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Original Research Article

FREQUENCY OF 30 DAYS MORTALITY IN PATIENTS OF ST-SEGMENT ELEVATION MI WITH VARYING HEMATOCRIT LEVELS

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Abstract: *A descriptive study was carried out in the Emergency Department of Punjab Institute of Cardiology, Lahore, from Oct 2022-April 2023 to assess the incidence of 30 days mortality in STEMI patients with varying hematocrit levels. A total of 440 cases with ST-segment elevation MI with varying hematocrit levels (anemia and erythrocytosis) were included in the study. In our study, the average age was 44.12+10.16 years, 273 (62%) were male, and 167 (37.9%) were females; frequency of different hematocrit levels was recorded, which showed that 263 (59.7%) had anemia and 177 (40.2%) had erythrocytosis. Out of 263 cases of anemia, 26 (9.8%) and out of 177 cases of erythrocytosis, 11 (6.2%) were recorded with mortality, while the remaining 237 (90.8%) cases of anemia and 166 (94.3%) of erythrocytosis had no mortality, the p-value was calculated as 0.17 which shows the insignificant difference between the two groups. We concluded that the frequency of 30 days mortality in STEMI patients is higher in anemic patients than in erythrocytosis, but hematocrit levels could be used as a biomarker for mortality in STEMI.*

Keywords: ST-Segment Elevation MI, Varying Hematocrit Levels, Mortality, 30 Days

Introduction

Cardiovascular diseases are the greatest scourge affecting the human population. They have the second-highest rate of mortality globally. Today it accounts for about 30% of deaths (Timmis et al., 2020). More than 17 million mortalities are recorded annually, mainly of individuals with coronary artery disease and stroke (Wall et al., 2018).

Acute coronary syndrome (ACS) consists of a range of co-morbidities caused by reduced blood flow to the heart. These conditions include ST elevation myocardial infarction, unstable angina, and non-ST elevation myocardial infarction (Parra-Reyna et al., 2022). The acute coronary syndrome is responsible for approximately 9.4% of hospital mortality (2.9% for NSTEMI and 6.5% for STEMI) (Saito et al., 2018). It is mainly manifested by STEMI, which results in one or more coronary artery occlusions, ultimately resulting in cardiac injury and necrosis (Ali and Ahmad, 2016).

Anemia poses a high risk of morbidity in the general population (Gardner and Kassebaum, 2020). In ACS patients, anemia at admission is a prevalent co-morbidity, and admission hemoglobin is inverse to the incidence of adverse events (Bellwald et al., 2018). Anemia in ACS patients is an independent risk factor for high mortality risk (Guedeney et al., 2019).

Hematocrit level is an independent mortality risk factor in ACS patients (Stepien et al., 2019). Kunnas T et al. evaluated the association between hematocrit and Coronary heart disease mortality in men aged 55 yrs. The patients were categorized into patients with HCT of more than 50% and patients with HCT of less than 50%. It was reported that men having HCT > 50 % were at 2.4 folds higher risk of mortality from coronary heart disease than men with HCT <50% (Kunnas et al., 2009). C.M. Seshadri et al. demonstrated that individuals with HCT <25% had a considerably low risk of mortality than patients with an HCT of 39.0%- 47% (Mudumbai et al., 2011).

There is scarce research on hematocrit levels and clinical outcomes of STEMI patients. Only Green Berg G at el. Have previously described the association of hematocrit levels with 30 days mortality in STEMI patients.

In a study by Greenberg G et al., STEMI patients with anemia and erythrocytosis were analyzed. 30 days mortality rates among these groups were 7.3% and 4.8%, respectively. Only a 2.2% mortality rate was observed in normal patients. (Greenberg et al., 2010). Hematocrit level is inexpensive and readily available everywhere. It would be a cost-effective study and help us know whether hematocrit levels can be used to detect patients with a higher mortality risk. So, a

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prompt and aggressive approach should be advocated among those patients. This study assessed the incidence of 30 days mortality in STEMI patients with varying hematocrit levels.

Methodology

A descriptive study was conducted in the Emergency Department of Punjab Institute of Cardiology, Lahore, from Oct 2022 to April 2023. A total of 440 cases with ST-segment elevation MI with varying hematocrit levels (anemia and erythrocytosis) were included in the study. Patients having a previous history of myocardial infarction, patients who had already been treated at some other hospital or medical ward and then shifted to Emergency Department, patients in whom thrombolytic therapy had been administered, critically sick patients (on cardiac or ventilator support), patients already on Iron therapy, patients with the hematological disorder, Liver disorder, renal disorder, Malignancy, COPD, CHD were excluded from the study.

Demographic history was taken. The research procedure was explained to the patients, and informed consent was taken. Approximately 5cc venous blood sample was drawn from every patient, which was sent to the pathology department where the hematocrit value was evaluated by a pathologist with 5 years of experience. The hematocrit level was determined in each patient. The patients were divided into two categories: anemia (<36% for women and <39% for men) and erythrocytosis (>46% for women and >47% for men). All the patients were followed up for 30 days to observe if there was any mortality in each group.

All the data was evaluated by SPSS version 16. The qualitative data like gender, anemia, erythrocytosis, and mortality were presented as frequency, percentages, and graphs. Mean, and standard deviation was employed to present quantitative data like age. The chi-Square test was performed to compare the mortality rate in both groups. A probability value equal to or less than 0.05 was considered statistically significant.

Results

Among 440 patients, 154 (35%) were aged 25-40, and 286 (65%) were aged 41-65. The average age was 44.12±10.16 years (Table I). With regards to gender, 273 (62%) patients were males, and 167 (37.9%) patients were females (Table II). The frequency of different hematocrit levels was recorded, showing that 263 (59.7%) had anemia and 177 (40.2%) had erythrocytosis. (Table III).

The frequency of 30 days mortality in STEMI patients with varying hematocrit levels, out of 263 cases of anemia, 26 (9.8%) and out of 177 cases of Erythrocytosis 11 (6.2%) were recorded with mortality while the remaining 237 (90.8%) cases of anemia and 166 (94.3%) of erythrocytosis had no mortality. The difference was insignificant between the two groups. (Table IV)

TABLE I: AGE DISTRIBUTION (n=440)

Age(in years)	No. of patients	%
25-40	154	35
41-65	286	65
Total	**440**	**100**
Mean±SD	**44.12±10.16**	

TABLE II: GENDER DISTRIBUTION (n=440)

Gender	No. of patients	%
Male	273	62
Female	167	37.9
Total	**440**	**100**

TABLE III: FREQUENCY OF DIFFERENT HEMATOCRIT LEVELS (n=440)

Hematocrit levels	No. of patients	%
Anemia	263	59.7
Erythrocytosis	177	40.2
Total	**440**	**100**

TABLE IV: FREQUENCY OF 30 DAYS MORTALITY STEMI PATIENTS WITH VARYING HEMATOCRIT LEVELS (n=440)

30 days mortality	Anemia (n=263)		Erythrocytosis (n=177)	
	No. of patients	%	No. of patients	%

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Yes	26	9.8	11	6.2
No	237	90.8	166	94.3
Total	**263**	**100**	**177**	**100**

Discussion

Anemia is an excellent predictor of poor prognosis in STEMI patients. However, the data regarding the outcome of erythrocytosis in STEMI patients is scarce (Greenberg et al., 2010; Hayıroğlu et al., 2019).
We planned this study with the view that hematocrit level can be used to predict the risk stratification of the patients with higher mortality. Hematocrit level is inexpensive and readily available everywhere. This cost-effective study may help us know that hematocrit levels can be used to detect patients with a higher risk of mortality. So, a prompt and aggressive approach should be advocated among those patients.
In our study, the average age was 44.12±10.16 years, 273 (62%) were male, and 167 (37.9%) were females; frequency of different hematocrit levels was recorded, which showed that 263 (59.7%) had anemia and 177 (40.2%) had erythrocytosis. Frequency of 30 days mortality in patients of ST-segment elevation MI with varying hematocrit levels, out of 263 cases of anemia, 26 (9.8%) and out of 177 cases of Erythrocytosis 11 (6.2%) were recorded with mortality while the remaining 237 (90.8%) cases of anemia and 166 (94.3%) of erythrocytosis had no mortality, the p-value was calculated as 0.17 which shows insignificant difference between the two groups. Our findings comply with the results of Greenberg G et al. (Greenberg et al., 2010).

Saghazadeh and Rezaei showed that a slight degree of preoperative polycythemia was a direct risk factor for 30-day mortality and cardiovascular disorders in patients who had undergone non-cardiac surgery (Saghazadeh and Rezaei, 2016). The study by Rymer and Rao also reported that increased hematocrit levels are significantly associated with the frequency of cardiovascular diseases, especially myocardial infarction and heart disease, and increased mortality risk. (Rymer and Rao, 2018). Recently, Aoki et al. proved that elevated hemoglobin levels were a major predictor contributing to the prognosis of early stent thrombosis after percutaneous coronary intervention in acute coronary syndrome patients (Aoki et al., 2009). These results of the studies and increased 30-day mortality in our study prove that erythrocytosis may contributes to thrombotic–ischemic complications due to elevated coronary vascular resistance (Vischetti et al., 2002).
Though in our study, the rate of mortality was not significantly higher in anemic patients than in patients with erythrocytosis, it may be due to the reason that anemic patients were higher than erythrocytosis, but the number of cases was higher in anemic patients.
The limitation of the current study was that we did not include patients in the normal group. However, we believe that hematocrit levels can be used to predict the risk stratification of patients with higher mortality, as this modality is inexpensive and readily available everywhere.

Conclusion

We concluded that the Frequency of 30 days mortality in Patients with ST-segment elevation MI is higher in anemic patients than in erythrocytosis, but hematocrit levels could be used as a biomarker for mortality in STEMI.

Conflict of interest

The authors declared the absence of a conflict of interest.

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