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Original Research Article

Assessment of anemia in cases of acute myocardial infarction in a tertiary care hospital in South India

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ABSTRACT

Background: Anemia is a known risk factor for ischemic heart disease and heart failure. It is also associated with increased mortality in acute myocardial infarction (AMI) patients. The study aimed to determine the anemia status of AMI patients and educate them on anemia and its impact on health.
Methods: This was a cross-sectional study conducted among 150 AMI patients admitted to the ICCU of Government General Hospital Srikakulam, Andhra Pradesh over 3 months. Hemoglobin levels were recorded and patients were classified as non-anemic, mildly, moderately, or severely anemic based on WHO criteria. Patients' sociodemographic profiles and risk factors were also collected.
Results: Of the 150 patients (mean age 59.6 years), 70% were males. 83% of patients had anemia- 67% mild, 12% moderate, and 4% severe. The 50-65 years age group reported the highest frequency of mild anemia cases (38 out of 54). Absence of anemia was highest among the younger 45-50 years group (3 out of 15). Anemia was higher in females, and patients with a vegetarian diet had comparatively more anemia than those consuming a mixed diet. Additionally, 24% of the cases of anemia were in the 65-75 age group.
Conclusions: A high prevalence of anemia was found among AMI patients. Counselling can help improve health by increasing awareness of anemia management. Screening AMI patients for anemia and therapeutic interventions were recommended.

Keywords: Anemia, Hemoglobin, MI, Risk factors, Screening

INTRODUCTION

The World Health Organization (WHO) defines myocardial infarction (MI) as the presence of myocardial cell necrosis due to substantial and prolonged ischemia. It is often, though not always, an acute sign of coronary heart disease caused by atherosclerosis.[1] MI is one of the life-threatening coronary events with sudden cardiac death and the most severe clinical presentation of coronary artery disease (CAD). This pathology is divided into two categories of ST-elevation MI (STE-MI) and non-ST-elevation MI (NSTE-MI).[2] Heart attacks, or acute myocardial infarctions (AMIs), are leading causes of death and morbidity globally. An AMI is one of the most common and potentially fatal cardiac events. Annually, over 3 million patients experience ST-elevation MI (STE-MI), while over 4 million people have STE-MI pathology.

MI occurs more frequently worldwide in people under 60 than in those over 60, with a 3.8% prevalence in the latter group.[3]

Anemia is a global public health problem affecting both developing and developed countries at all ages. According to the World Health Organization (WHO), anemia is defined as hemoglobin (Hb) levels <12.0 gm/dl in women and <13.0 gm/dl in men. However, normal Hb distribution varies not only with sex but also with ethnicity and physiological status.[4] The WHO defines anemia as a condition where the concentration of hemoglobin in red blood cells is below normal or where there is a decrease in the number of red blood cells. Anemia can lead to symptoms such as weakness, exhaustion, light headedness, and dyspnea. The ideal hemoglobin concentration varies based on factors like age, gender, altitude, smoking status, and pregnancy. The most common causes of anemia are hemoglobinopathies, dietary deficiencies (especially iron, folate, vitamins B_{12} and A), and infectious diseases such as HIV, malaria, TB, and parasitic infections.[5]

Post-AMI, anemia may negatively impact recovery and prognosis. It can exacerbate pre-existing heart conditions and increase the heart's workload.[6] Additionally, the decreased oxygen delivery capacity of the blood can cause tissue hypoxia, leading to organ damage and cellular energy failure. Anemia, whether mild or severe, poses significant risks and is linked to increased mortality after AMI.[7] When combined with acute renal injury or chronic kidney disease, hospital-acquired anemia is a strong predictor of long-term mortality in AMI patients.[8]

In acute coronary syndrome (ACS) patients, anemia independently predicts major adverse cardiovascular events (MACE) and is a known risk factor for ischemic heart disease.[9] Anemia is linked to severe morbidity and disability, and it has been reported in about 40% of acute ischemic stroke (AIS) cases.[10] Anemia can impair the healing process after an MI by increasing the heart's workload, causing tissue hypoxia, and raising mortality.[11-13] Therefore, treating anemia should logically reduce these issues and lead to better outcomes. This study aims to assess the burden of anemia in these high-risk patients, given that anemia screening is not routinely performed for all AMI hospitalizations and its impact remains poorly understood.

METHODS

It was descriptive cross-sectional study conducted in the tertiary care hospital of Srikakulam for period of 3-month duration from March 2024 to May 2024.

Study subjects

Patients of AMI admitted to the intensive coronary care unit (ICCU) of a tertiary care hospital.

Sample size

A total of 150 patient with recent myocardial infraction were approached in the ICCU of hospital.

Sampling method

Non-probability purposive sampling method was used. The first 150 consenting subjects who fit the inclusion criteria were enrolled in the study.

Study tools and techniques

A pre-tested, semi-structured questionnaire was designed to collect patients' socio-demographic details, dietary habits, and the most recent hemoglobin levels recorded as part of routine investigations during hospital admission to classify anemia status. Data were collected after obtaining consent from the patient during their hospital stay using the study questionnaire and relevant information from case sheets. If the patient was not in a condition to understand or respond to our questions, information was obtained from the patient's relative. Patients were classified as non-anemic or as having mild, moderate, or severe anemia based on Hb levels and WHO criteria for anemia diagnosis.[12]

Criteria for classification of anemia is based on Hb Concentration: >12 gm%- no anemia; 9-11.9 gm%- mild anemia; 7-8.9 gm%- moderate anemia; <7 gm%- severe anemia.[13]

Ethical consideration

A formal permission letter seeking approval from the institutional ethics committee and hospital administration was obtained to conduct the study.

Data analysis

The data analysis in the study was carried out using percentages, pie charts, bar diagrams, descriptive statistics and graphical representation to determine the factors influencing anemia status among patients. This will help identify the prevalence of anemia and its various classifications (non-anemic, mild, moderate, severe) based on socio-demographic details and dietary habits. Frequency distribution and percentages were also calculated for categorical variables to describe the socio-demographic characteristics of respondents. Crosstabulation of sociodemographic and Anemia status were done to look into possible relation.

RESULTS

Patient age varied substantially, ranging from 45 to 80 years, with an average age of 59.66 years, as shown in Figure 1. Of the 150 respondents enrolled in the study, the majority were males (70%) as shown in Figure 2. The respondents were distributed across four age groups: 45-

50 years (10%), 50-65 years (36%), 65-75 years (24%), and 75-80 years (20%). The most common occupations included laborers (32%), housewives (22%), farmers (20%), and small-scale traders (18%), with the majority residing in rural areas (55%). Over four-fifths of the respondents possessed poverty identification cards, indicating their lower socioeconomic status.

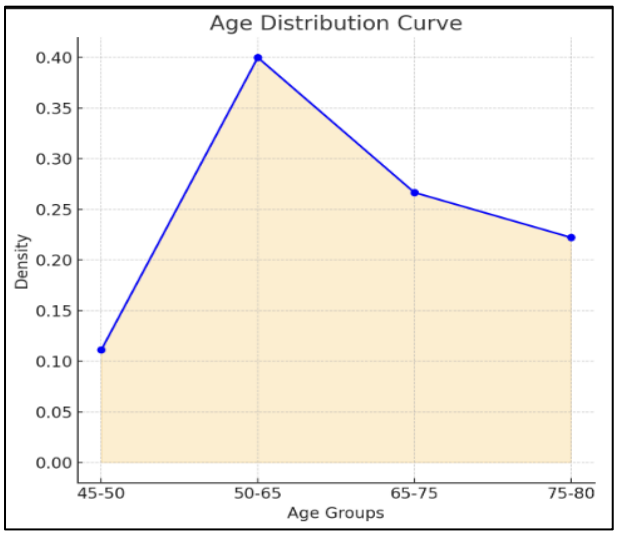

Figure 1: Age distribution of the patients.

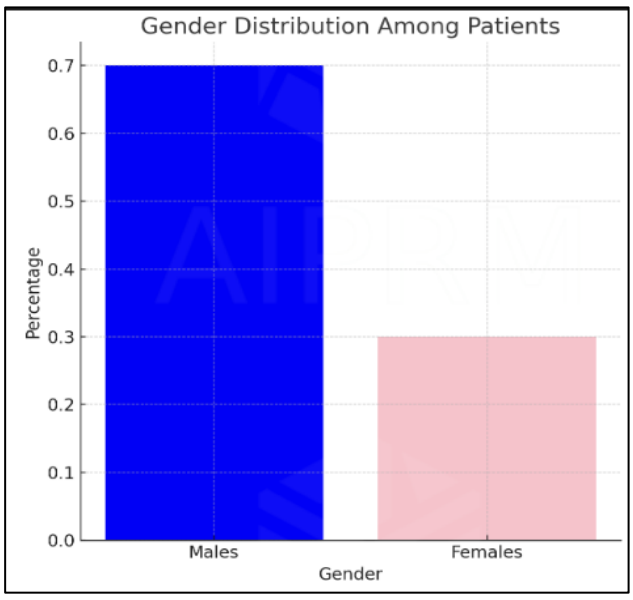

Figure 2: Gender distribution among the patients.

The pie chart depicting the status of anemia among the 150 respondents showed that the majority (88%) of them were anemic. Of the anemic patients, most (67%) had mild anemia, while 12% had moderate anemia. Severe anemia was present in 4% of respondents only. The slight decrease in the overall percentage of anemic patients and the adjusted distribution of anemia severity reflect the larger sample size and the natural variability in health status among a more diverse group of participants.

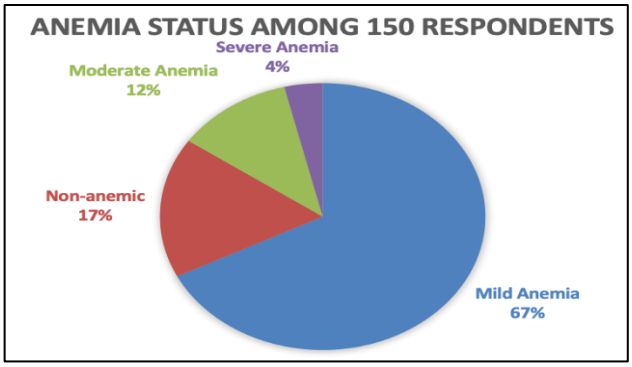

Figure 3: Status of anemia in respondents.

Table 1: Demographic details of the respondents (n=150).

Variables	N (%)
Sex	
Male	105 (70)
Female	45 (30)
Age group (in years)	
45-50	15 (10)
50-65	54 (36)
65-75	36 (24)
75-80	30 (20)
Occupation	
Laborer	48 (32)
Housewife	33 (22)
Farmer	30 (20)
Small-scale trader	27 (18)
Others	12 (8)
Residence	
Rural	83 (55)
Urban	67 (45)
Possession of poverty identification card (BPL)	
Yes	120 (80)
No	30 (20)
Diet	
Vegetarian	119 (79)
Mixed	31 (21)
Total	150

The classification of anemia across different age brackets revealed that mild anemia was most prevalent across all age groups. The 50-65 years age group reported the highest frequency of mild anemia cases (38 out of 54). For moderate anemia, the 65-75 years group had the maximum number of cases (8 out of 36), followed by 50-65 years (6 out of 54). The highest number of severe anemia cases belonged to the 50-65 years category (2 out of 54). Absence of anemia was highest among the younger 45-50 years group (3 out of 15), followed by the oldest 75-80 years group (1 out of 30). Mild anemia predominated across all ages with severity being higher in the 50-65 years group among this sample of AMI patients.

Table 2: Classification of anemia in patients according to age groups.

Variables	Mild	Moderate	Severe	Absent	Total
Age group (in years)					
45-50	10	2	0	3	15
50-65	38	6	2	8	54
65-75	26	8	1	1	36
75-80	26	2	1	1	30
Gender					
Male	88	6	3	8	105
Female	12	12	1	20	45
Diet					
Vegetarian	102	12	3	2	119
Mixed	10	6	1	14	31
Total	100	18	4	28	150

DISCUSSION

We discovered that anemia affected an astounding 81% of patients with AMI. However, 30% of rural boys in northern India were found to be anemic in the Singh et al study.[14] Both the current analysis and the Salisbury et al studies found that anemia was highly prevalent in patients with AMI. According to Salisbury et al, 45.4% of patients had hospital-acquired anemia (HAA).[15]

Comparable to the current study, which discovered that 67% of AMI patients had mild anemia, Farhan et al review numerous other investigations that found anemia to be quite prevalent in ACS situations.[16] For instance, they mentioned that over 40,000 patients with ACS had an overall anemia prevalence of 28% according to Mamas et al.[17]

Both mild and moderate to severe anemia significantly increased mortality rates compared to patients without anemia, according to a study using the MONICA/KORA MI registry.[18] This is consistent with our observation that mild anemia was the most common in all age categories, with the 50-65-year-old age group reporting the highest incidence of instances of mild anemia.

According to a study by Gaskell et al, older people especially those who were hospitalized or lived in nursing homes had a higher prevalence of anemia.[19] This is in line with our discovery that 24% of the cases of anemia were in the 65-75 age group. According to a study conducted in rural India, the prevalence of anemia rose with age, which is consistent with our results showing that the younger 45-50 years old group had the highest absence of anemia.[20]

According to a study by Camaschella, iron deficiency is the most common cause of anemia, and dietary iron consumption can significantly affect iron storage and anemia status.[21] The majority of anemic patients in our study (102 out of 119 vegetarians) had diets that were either deficient in iron-rich food sources or absent from them and these results are similar to the study conducted by Thakur et al in Bhopal.[22] This underscores the importance of dietary counselling and interventions to address nutritional deficiencies in managing anemia among AMI patients.

As it was a cross-sectional design, this study can only provide a snapshot of data at a single point in time, limiting the ability to establish causality or understand changes over time. Additionally, the study's relatively small sample size of 150 patients may limit the generalizability of the findings to a larger, more diverse population. The potential for selection bias also exists, as the study sample may not be fully representative of all AMI patients. Furthermore, reliance on self-reported dietary information could introduce reporting bias and affect the accuracy of the correlation between dietary habits and anemia prevalence. A longitudinal study with a larger and more diverse sample would be more appropriate to establish a causal relationship and provide a more comprehensive understanding of the dynamics between anemia and AMI over time. This approach would help to validate the findings and enhance their applicability to broader patient populations.

CONCLUSION

This study discovered that among patients admitted with AMI, anemia was highly prevalent, mostly of mild severity. Of the patients, an alarming 83% had anemia, of which 67% had mild anemia. Anemia was more common in some patient groupings, such as middle-aged and female patients. The 50-65 years age group reported the highest frequency of anemia cases, highlighting the vulnerability of this demographic. Additionally, there was a significant prevalence of anemia among vegetarians, indicating a possible correlation between anemia and low dietary iron intake. The cross-sectional design of the study posed limitations, but the results underscore the importance of identifying individuals at risk and assessing anemia in AMI admissions. Counselling sessions were successful in increasing knowledge about the

management of anemia. The findings of this study highlight the necessity for targeted interventions and dietary modifications to manage and prevent anemia in AMI patients, ultimately improving patient outcomes and quality of life. This study was instrumental in raising awareness and guiding clinical practices to address this critical health issue.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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