemia was not statistically significant (p=0.1470).

In-hospital mortality

In Nonanemic No 16(32.00%) patients had In-hospital mortality. In anemic No, 30(60.00%) patients had In-hospital mortality. Association of In-hospital mortalitywith anemia was statistically significant (p=0.0049).

One-year mortality

In Nonanemic No 11(22.00%) patients had One-year mortality. In anemic No, 35(70.00%) patients had One-year mortality. Association of One-year mortality with anemia was not statistically significant (p<0.0001).

Discussion

The present study was a Comparative Study. This Study was conducted for 1year at Department of Cardiology, Nil Ratan Sircar Medical College & Hospital, Kolkata, West Bengal 700014. Total 100 patients were included in this study.

Jomaa W et al [7] (2017) found that Upon admission, patients with acute coronary syndromes are more likely to experience major cardiovascular events. In all, 1498 patients were enrolled. 36.6% of patients with anemia were 60.47 ± 12.7 years old on average. But in our study, most of the patients were ≥ 60 years old [33(66.00%)] which was not statistically significant (p=0.1546).

Sulaiman K et al [8](2012) showed that The purpose of this study was to ascertain the impact of admission anemia on in-hospital, one-month, and one-year mortality rates for Middle Eastern patients suffering from acute coronary syndrome (ACS). The cohort's median

age ranged from 48 to 65 years old, with 79% of participants being men but we found that, female population was higher [32(64.00%)] than the male population [18(36.00%)]. Male: Female ratio was 1.7:1 but this was not statistically significant (p=0.6803).

Our study showed that, higher no. of patients had History of HTN in Nonanemic No Group [30(60.00%)] compared to Anemic No Group [25(50.00%)] but this was not statistically significant (p=0.3148).

Bekele A et al [9](2019) found that Anemia has a major impact on the overall health and prognosis of diabetic patients as it is a common side effect of diabetes mellitus. However, there is little evidence of anemia among diabetic patients in Ethiopia, particularly in the Harari Region. Therefore, the goal of this study was to assess the level of anemia and associated factors in Type 2 Diabetes Mellitus (T2DM) patients examined in public hospitals in the Eastern Ethiopian region of the Harari Region but we observed that, higher number of patients had History of Diabetes in Nonanemic No Group [27(54.00%)] compared to Anemic No Group- [21(42.00%)] but this was not statistically significant (p=0.2297).

Rai A et al [10](2020) found that Anemia is one of the symptoms and indicators of ST-elevation myocardial infarction (STEMI) in hospitalized patients, and it may be predictive of issues in the short- or long-term. Anemia raises the possibility of unfavorable outcomes for hospitalized STEMI patients. Furthermore, factors associated with anemia, such as female gender, hyperglycemia, and a history of MI, may be very influential in the outcomes of STEMI. But we examined that, more number of patients had Hyperlipidemia in Nonanemic No Group [28(56.00%)] compared to Anemic No Group [26(52.00%)] which was not statistically significant (p=0.6882).

Vivek A et al [11](2023) found that iron deficiency anemia (IDA) poses a significant worldwide threat to public health. Tobacco smoking is frequently disregarded as a risk factor for anemia. There is a strong link between IDA and tobacco usage. There is a direct link between IDA and beedi smoking and cigarette smoking. IDA is more common in light smokers, and the risk increases with time. but our study showed that,

higher no. of patients had Current Smoker in anemic No Group [38(76.00%)] compared to in Nonanemic No Group [30(60.00%)] but this was not statistically significant (p=0.0863).

Rai A et al [10](2020) found that Anemia is one of the symptoms and indicators of ST-elevation myocardial infarction (STEMI) in hospitalized patients, and it may be predictive of issues in the short- or long-term. Anemia raises the possibility of unfavorable outcomes for hospitalized STEMI patients. Furthermore, factors linked to anemia, such as female gender, hyperglycemia, and MI history, may significantly affect the outcomes of STEMI. but we observed that, higher number of patients had History of MI in Nonanemic No Group [35(70.00%)] compared to anemic No Group- [16(32.00%)] but this was statistically significant (p<0.0001).

We examined that, more number of patients had History of CVA in anemic No Group [22(44.00%)] compared to Nonanemic No Group [21(42.00%)] which was not statistically significant (p=0.8399).

Sulaiman K et al [8](2012) showed that this study sought to determine how admission anemia affected Middle Eastern patients with acute coronary syndrome (ACS) in terms of in-hospital one-month, and one-year death. Anemia increased the risk of heart failure, recurrent ischemia, re-infarction, cardiogenic shock, stroke, and severe bleeding among hospitalized patients but our study showed that, higher no. of patients had Cardiogenic shock in Nonanemic No Group [32(64.00%)] compared to Anemic No Group [30(60.00%)] but this was not statistically significant (p=0.6803).

Rai A et al [10](2020) found that one of the signs and symptoms of ST-elevation myocardial infarction (STEMI) in hospitalized patients is anemia, which may be prognostic of short- or long-term problems. Out of 423 individuals, 49 (11.7%) had anemia overall. Women (OR = 2.92; CI 95% = 1.58-5.38), diabetics (OR = 2.5; CI 95% = 1.32- 4.74), people over 60 (OR = 2.42; CI 95% = 1.24-4.73), nonsmokers (OR = 2.18; CI 95% = 1.07-4.4), and those who might need in-hospital cardiopulmonary resuscitation (CPR) (OR = 3.12; CI 95% = 1.35-7.1) were among the characteristics of STEMI patients with anemia. But we observed that,

higher number of patients had In hospital CPR in Nonanemic No Group [20(40.00%)] compared to anemic No Group- [18(36.00%)] but this was not statistically significant (p=0.6803).

We examined that more number of patients had > 40 Ejection fraction in Nonanemic No Group [40(80.00%)] compared to anemic No Group [11(22.00%)] which was not statistically significant (p=6.5861).

Aslanabadi N et al [12] (2018) found that one of the primary causes of death and morbidity is acute myocardial infarction (AMI).. This study was conducted to assess the pattern of adverse drug reactions (ADRs) caused by streptokinase and its associated risk variables in patients with acute ST elevation MI because of the critical situation of AMI patients and difficulties of streptokinase therapy. But our study showed that, higher no. of patients had Streptokinase in anemic No Group [27(54.00%)] compared to Nonanemic No Group [21(42.00%)] but this was not statistically significant (p=0.2297).

We observed that, higher number of patients had P.PCI in anemic No Group- [22(44.00%)] compared to Nonanemic No Group [15(30.00%)] but this was not statistically significant (p=0.1470).

Ioannou P et al [13](2023) observed that Anemia is a widespread worldwide health issue that has a variety of causes and can shorten life expectancy, increase hospital admissions, and increase mortality, especially in the elderly. Using multivariate logistic regression analysis, longer hospital stays and higher B12 levels were revealed to be independently positively related with death but we examined that, more number of patients had In-hospital mortality in anemic No Group [30(60.00%)] compared to Nonanemic No Group [16 (32.00%)] which was not statistically significant (p=0.0049).

Our study showed that, higher no. of patients had one-year mortality in Anemic No Group [35(70.00%)] compared to Nonanemic No Group [11(22.00%)] but this was not statistically significant (p<0.0001).

Conclusion

Numerous factors linked to anemia in STEMI patients were found to potentially increase the probability of the illness's effects. Additionally, anemia-afflicted STEMI patients may be considered a high-risk group for in-hospital outcomes at the time of admission. More study with larger sample sizes is needed to examine the relationship between anemia and CPR in STEMI patients. Furthermore, there was a higher chance of mortality for the anemic individuals. Furthermore, hyperglycemia and a history of MI are the two most important anemia-related variables that might significantly affect the outcomes of STEMI.

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