

Frequency of Anemia in Patients with Acute Coronary Syndrome

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ABSTRACT

Introduction: The WHO defines anemia as a condition wherein the hemoglobin level falls below 13 grams per liter in males and 12 grams per liter in females. It is a process that involves supplying the body with oxygen, and it is relevant for the management of acute coronary syndrome. The prevalence of this condition is highly variable globally, and it has been observed in around 10 to 58% of all cases. This study was conducted to evaluate the frequency of this condition in patients with ACS.

Methodology: The research was conducted between December 1, 2020, and May 31, 2021, at the Punjab Institute of Cardiology in Lahore. Men and women between the ages of 30 and 70 who presented with ACS were included in the study. Patients with end-stage liver disease, malignancy, or anemia due to any other cause i.e. aplastic anemia, hemolytic anemia, or anemia of chronic disease were excluded. Detailed clinical and socio-demographic information was collected in age, gender, weight, height, body mass index (BMI), smoking, diabetes mellitus, hypertension, and dyslipidemia recorded on a predesigned proforma. Then 5 ml of venous sample was drawn for each case and their hemoglobin level was assessed by using Certeza HB-101 (Germany) machine and anemia was labeled.

Results: Participants' ages from 30 to 70 years old, with the mean age being 55.9. Seventy-two percent of the patients were between the ages of 51 and 70. The gender breakdown of the 76 patients was 58 men (76.32%) and 18 girls (23.68%). Twenty-two individuals (28.95%) were discovered to have anemia with their Acute Coronary Syndrome.

Practical Implication: The advice that high-risk individuals with acute coronary syndrome be screened for anemia and treated promptly if they are found to have the condition.

Conclusion: This study concluded that there is high frequency of anemia in patients with acute coronary syndrome.

Keywords: Acute Coronary Syndrome, Anemia, Mortality, Coronary artery disease,

INTRODUCTION

The main symptom is chest pain. However, acute coronary syndrome (ACS) is only diagnosed in a small percentage of cases of chest discomfort. In patients with underlying ACS, this leads to frequent inappropriate discharge and significant delay in treatment. Coronary artery disease (CAD) is a serious health problem, and major risk factors make up a substantial part of it. Symptoms of unstable angina (UA), non-ST-segment elevation myocardial infarction (NSTEMI), and ST-segment elevation myocardial infarction (STEMI) are part of the spectrum of conditions that make up acute coronary syndrome (ACS).¹⁻²

Acute ischemia is caused by the blockage of the coronary arteries by plaque due to process of atherosclerosis. This can be influenced by several coronary risk factors such as high cholesterol, high blood pressure, diabetes, and smoking. Mortality and morbidity can be influenced by diagnosing and treatment of ACS, which is a typical symptom of cardiovascular disease. Heart disease is predicted to overtake cancer as the leading cause of death worldwide by 2020. Coronary artery disease strikes at an unusually young age in Pakistan, despite the country's location in Southern Asia.²⁻⁴

It may take some time for the usual ways to evaluate ACS, such as electrocardiography and serological markers of infarct, to become apparent. To accurately assess diastolic function and filling pressures using echocardiography, the data collecting process must be thorough, and the operating technician must interpret the result correctly. Indicators of impaired ventricular relaxation include a decrease in the amplitude of early and late diastolic filling, a lengthening of the deceleration time of early diastolic filling, or a lengthening of the iso-volumetric relaxation time.^{1,3}

Risk factors for coronary heart disease include both those that can be changed and those that cannot. Risk factors are diabetes mellitus (DM), high blood pressure (HTN), smoking, previous heart disease, hyperuricemia, advanced age, homocystinuria, and male. There are still many that may add additional risk and may also affect the outcome, and anemia is one of them.³

The data confirm the importance of hemoglobin in ACS, as the function of hemoglobin is to ensure an adequate supply of oxygen to body tissues, including myocardial cells. Prevalence is highly variable worldwide and has been observed in 10 to 58% of cases.⁵⁻⁷ According to a study by Yazji K et al, anemia was observed in 26.9% of cases with ACS.⁷

Acute coronary syndrome is a highly lethal entity and anemia is one of the important underestimated factors. It is also seen to be more common in less developed countries. There is very scarce data on its prevalence and all studies have been conducted in the Western world. This study was planned to quantify the data of such cases so that the association of anemia as a risk factor can be seen and improvements can be made to prevent it in the future.

METHODOLOGY

The study, which was conducted from December 2020 to May 2021 at the Punjab Institute of Cardiology, Lahore, enrolled patients aged 30 to 70 years of both sexes who had ACS. Exclusion criteria were cases with end-stage liver failure, i.e. ALT and AST > 2 times their normal limit which is 40 IU/L (as per medical record), cases with documented anemia from any other cause, i.e. aplastic anemia, hemolytic anemia, anemia of chronic disease (assessed by history and medical record) and cases with known malignancy (assessed by history and medical record).

The sample size was calculated as 76 by keeping a confidence interval equal to 95% and a margin of error equal to 10% and a prevalence of anemia as 26.9% in previous studies.⁷ An Informed written consent for data collection was taken from each subject. and included in the study by ensuring data confidentiality. Detailed clinical and sociodemographic information was collected in the form of age, gender, weight, height, body mass index (BMI), tobacco smoking, hypertension, diabetes mellitus and dyslipidemia recorded on a pre-designed form.

After that, a 5 ml venous sample was collected for each case and the hemoglobin level was determined using a Certeza HB-101 (Germany) and anemia was labeled according to the operational definition. Non-ST-segment elevation myocardial infarction, ST-segment elevation myocardial infarction and unstable angina are

part of a spectrum of clinical manifestations known as acute coronary syndrome (ACS). ACS was scored as "yes" if both were present; Chest pain greater than 3/10 on a visual analog scale that is crushing in nature and in the center of the chest, lasting any length of time, and ECG changes in the form of ST segment elevation or depression of at least 1 mm or T wave inversion in at least 2 consecutive leads.

Hemoglobin levels below 13 g/dL in males and 12 g/dL in females were considered indicative of anemia. SPSS version 23.0 was used for data analysis. Age and body mass index (BMI) were among the quantitative variables reported as means and standard deviations. Sex, diabetes mellitus, hypertension, smoking, dyslipidemia, and frequency and percentage of anemia were determined. To examine the effect of potential confounders on the outcome variable, we used a post stratification chi-square test after controlling for age, sex, BMI, diabetes mellitus, hypertension, dyslipidemia, and smoking.

RESULTS

Participants' ages from 30 to 70 years old, with the mean age being 55.9 years. 72 percent of the patients were between the ages of 51 and 70. There were a total of 76 patients, 58 (76.3% men) and 18 (23.7% women). Their average body mass index was 30,383.33 kg/m². Anemia was observed in 22 (28.9%) of our patients with acute coronary syndrome. In the tables below, we see how anemia varies by age, sex, body mass index, hypertension, diabetes, tobacco smoking as well as lipid profile.

Table-1: Frequency distribution of demographic variables

Gender	Frequency	Percent
Male	58	76.3
Female	18	23.7
Age groups		
30-50 years	21	27.6
51-70 years	55	72.4
BMI		
≤30 kg/m ²	35	46.1
>30 kg/m ²	41	53.9
Diabetes		
Yes	46	60.5
No	30	39.5
Hypertension		
Yes	45	59.2
No	31	40.8
Smoking		
Yes	26	34.2
No	50	65.8
Dyslipidemia		
Yes	46	60.5
No	30	39.5
Anemia		
Yes	22	28.9
No	54	71.1

Table-2: Stratification of anemia with respect to different variables

Variables		Anemia		p-value
		Yes	No	
Age groups	30-50 years	6	15	0.964
	51-70 years	16	39	
Gender	Male	16	42	0.051
	Female	6	12	
BMI	≤30 kg/m ²	10	25	0.947
	>30 kg/m ²	12	29	
Diabetes	Yes	14	32	0.723
	No	8	22	
Hypertension	Yes	14	31	0.616
	No	8	23	
Smoking	Yes	5	17	0.178
	No	21	33	
Dyslipidemia	Yes	11	35	0.231
	No	11	19	

DISCUSSION

Cardiovascular disease (CVD) now accounts for 17.3 million deaths annually worldwide and is projected to increase to approximately 23.6 million by 2030. Acute coronary syndrome (ACS) includes ST-elevation myocardial infarction (STEMI), non-ST-elevation myocardial infarction (NSTEMI) as well as unstable angina and is the leading cause of death and disability from cardiovascular disease (CVD). It is often overlooked that a growing number of developing countries contribute to the global burden of CVD.⁸⁻¹³ In countries such as Pakistan, where 55% of women aged 15 to 49 years are anemic and 24% of men aged 15 to 49 are anemic, nutritional anemia is a major contributor to the disease.¹⁴

Coexisting anemia is a common complication of ACS that significantly increases cardiovascular morbidity and mortality. While the heart's initial response to anemia may be a beneficial adaptation, the structural changes that occur in the heart as a result of anemia may ultimately increase susceptibility to cardiovascular disease. It is well known that anemia can impair myocardial oxygenation leading to or precipitate angina attacks and that it can worsen congestive heart failure (CHF) in individuals with pre-existing cardiovascular disease. Mortality and morbidity are also higher in patients undergoing cardiac surgery or percutaneous intervention.¹⁵

On the other hand, a significant part of these findings comes from retrospective evaluations of certain studies.²³⁻²⁵ The purpose of this research was to quantify the prevalence of anemia in patients diagnosed with acute coronary syndrome. The mean age of the participants in this research was 55.9 years, with an age range from 30 to 70 years. 72 percent of the patients were between the ages of 51 and 70. Among the patients, 76.3% were men and 23.7% were women. total. In our analysis, 28.9% of patients with ACS also had anemia. According to a study by Yazji K et al, anemia was observed in 26.9% of cases with ACS.7 Some studies show that 15 to 43 percent of individuals with ACS had anemia at hospital admission.26 Previous research by Bindra et al. in the UK, Arant et al. in the USA Anker et al. in Europe and Sulaiman et al. in the Middle East, respective prevalence rates of 18%, 21%, 28%, and 28% were found for anemia.¹⁶

This variation is due to a combination of variables, including Hb disease and dietary deficiencies that only affect certain groups. Anemia is undoubtedly associated with worse outcome in individuals with MI, both before and after hospitalization. A 2012-2013 study conducted at Hamadan Ekbatan Hospital found that 19.1% of 320 MI patients had anemia with a subsequent mortality rate of 83.6%. Despite its high incidence and prevalence, anemia is often undertreated, particularly in advanced age people with comorbidities.¹⁷⁻¹⁹

One quarter of individuals with ACS in a retrospective cohort study of 422,855 UK patients with anemia. These individuals also had an increased risk of poor hospital outcomes if they were anemic. It is widely known that anemia affects many different bodily functions. The heart, like all other organs, requires oxygenated blood. Approximately 4-6% of the cardiac output is used for its own function. Cardiac output multiplied by arterial oxygen content is a measure of oxygen delivery to tissues. Reduced oxygen delivery to tissues is thus determined by low hemoglobin concentration (leading to hypoxia), low stroke volume (leading to stagnant hypoxia) or decreased saturation of hemoglobin (leading to hypoxic hypoxia).¹⁹⁻²⁰

For a median of 4.2 years, Colombo et al. monitored 2,011 people who had an acute myocardial infarction (MI). Anemic patients with acute MI were compared with those without using Kaplan-Meier plots and log-rank testing to determine who would have a better chance of survival. After doing the first round of unadjusted statistics, the researchers went back and took into account things like gender, age, body mass index, tobacco smoking, angina episodes or diabetes, acute myocardial infarction subtype, left ventricular fractional shortening as well as ejection fraction and renal function estimated with glomerular filtration rate. Anemia was associated with a statistically significant increase in

all-cause mortality; this association was reduced after multivariate analysis but remained statistically significant.²⁰

Hospital outcomes in 1,919 patients with STEMI were studied by Moghaddam et al., of whom 322 had anemia. Hospital stay ($p = 0.001$), cardiac arrest ($p = 0.022$), cardiac failure ($p = 0.003$) and cardiogenic shock ($p = 0.001$) were all statistically significant outcomes. After accounting for multivariate factors including infarction, location, and timing of reperfusion, each of which may individually influence morbidity and death rate, the researcher could not establish any relationship between decreased hemoglobin levels and mortality rates, although their first study found an increase in all-cause death rates in these individuals. . They found that anemia may serve as a signal of increased mortality in people with ACS, although it is uncertain whether anemia actually increases mortality.

CONCLUSION

Patients with acute coronary syndrome were shown to have a significant prevalence of anemia, according to this study. Therefore, we advise that high-risk individuals with acute coronary syndrome be screened for anemia and treated promptly if they are found to have the condition.

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