

ORIGINAL ARTICLE

Frequency of Anemia among the Patients Presented with Myocardial Infarction at a Tertiary Care Hospital of Karachi, Pakistan

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ABSTRACT

Objective: To determine the frequency of anemia among the patients presented with myocardial infarction (MI) at a tertiary care hospital of Karachi, Pakistan.

Study Design: A cross-sectional study.

Place and Duration: Adult Cardiology Department of National Institute of Cardiovascular Disease (NICVD), Karachi from February 2022 to July 2022.

Methodology: A total of 253 patients diagnosed with MI were included. Demographic and clinical characteristics of the patients were recorded. Hemoglobin level was obtained at the time of admission.

Results: In a total of 253 patients, the mean age was 54.36 ± 8.21 years. There were 187 (73.9%) male and 66 (26.1%) female. Frequency of anemia among the patients presented with myocardial infarction was found to be in 72 (28.5%). Frequency of anemia among patients presenting with MI was noted.

Practical Implications: Anemia in myocardial infarction patients has affected the patency of vessel so this single most essentially and easily treatable component should be corrected in these patients..

Conclusion: High prevalence of anemia in patients presenting with MI was noted.

Keywords: Anemia, hemoglobin, ischemic heart disease, myocardial infarction.

INTRODUCTION

Anemia is an important risk factor to further damage the myocardium in an ischemic insult as the blood being supplied to the compromised myocardium is deficient of oxygen.¹ The oxygen requirement of the myocardium also increases because in order to continue the required supply of the blood to the body, cardiac work load is also increased.² When there is a decrease in hemoglobin (Hb), an increased cardiac output might occur to fulfill the needs of the tissues for their normal metabolism.³ That is why cardiac output is increased causing further damage to the myocardium.²

According to the modern literature, anemia develops when in the blood the mass of red blood cell (RBC) is reduced and the establishment of the diagnosis comes through expedient gender-specific thresholds, as illustrated by the WHO, i.e., for males Hb level $<13\text{g/dl}$ and for females $<12\text{g/dl}$.⁴ The Hb is a carrier of oxygen within blood, no matter how much a vessel is patent, if the carrier is in deficit, the supply of this essential component for energy is compromised, leading to verge of severe consequences. Hence, in the presence of any occlusion of vessel due to already progressive comorbid, this supply demand worsens much more and may cause death of the tissue or organ.

In a recent work by Lee WC and colleagues, they concluded "Anemia is a marker of an increased risk in one-year cardiovascular mortality in patients with ST-segment elevation myocardial infarction (STEMI). If the patients have comorbidities such as hypertension, or CKD, the effect of anemia is very significant".³ Similarly, an another study by Fariba F et al⁵ showed that in between two group of patients presented with myocardial infarction (MI), deceased and survived, statistics confirmed that anemia was significantly prevalent among the individuals of 1st group. Jomaa W et al⁶ revealed that among in-patients presenting STEMI higher rate of mortality was observed in patients with anemia. Mamas et al⁷ performed a study to establish an association of anemia to mortality, in a group of patients presenting acute coronary syndrome (ACS), and found anemia to be significantly prevalent in the ACS group. Older individuals present with anemia more frequently accompanied by other morbidities while measuring the outcomes, anemia is an independent predictor.⁷ A study conducted by Shiraishi et al described that in 25.8% of STEMI patients had anemia.⁸ Lee et al³ from Taiwan reported the frequency of anemia in patients with STEMI as 20.7%.

Jomaa W et al⁹ mentioned 36.6% prevalence of anemia based on retrospective data derived from STEMI registry of Tunisia. In a study by Sulaiman K et al¹⁰ based on "Middle Eastern Gulf RACE II registry" the prevalence of anemia in ACS patients was 28%.

There is paucity of local data on the prevalence of anemia among MI patients in Pakistan. Based on past studies, the frequency varies from one part of the world to other.⁹⁻¹⁰ The results derived from the local population may have dissimilarities as compared to the results presented by rest of the world because, our people have different lifestyles, different prevalence of diseases, different socioeconomic positions, and different prevalence of anemia. It looks worthy estimating the frequency of anemia in MI patient regardless of any comorbid that has affected the patency of vessel so that this single most essential, easily treatable component would be corrected in the naïve as well as in diseased patient when other comorbid & their progression are difficult to control or stop in order to reduce the burden of disease in our local population. Objective of this study was to determine the frequency of anemia among the patients presented with MI at a tertiary care hospital in Karachi, Pakistan.

METHODOLOGY

This cross-sectional study was conducted at The Adult Cardiology Department of "National Institute of Cardiovascular Disease (NICVD)", Karachi from February 2022 to July 2022. Approval from "Institutional Ethical Committee" was acquired. Informed and written consents were sought from all study participants. Taking the frequency of anemia as 20.7%,³ confidence interval at 95% and margin of error at 5%, the sample size was calculated to be 253.

Demographical data and clinical characteristics of the patients were recorded at the time of presentation such as age (years), weight (kg), height (cm), BMI (kg/m^2), gender, smoking status, diabetic mellitus, family history, obesity, and hypertension. The MI was labeled with either STEMI or non STEMI (NSTEMI). The STEMI was labeled in patient with any two of the following criteria; Typical chest pain >20 minutes (retrosternal pain with radiation to left arm or shoulder, aggravates on exertion or emotional stress, relieved with rest or nitroglycerin); new ST elevation in at least two contiguous leads $>2\text{mm}$ in men or $>1\text{mm}$ in women in leads V2 to V3 and/or of $>1\text{mm}$ in other contiguous chest leads or limb leads. The NSTEMI was diagnosed as; Typical

chest pain lasting >20 minutes; ECG at presentation showing ST depression ($\geq 0.5\text{mm}$ at the J point in two or more contiguous leads), transient ST elevation ($>2\text{mm}$ in men or $>1\text{mm}$ in women in leads V2 to V3 and/or of $>1\text{mm}$ in other contiguous chest leads or limb leads), and/or prominent T-wave inversions at least 1 mm deep; the typical raise of HSC troponin I one value above the upper limit of normal range (for male: 0-0.0342 ng/ml and for female: 0-0.157ng/ml). Smoking was labeled as "Yes" if patient currently or had history of smoking 10 or more cigarettes per day for at least 5 years or 5 or more cigarettes per day for at least 10 years otherwise was labeled as "No". Diabetic mellitus (DM) was labeled as "Yes" if patient had documented history of DM and on anti-diabetic medication for at least 6 months otherwise was labeled as "No". Hypertension (HTN) was labeled as "Yes" if patient has documented history of HTN and on anti-hypertensive medication for at least 6 months otherwise was labeled as "No". Obesity was labeled as "Yes" if the patient had body mass index (BMI) $> 27.5 \text{ kg/m}^2$ otherwise was labeled as "No". At the time of admission, hemoglobin levels were measured and if less than 13 g/dL for men and less than 12 g/dL for women, it was labeled as anemia or no if otherwise.

Data was entered and analyzed using "Statistical Package for Social Sciences (SPSS)" version-26.0. Frequency and percentages were determined for categorical data. For quantitative variables, mean and standard deviation (SD) were calculated. Effect modifiers were controlled through stratification. Post stratification, chi-square test or fisher exact test was applied. Two sided p-value of ≤ 0.05 was taken as significant.

RESULTS

In a total of 253 patients, the mean age was 54.36 ± 8.21 years. There were 187 (73.9%) male and 66 (26.1%) female patients. There were 127 (50.2%) patients who were obese whereas 123 (48.6%) were smokers. There were 162 (64.0%) patients who had diabetes and 176 (69.6%) had hypertension. Family history of MI was recorded in 82 (32.4%) patients. Baseline characteristics of patients are shown in table 1 and 2.

Table-1: Baseline characteristics of Patients with Myocardial Infarction (n=253)

Characteristics	Number (%)
Gender	Male 187 (73.9%)
	Female 66 (26.1%)
Age Groups (years)	≤ 40 21 (8.3%)
	41-50 53 (21.0%)
	51-60 127 (50.2%)
	>60 52 (20.6%)
Obesity	127 (50.2%)
Smokers	123 (48.6%)
Diabetes Mellitus	162 (64.0%)
Hypertension	176 (70.0%)
Family History	82 (32.4%)

Table-2: Quantitative (continuous) Characteristics of the Patients with Myocardial Infarction (n=253)

Variables	Mean (SD)	Median (Interquartile Range)	Minimum	Maximum
Age (years)	54.36 ± 8.21	55 (10)	31	70
Height (cm)	154.42 ± 5.43	154 (9)	142	167
Weight (kg)	66.57 ± 11.04	68 (15)	41	95
BMI (kg/m^2)	27.87 ± 4.21	27 (6.3)	19.8	39.7
Hemoglobin (g/dl)	12.973 ± 1.92	13 (2.5)	8.5	15.6

Frequency of anemia among the patients presenting with MI was noted in 72 (28.5%) patients. Rate of anemia among the patients presented with MI was significantly high in below and equal to 40 years of age ($p=0.003$). Rate of anemia was also not statistically significant with respect to gender, obese cases, smoker, and diabetic and hypertensive patients ($p>0.05$). Rate of

anemia among the patients presented with MI was significantly high in those cases who had family history of MI (37.8% vs. 28.2%; $p=0.020$). Table 3 is showing frequency of anemia among the patients presented with MI with respect to study variables.

Table-3: Frequency of Anemia among the Patients Presented with Myocardial Infarction with respect to study variables

Study Variables	Anemia		
	Yes (n=72)	No (n=181)	
Gender	Male 52 (72.2%)	135 (74.6%)	0.699
	Female 20 (27.8%)	46 (25.4%)	
Age Groups (years)	≤ 40 13 (18.1%)	8 (4.4%)	0.003
	41-50 11 (15.3%)	42 (23.2%)	
	51-60 36 (50.0%)	91 (50.3%)	
	>60 12 (16.7%)	40 (22.1%)	
Obesity	39 (54.2%)	88 (48.6%)	0.426
Smokers	41 (56.9%)	82 (45.3%)	0.095
Diabetes Mellitus	42 (58.3%)	115 (63.5%)	0.794
Hypertension	54 (75.0%)	122 (47.4%)	0.236
Family History	31 (43.1%)	51 (28.2%)	0.020

DISCUSSION

The etiology of non-communicable diseases (NCDs) is based on multiple causative factors having 70% contribution to mortality all over the world. Cardiovascular diseases are the major contributing part to these deaths (17.7 million individuals every year) next to come cancers (8.8 million), respiratory illnesses (3.9 million) and DM (1.6 million).¹¹ Anemia is reported to be significantly more prevalent among patients presenting acute myocardial infarction (AMI), and hanging to the definition and features of the patients, the frequency diverges between 6.4% and 43%.^{12,13}

In this study, there were 73.9% male and 26.1% females while 50.2% patients were obese and 48.6% were smokers. There were 64.0% patients who had diabetes and 69.6% were having hypertension. It was also by some other researchers that in males, CAD was more frequent.¹⁴ We also found comparable risk factors during our research. In a demographical survey, Jafar et al¹⁵ found that IHD was equally prevalent among males and females (in males 26.9% and in females 30%, $p=0.12$). An Indian retrospective study¹⁶ presented parallel findings that extensive smoking, hypertension and diabetes mellitus were the most frequent risk-factors for MI.

In our study, majority of the individuals were aged more than 50 years and their mean age was 54.36 ± 8.21 years whereas aging more than 60 years were just 20.5%. In USA, according to the COURAGE trial,¹⁷ 62 ± 5 was the mean age and male gender was found to be predominant (85%). Comparing smoking as risk factors, it was considerably lower than our findings i.e., 29% vs. 48.62%. A study¹⁸ reported comparative results for ACS between South Asian and Western population as they found Asians presenting ACS to be younger than westerners for almost 10 years. Our study revealed that the patients with less than 40 years of age were only 8.3%. Another study from India reported that contributors of age less than 40 years were 19.2%. Even though the individuals of their study were hard working with less weight, smoking came out to be the risk factor observed most frequently. It establishes the belief that among South Asian population, AMI cases are relatively younger.

In our study, we observed that among MI patients, anemia was 28.5% prevalent. Patel found in their study that anemia was 40.4% prevalent in the patients presenting MI.²⁰ According to the findings of another research in MI patients, the frequency of anemia was 23% and they also suggested that anemia of such patients should be addressed on the serious note.²¹ Al Falluji et al²² from New Jersey evaluated from an American registry that the frequency of anemia was 10.2%.²³

CONCLUSION

High prevalence of anemia in patients presenting with myocardial infarction was noted. Anemia in myocardial infarction patients has

affected the patency of vessel so this single most essentially and easily treatable component should be corrected in these patients.

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