Original Research Article

Anaemia in acute coronary syndrome patients: a study from rural tertiary care centre of India

Vivek Kumar Verma[1], Durga Prasad Singh[2]*, Dheeraj Kela[1], V. Vijayavarman[1], Geeta Singh[1]

[1]Department of General Medicine, U. P. University of Medical Sciences, Saifai, Etawah, Uttar Pradesh, India
[2]Department of General Medicine, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India

*Correspondence:
Dr. Durga Prasad Singh,
E-mail: dps2704@gmail.com

ABSTRACT

Background: Acute coronary syndromes (ACS) are an imbalance between myocardial oxygen supply and demand, and the presence of anaemia further potentiates this imbalance. The burden of anaemia in patients presenting with acute coronary syndromes (ACS) is significant. Anaemia has the potential to worsen myocardial ischemic insult by decreasing the oxygen content of the blood supplied to the jeopardized myocardium.

Methods: A total of 148 patients with ACS were recruited in the study from October 2016 to December 2017 in Medicine and Cardiology Department of UPUMS Saifai, India. All patients were subjected to a detailed history and thorough clinical examination and investigations after obtaining informed consent. Patient having any other diseases known to cause anaemia were excluded.

Results: Mean age of patients was 58.5 years. 72.97% were vegetarian and 27.03% were non-vegetarian. Most common morphological type of anaemia was dimorphic anaemia followed by macrocytic and microcytic hypochromic respectively. Iron deficiency anaemia was most common type of anaemia followed by vitamin B12 deficiency and mixed (Iron and vitamin B12 deficiency). 45.28% anaemic patients had no symptoms of blood loss. Most common symptom of blood loss was bleeding per rectum followed by malena. Severity of acute coronary syndrome was more in subjects having anaemia which was evident by higher incidence of anaemia in subjects having ST elevation myocardial infarction (STEMI). The incidence of anaemia was low in case of Non ST elevation Myocardial Infarction (NSTEMI) and Unstable angina (UA). The results of the present study have been compared to those from India.

Conclusions: Higher incidence of anaemia was reported in subjects having acute coronary syndrome. Incidence of anaemia in STEMI patients was greater than NSTEMI and unstable angina patients. Severe form of acute coronary syndrome i.e. STEMI was associated with higher incidence of anaemia.

Keywords: Non ST elevation myocardial infarction, Non-vegetarian, ST elevation myocardial infarction, Unstable angina

INTRODUCTION

Numerous studies have suggested that the burden of anaemia in patients presenting with acute coronary syndromes (ACS) is significant. Anaemia is associated with a significantly increased prevalence of baseline comorbidities, and a lower use of guidelines-based

therapies, and is associated with increasing odds of in-hospital mortality.[1-8]

Anaemia has the potential to worsen myocardial ischemic insult by decreasing the oxygen content of the blood supplied to the jeopardized myocardium and by increasing myocardial oxygen demand through necessitating a higher cardiac output to maintain adequate systemic oxygen delivery.[9,10] Mixed comorbidities in anemic patients may influence their short-term and long-term mortality. Anaemia seems to be a significant factor related to improving the long-term survival of ACS patients. Previous reports have suggested that ACS patients with anaemia have significantly worse in-hospital and longer-term total and cardiac mortality outcomes, heart failure, and risk of major bleeding and of reinfarction.[5-7,11-15]

Some studies have reported that, once differences in age or comorbidity burden between anaemic/non-anaemic ACS cohorts are adjusted for, anaemia is no longer an independent predictor of adverse mortality or cardiovascular mortality, although other studies report that the relationship persists.[6,7,15-18] Other studies have reported different relationships between anaemia and cardiovascular (CV) outcomes according to sex, with baseline anaemia independently associated with higher rates of all-cause and cardiac mortality at 30 days and 1 year in men but not in women.[7]

Our study investigates the prevalence of anaemia in ACS patients attending a rural tertiary health care institute of the Northern India and explores which comorbidities could be influenced by anaemia.

METHODS

This study was carried on patients of ACS admitted in Medicine and Cardiology Department of UPUMS Saifai, from October 2016 to December 2017.

Inclusion criteria

A case of Acute coronary syndrome

Exclusion criteria

- Patients of Acute coronary syndrome with altered sensorium and disturbed mental state.

- Patients of Acute coronary syndrome having any other diseases known to cause anaemia like HIV infection, chemotherapeutic agents, malignancy, pancytopenia etc.
- Patients with renal failure, liver failure and respiratory failure.

Sample size

All patients satisfying inclusion and exclusion criteria were included in study. This was a cross sectional study.

All patients were subjected to a detailed history and thorough clinical examination after obtaining his/her informed consent.

Investigations: Electrocardiogram, troponin-T, CPK-MB, haemoglobin, total and differential counts, peripheral smear for type of anaemia, Iron Profile, Serum Vitamin B12 and Folate.

Statistical analysis was done by SPSS version 22.0. Percentage, mean and ratio were calculated.

RESULTS

Total 148 patients were included in the study who satisfied the inclusion and exclusion criteria. In this study minimum age of patient was 34 years and maximum age was 81 years with mean age of 58.5 years. Male to female ratio was 1:0.7. 108 patients (72.97%) were vegetarian and 40 patients (27.03%) were non-vegetarian. Out of 87 male patients, 27 patients (31.03%) were anaemic while out of 61 female patients, 26 patients (42.62%) were anaemic (Figure 1). Higher incidence of anaemia was found in vegetarian females (Table 1).
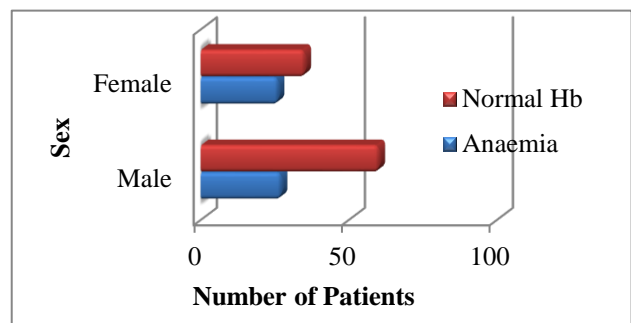

Figure 1: Status of patients according to haemoglobin.

Table 1: Food habits and anaemia.

Sex	Number of Patients	Food Habit	Total Number of Patients	Number of Patients with Anaemia
Male	87(100%)	Vegetarian	63(72.41%)	20(22.99%)
		Non-vegetarian	24(27.59%)	07(8.05%)
Female	61(100%)	Vegetarian	45(73.77%)	21(34.43%)
		Non-vegetarian	16(26.23%)	05(8.20%)

Incidence of Acute coronary syndrome was less in females below 40 years of age as compared to males of same age group. Incidence sharply increases in age groups of 41-50 years and 51-60 years in female patients and it was more than male patients of same age groups. Male predominance was found in patients of more than 60 years of age (Figure 2).
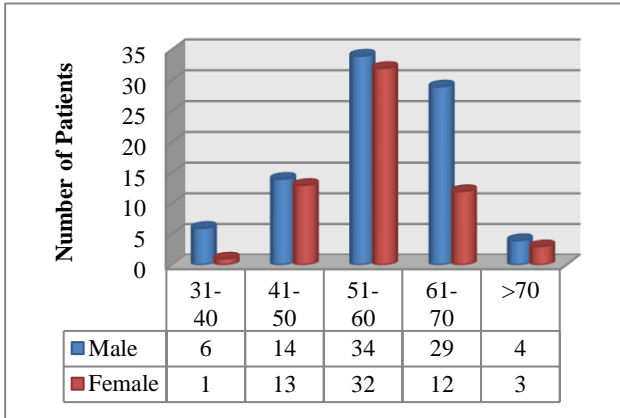
Figure 2: Distribution of ACS patients according to age groups.

Most common morphological type of anaemia in study population was dimorphic anaemia followed by macrocytic and microcytic hypochromic respectively (Table 2).

Table 2: Morphological types of anaemia in ACS patients.

Morphological type of anaemia	Male	Female	Total
Microcytic hypochromic	7 (25.93%)	7 (26.92%)	14 (26.42%)
Macrocytic	8 (29.63%)	7 (26.92%)	15 (28.30%)
Normocytic normochromic	3 (11.11%)	2 (7.69%)	5 (9.43%)
Dimorphic	9 (33.33%)	10 (38.46%)	19 (35.85%)
Total	27 (100%)	26 (100%)	53 (100%)

Iron deficiency anaemia was most common type of anaemia in study population followed by vitamin B12 deficiency and mixed (Iron and vitamin B12 deficiency) picture of anaemia (Table 3).

No addiction was found in 73.77% female patients and 35.63% male patients. Only tobacco abuse was found in female patients. Multiple substance abuse was found in 34.48% male patients (Table 4).

45.28% anaemic patients in the study had no symptoms of blood loss. Most common symptom of blood loss was bleeding per rectum followed by malena (Table 5).

Severity acute coronary syndrome was more in subjects having anaemia which was evident by higher incidence of anaemia in subjects having ST elevation Myocardial Infarction (STEMI) in both sexes. The incidence of anaemia was low in case of Non ST elevation Myocardial Infarction (NSTEMI) and Unstable angina (UA). The result is statistically significant (Table 6 and Figure 3).

Table 3: Type of anaemia in ACS patients.

Type of anaemia	Male	Female	Total
Iron deficiency anaemia	10 (37.04%)	09 (34.62%)	19 (35.85%)
Vitamin B12 deficiency	08 (29.63%)	07 (26.92%)	15 (28.30%)
Folate deficiency	00	01 (3.85%)	01 (1.89%)
Chronic anaemia	02 (7.41%)	01 (3.85%)	03 (5.66%)
Mixed	07 (25.93%)	08 (30.77%)	15 (28.30%)
Total	27 (100%)	26 (100%)	53 (100%)

Table 4: Type of addiction in ACS patients.

Addiction	Male	Female	Total
Tobacco alone	18 (20.69%)	16 (26.23%)	34 (22.97%)
Alcohol alone	08 (9.20%)	00	08 (5.41%)
Multiple substance abuse	30 (34.48%)	00	30 (20.27%)
No addiction	31 (35.63%)	45 (73.77%)	76 (51.35%)
Total	87 (100%)	61 (100%)	148 (100%)

Table 5: Symptoms of blood loss in ACS patients.

| Symptoms	Male	Female	Total
Bleeding per rectum	9 (33.33%)	7 (26.92%)	16 (30.19%)
Bleeding per vaginum	-	3 (11.54%)	03 (5.66%)
Malena	4 (14.81%)	2 (7.69%)	06 (11.32%)
Passing of worms in stool	3 (11.11%)	1 (3.85%)	04 (7.55%)
No symptom	11 (40.74%)	13 (50%)	24 (45.28%)
Total	27 (100%)	26 (100%)	53 (100%)

DISCUSSION

In our study incidence of anaemia was 35.81% which was comparable to WHO data of 2011, the highest prevalence of anaemia was in children (42.6%, 95% CI: 37-47), and the lowest prevalence was in non-pregnant women (29.0%, 95% CI: 23.9-34.8). In addition, the global prevalence of anaemia for pregnant women was 38.2% (95% CI: 33.5-42.6) and for all women of reproductive age was 29.4% (95% CI: 24.5-35.0). The prevalence of anaemia was 37.7% to 41.5% for non-pregnant women and 38.9% to 48.7% for pregnant women in South-East

Asia, Eastern Mediterranean and African Regions. Incidence of anaemia in women of age group 26-40 years 23% and anaemia among elderly was quite higher 15.5% which was much less than incidence of anaemia in ACS patients.[19,20] Dimorphic anaemia was the most common morphological type of anaemia found in our study, the result was contrary to the study done by Garg et al, in which most common type of anaemia was microcytic hypochromic in 64.5% of patient, followed by dimorphic anaemia observed in 17.5% of patient, then normocytic normochromic anaemia in 13.8%, followed by macrocytic anaemia in 3% patients.[21]

Table 6: Incidence of anaemia in various types of ACS.

Type of ACS	Male			Female			Total
	Total	Normal Hb	Anaemia	Total	Normal Hb	Anaemia	
STEMI	45 (51.72%)	27 (45%)	18 (66.67%)	29 (47.54%)	14 (40%)	15 (57.69%)	74 (50%)
NSTEMI	22 (25.29%)	17 (28.33%)	05 (18.51%)	17 (27.87%)	11 (31.43%)	06 (23.08%)	39 (26.35%)
UA	20 (22.99%)	16 (26.67%)	04 (14.81%)	15 (24.59%)	10 (28.57%)	05 (19.23%)	35 (23.65%)
Total	87 (100%)	60 (100%)	27 (100%)	61 (100%)	35 (100%)	26 (100%)	148 (100%)
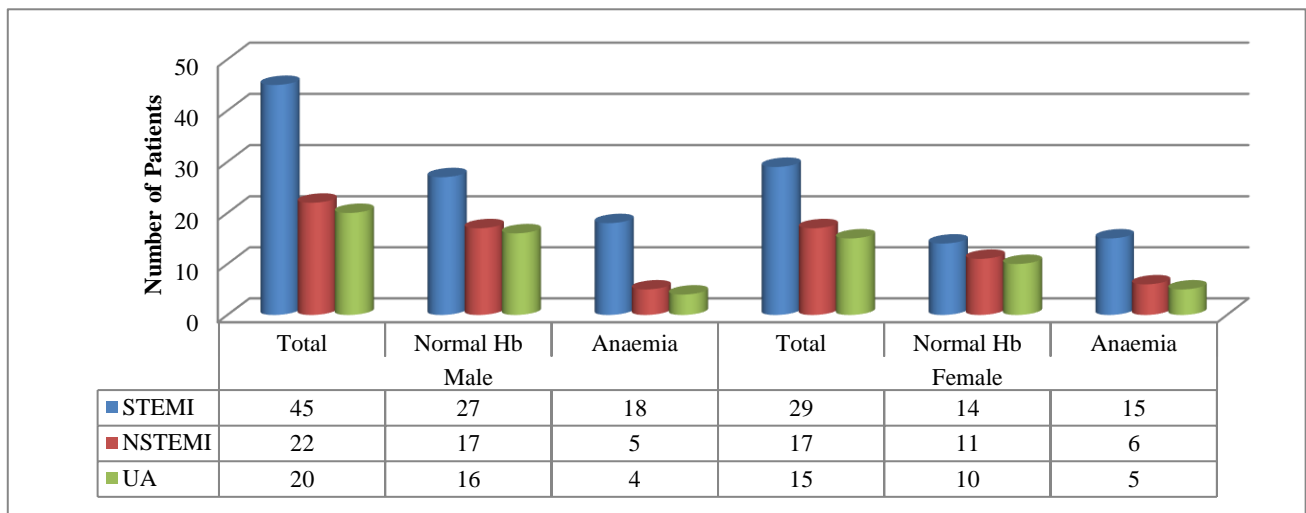
Figure 3: Type of ACS and haemoglobin in male and female.

Iron deficiency anaemia was most common type of anaemia in study population which was comparable to study done by Gupta et al.[20]

Anaemia was more common in subjects with STEMI, 44.59% patients of STEMI had anaemia which was much higher than study done by Mamas et al.[22]

CONCLUSION

Higher incidence of anaemia was reported in subjects having acute coronary syndrome. Incidence of anaemia in STEMI patients was greater than NSTEMI and Unstable Angina patients. Severe form of Acute coronary syndrome i.e. STEMI was associated with higher incidence of anaemia. Hence, we recommend routine screening for anaemia in ACS patients. Due to small data and demographic variation among different regions of our county and world more research is needed to test this hypothesis.

REFERENCES

1. Aronson D, Suleiman M, Agmon Y, Suleiman A, Blich M, Kapeliovich M, et al. Changes in haemoglobin levels during hospital course and long-

term outcome after acute myocardial infarction. Eur Heart J. 2007;28:1289-96.

2. Giraldez RR, Sabatine MS, Morrow DA, Mohanavelu S, McCabe CH, Antman EM, et al. Baseline hemoglobin concentration and creatinine clearance composite laboratory index improves risk stratification in ST-elevation myocardial infarction. Am Heart J. 2009;157:517-24.

3. Al Falluji N, Lawrence-Nelson J, Kostis JB, Lacy CR, Ranjan R, Wilson AC. Effect of anaemia on 1-year mortality in patients with acute myocardial infarction. Am Heart J. 2002;144:636-41.

4. Alexander KP, Chen AY, Wang TY, Rao SV, Newby LK, LaPointe NM, et al. Transfusion practice and outcomes in non-ST-segment elevation acute coronary syndromes. Am Heart J. 2008;155:1047-53.

5. Anker SD, Voors A, Okonko D, Clark AL, James MK, von Haehling S, et al. Prevalence, incidence, and prognostic value of anaemia in patients after an acute myocardial infarction: data from the OPTIMAAL trial. Eur Heart J. 2009;30:1331-9.

6. Kunadian V, Mehran R, Lincoff AM, Feit F, Manoukian SV, Hamon M, et al. Effect of anaemia on frequency of short- and long-term clinical events in acute coronary syndromes (from the Acute Catheterization and Urgent Intervention Triage Strategy Trial). Am J Cardiol. 2014;114:1823-9.

7. Tsujita K, Nikolsky E, Lansky AJ, Dangas G, Fahy M, Brodie Br, et al. Impact of anaemia on clinical outcomes of patients with ST-segment elevation myocardial infarction in relation to gender and adjunctive antithrombotic therapy. Am J Cardiol. 2010;105:1385-94.

8. Riley RF, Newby LK, Don CW, Alexander KP, Peterson ED, Peng SA, et al. Guidelines-based treatment of anaemic STEMI patients: practice patterns and effects on in-hospital mortality: a retrospective analysis from the NCDR. Eur Heart J Acute Cardiovasc Care. 2013;2(1):35-43.

9. Most AS, Ruocco NA Jr, Gewirtz H. Effect of a reduction in blood viscosity on maximal myocardial oxygen delivery distal to a moderate coronary stenosis. Circulation 1986;74:1085-92.

10. Levy PS, Quigley RL, Gould SA. Acute dilutional anaemia and critical left anterior descending coronary artery stenosis impairs end organ oxygen delivery. J Trauma 1996;41:416-23.

11. Archbold RA, Balami D, Al-Hajiri A, Suliman A, Liew R, Cooper J, et al. Hemoglobin concentration is an independent determinant of heart failure in acute coronary syndromes: cohort analysis of 2310 patients. Am Heart J. 2006;152:1091-5.

12. Sudarsky D, Sudarsky M, Matezky S, Goldenberg I, Farcas A, Nikolsky E. Impact of early invasive approach on outcomes of patients with acute coronary syndrome and baseline anaemia: analysis from the ACSIS registry. J Interv Cardiol. 2015;28:315-25.

13. Kruk M, Przyluski J, Kalinczuk L, Pregowski J, Kadziela J, Kaczmarska E, et al. Hemoglobin, leukocytosis and clinical outcomes of STelevation myocardial infarction treated with primary angioplasty: ANIN Myocardial Infarction Registry. Circ J. 2009;73:323-9.

14. Lawler PR, Filion KB, Dourian T, Atallah R, Garfinkle M, Eisenberg MJ. Anaemia and mortality in acute coronary syndromes: a systematic review and metaanalysis. Am Heart J. 2013;165:143-153.e5.

15. Greenberg G, Assali A, Vaknin-Assa H, Brosh D, Teplitsky I, Fuches S, et al. Hematocrit level as a marker of outcome in ST-segment elevation myocardial infarction. Am J Cardiol. 2010;105:435-40.

16. Valeur N, Nielsen OW, McMurray JJ, Torp-Pedersen C, Kober L. Anaemia is an independent predictor of mortality in patients with left ventricular systolic dysfunction following acute myocardial infarction. Eur J Heart Fail. 2006;8:577-84.

17. Sabatine MS, Morrow DA, Giugliano RP, Burton PB, Murphy SA, McCabe CH, et al. Association of hemoglobin levels with clinical outcomes in acute coronary syndromes. Circulation. 2005;111:2042-9.

18. Nikolsky E, Mehran R, Aymong ED, Mintz GS, Lansky AJ, Lasic Z, et al. Impact of anaemia on outcomes of patients undergoing percutaneous coronary interventions. Am J Cardiol. 2004;94:1023-7.

19. WHO. The global prevalence of anaemia in 2011. Geneva: World Health Organization; 2015.

20. Gupta SK, Agarwal SS, Kaushal R, Jain A, Gupta VK, Khare N. Prevalence of Anaemia among rural population living in and around of rural health and training center, Ratua Village of Madhya Pradesh. Muller J Med Sci Res. 2014;5:15-8.

21. Garg P, Deshpande AH, Dey B, Ojha P. A Study of the Peripheral Smears in a Tertiary Care Teaching Hospital of Andaman & Nicobar Islands. Int J Health Sci Res. 2017;7:22-7.

22. Mamas MA, Kwok CS, Kontopantelis E, Fryer AA, Buchan I, Bachmann MO, et al. Relationship between anaemia and mortality outcomes in a national acute coronary syndrome cohort: insights from the UK myocardial ischemia national audit project registry. J Am Heart Assoc. 2016;5(11):e003348.