Original Article

Erythrocyte Sedimentation Rate as A Marker of Prognosis in Patients of Myocardial Infarction

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Abstract

Objective: Frequency of in-hospital mortality of myocardial infarction patients with raised erythrocyte sedimentation rate.

Methods: In this descriptive study, 200 consecutive cases of age 40-60 years with either gender with a definite diagnosis of acute ST-segment elevation myocardial infarction (STEMI) presenting to the medical emergency department were enrolled in the study. ESR sample was taken in all these patients. Data was analyzed in the SPSS version 20.0.

Results: The mean age of patients was 53.01±5.95 years. Out of 200 patients diagnosed with STEMI, 130 (65%) were males while 70 (35%) were female. In patients who died, the mean raised erythrocyte sedimentation rate was found to be 48.47±3.32, while among survival the mean raised erythrocyte sedimentation rate was 45.17±4.12. Mortality was noted in 28 (14%) patients with ST elevation myocardial infarction with raised ESR (>33 mm in 1st hour).

Conclusion: Raised erythrocyte sedimentation rate leads to worse prognosis and increased in-hospital mortality of patients with STEMI.

Key words: Erythrocyte sedimentation rate, Prognosis, Marker, ST elevation myocardial infarction.

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Introduction

Acute myocardial infarction (AMI) or acute coronary syndrome, is a disease in which patients are at a higher risk of long-term cardiovascular mortality and adverse clinical outcome.[1] Chronic inflammatory processes occur as a result of AMI & contributes to pathogenesis and extension of atherosclerosis in acute coronary syndrome.[2] Several inflammatory markers have been studied to predict short- and long-term prognosis of AMI. These include mean platelet volume,[3] platelet-to-lymphocyte ratio,[4] neutrophil count,[5] and C-reactive protein (CRP).[6,7] However prognostic value of the erythrocyte sedimentation rate (ESR) has not been studied that much. Increased ESR in coronary artery disease is useful marker to predict mortality.[8]

ESR is acute phase reactant, very cheap, accurate, and easily available test.[8,9,10] It shows inflammation, infection or malignancy when raised. On the other hand decreased ESR is seen in polycythemia vera. It has also very vital role in the diagnosis of inflammatory as well as in non-inflammatory diseases like acute coronary and syndrome prostate carcinoma.[11] It is of interest that ESR is directly related to atherosclerosis. A small rise in ESR should alert internist and cardiologist to treat coronary artery disease and its possible complications. ESR is an independent predictor of poor outcome & mortality of coronary artery disease.[12]

As ESR is widely available in Pakistan and is routinely used as a nonspecific marker of systemic inflammation, it can be a low cost method to determine prognosis and mortality of STEMI in our population. It has not been studied so far for its prognostic value in ST elevation myocardial infarction in our local population, therefore

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we conducted this study.

Objective

To determine the prognostic value of raised ESR in patients of acute myocardial infarction.

Methods

This was a descriptive study conducted at department of medicine, Mayo Hospital, Lahore for 6 months. 200 patients of ages 40 to 60 years with either gender presenting to emergency department within 12 hours of new onset STEMI symptoms who consented to provide blood sample for ESR were included in study. The sample size was calculated by Non probability consecutive sampling by taking 95% confidence, 5% margin of error with expected population proportion of the in-hospital mortality with raised erythrocyte sedimentation rate (ESR > 33mm in 1st hour) in patients with ST-segment elevation myocardial infarction = 9%.[13]

All patients with anemia (Hemoglobin < 10.5 mg/dl), malignancy, connective tissue disorder, end stage renal disease, valvular heart disease, diabetes mellitus and acute or chronic infections were excluded from the study. STEMI was diagnosed by ST-segment elevation of > 1 mm in two or more chest leads or ≥ 2 mm in two or more adjacent limb leads or the presence of new left bundle branch blocks with typical anginal pain for ≥ 20 minutes. Informed consent was taken from all patients. Under aseptic conditions, a venous blood sample was obtained from all patients at the time of admission at medicine emergency department. ESR was measured by Westergren's technique as mm of sedimentation in first hour. Data was collected in structured questionnaire containing background information like age, sex, ESR Level and in-hospital mortality. Data was analyzed by SPSS version 20. Quantitative variables like age and ESR were expressed as Mean ± standard deviation and raised mortality was expressed in frequency and percentage.

Results

The mean age of patients was 53.01±5.95 years. Among two hundred patients, 130 (65%) were females while 70(35%) were males. 52 (26.0%) patients were hypertensive while 148(74%) were non hypertensive. Similarly 40% (80) patients were smokers while 60%(120) were non smokers.

The minimum and maximum elevated ESR noted in the study was 33 and 52 respectively. The mean elevated ESR of the patients was 45.55±4.17. The mean elevated ESR (> 33mm in 1st hour) was found to be higher in males as compare to females (47.31±3.22 vs. 44.6± 4.32). The patients who died in hospital due to MI, their mean raised ESR was found to be 48.47±3.32 while among survivors the mean elevated ESR was 45.17±4.12.

Mortality was noted in 28 patients (14%) of ST Elevation Myocardial Infarction with elevated ESR while 172 patients with raised ESR survived (82%).Out of 200 patients there were 8 patients in ESR range 33-36 mm/hour, 33 patients were in range 37-40 mm/hour, 16 in range 41-44 mm/hour, 80 in range 45-48mm/hour and 63 in ESR range 49-52 mm/hour. Mortality rate was observed to be more common 23(36.5%) in ESR range 49-52 mm/hour while less common (1 and 4 respectively) found in ESR range 37-40 and 45-48 mm/hour. In ESR range 33-36 and 41-44 mm/hour patients no mortality was noted. P value was significant for mortality in raised ESR patients (p=0.001).
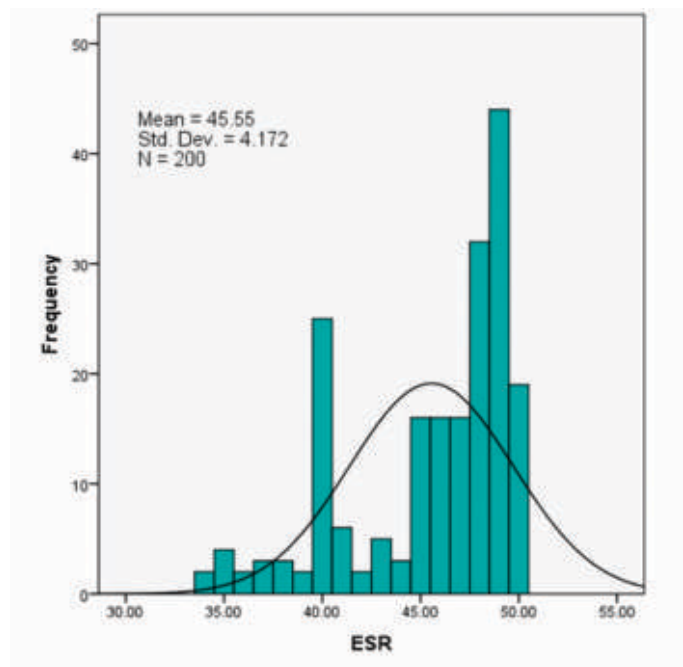
Figure-1: *Graphical Distribution According To The Elevated Erythrocyte Sedimentation Rate In Stemi Patients*

Discussion

In our study it was found that out of 200 patients with raised elevated erythrocyte sedimentation rate (ESR), 28 patients(14%) with ST-segment elevation myocardial infarction died (p=0.001). This shows the significance of ESR as a marker of mortality in MI patients. Our

Table 1: *Descriptive Statistics of the Raised Erythrocyte Sedimentation Rate with Respect to Gender*

Descript.	Gender	N	Mean	Std. Deviation	Std. Error Mean
Raised ESR	Female	130	44.6000	4.32157	.37903
	Male	70	47.3143	3.22824	.38585

Table 2: *Descriptive Statistics of the Raised Erythrocyte Sedimentation Rate With Respect to Mortality*

	Mortality	N	Mean	Std. Deviation	Std. Error Mean
ESR	Yes	28	48.4783	3.32852	.69404
	No	172	44.1695	4.12649	.31017

Table 3: *Descriptive Statistics Of Raised Erythrocyte Sedimentation Rate Groups With Respect To Mortality*

Patients	Esr Range	Mortality Yes	Mortality No	Total	P-value
Raised ESR groups	33-36	0	8(100.0%)	8(100.0%)	0.001
	37-40	1(3.0%)	32(97.0%)	33(100.0%)	
	41-44	0	16(100.0%)	16(100.0%)	
	45-48	4(5.0%)	76(95.0%)	80(100.0%)	
	49-52	23(36.5%)	40(63.5%)	63(100.0%)	
Total		28(14.0%)	172(86.0%)	200(100.0%)	

results are well supported by the previous literature.

Fatih OM et al conducted a study to see the impact of ESR on outcome of the patients and found that in-hospital mortality was more common in raised ESR group 14.0% as compare to decreased ESR group 4% as we have seen in our study.[12]

Another study by Lakshmi AB et al scrutinized that in-hospital mortality of patients with raised erythrocyte sedimentation rate in patients with STEMI was noted but was less common (26.6%) among the study groups as seen in our study results.[14]

Erikssen G et al in their study noted that ESR > 30 mm in first hour was observed to be a strong predictor of STEMI mortality after 23 years age and less so for cardiovascular disease mortality, and insignificant for non-cardiovascular disease mortality (25%, 33.3% and 27.8% respectively). Mortality among CAD having STEMI patients was highest in all erythrocyte sedimentation rate (> 30 mm. H-1) as 28/36 (77.8%) as compare to patients of coronary artery disease without STEMI 7/36(19.4%).[9]

In another study Timmer JR et al demonstrated that there was a significant association found between raised ESR and deaths in acute myocardial infarction as 48%. Erikssen G and Timmer JR studies showed high mortality rate due to the increased ESR in patients with AMI occurs via significantly increased RBCs aggregation.[15]

Another study by Farhana S et al found that there is a significant association between raised ESR level and mortality (raised ESR group 26% compared to the lower ESR group 13%). among IHD.[16]

Mehmet FO et al (2012) investigated that raised ESR is associated with worse prognosis in STEMI, concluded that in-hospital mortality rates were significantly higher in patients with raised ESR (9 % vs. 1 %) as seen in our study.[17]

Since the prevalence and prognostic importance of ESR levels in our study was significant, it also necessitate further confirmation and investigation to explain the clinical usefulness of ESR levels to know mortality in STEMI patients.

Conclusion

Prognostic value of ESR in admitted patients (> 33mm in 1st hour) is a cost effective method to predict prognosis and mortality. Present study concluded that high in-hospital mortality is related with raised erythrocyte sedimentation rate (ESR >33mm in 1st hour) in patients with STEMI (14.0%).

Conflict of Interest: None

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Authors Contribution

S.M: Data Collection & Analysis, Literature Review, Drafting, Manuscript Writing

F.N: Literature Review, Drafting, Manuscript Writing, Revision

S.U.M: Data Collection, Literature Review, Drafting, Manuscript Writing

T.K: Literature Review, Drafting, Manuscript Writing, Analysis

S.I: Literature Review, Statistical Analysis, Drafting, Manuscript Writing, Revision

S.A: Conceptualization of Topic ,literature Review, Revision, Supervision