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PLATELET TO LYMPHOCYTE RATIO AS A MARKER FOR IN-HOSPITAL MORTALITY IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION.

Cardiology

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ABSTRACT

Introduction : Platelet-to-lymphocyte ratio (PLR) is an upcoming haematological inflammatory bio-marker in coronary artery disease. Platelets play the dominant role in development, destabilization, and rupture of the atherosclerotic plaque whereas lymphocytes play a dominant role in chronic inflammation of atherosclerosis. Thus lower lymphocyte count is associated with increased cardiovascular risk and mortality. **Aim:** In this study we aim to evaluate the role of PLR in the prognosis of acute myocardial infarction (AMI), by assessing the relation with in-hospital mortality of the patients. **Material and Methods:** The study included 369 patients admitted with AMI. The study population was divided into two groups based on the 50th percentile value of on admission PLR, i.e. patients with PLR > 132 as High PLR group (N=181) and PLR < 132 as Low PLR group (N=188). The statistical test used was Chi- square test and Point-Biserial Correlation Test. **Results:** Risk factors of coronary artery disease and treatments administered during the in-hospital period were similar between the groups. In-hospital mortality was increased in the high PLR group when compared to the low PLR group (9.70% vs. 2.73 %, $p < 0.05$). $X2 (1, N = 369) = 6.56$, $p < .05$. By Point-Biserial Correlation Test, correlation was found out between mortality and PLR ratio with r value of 0.396 **Conclusion:** This study showed that PLR has significant role in predicting in hospital mortality in patients with AMI. As an easily available and inexpensive inflammatory marker which is readily available with the complete blood count (CBC), PLR seems to be a promising indicator for the prognosis of AMI.

KEYWORDS

Platelet-to-lymphocyte ratio, acute myocardial infarction, in-hospital mortality, acute coronary syndrome

INTRODUCTION

An acute myocardial infarction (AMI) is a subset of a spectrum of acute coronary syndrome (ACS) which includes unstable angina (UA) and AMI with ST segment elevation (STEMI) and non-ST segment elevation (NSTEMI).

Myocardial infarction (MI), is caused by decreased or complete stoppage of blood flow to a portion of the myocardium, when one or more big epicardial coronary arteries are suddenly blocked for longer than 20 to 40 minutes. The occlusion is typically thrombotic and results from rupturing of a plaque in the coronary arteries.

Acute myocardial infarction remains a leading cause of morbidity and mortality worldwide, despite substantial improvements in prognosis over the past decade [(1)]. Scenario of AMI is alarming in our country, 21.4% of diabetic Indians and 11% of non-diabetic Indians are suffering from the illness. Thus a deep understanding of the prediction factors of AMI prognosis can provide important information for disease stratification and clinical treatment of our patients[(2)].

For prognosis of AMI, cardiac troponins, brain natriuretic peptide (BNP), and N-terminal pro–brain natriuretic peptide (NT-proBNP) were proved to have prognostic value in morbidity and mortality of AMI patients with or without heart failure[(3)].

However, there is actually no gold standard prognostic biomarker for AMI [(4)]. Clinical studies are still highly needed to evaluate the factors predicting prognosis of AMI, especially with continuous advances in cardiovascular care [(4)].

Many studies have shown that platelet to lymphocyte ratio is a major independent predictor of in-hospital and long-term outcome in patients with acute myocardial infarction.

PLR is a ratio between the absolute platelet count and the absolute lymphocyte count.The PLR has been used as a systemic inflammatory biomarker to predict the prognosis of neoplastic diseases[(5)-(9)]. In recent years, the PLR has also been used as a prognostic marker in cardiovascular (CV) conditions.

MATERIALS AND METHODS

The present study is a hospital based Prospective Observational Study, conducted in 369 patients of acute myocardial infarction admitted in Department of General Medicine and Department of Cardiology, Silchar Medical College and Hospital in patients of both sexes with a median age of 48(+/-) 24 years, from 1st June 2021 to 31st May 2022.

All the patients with clinical features suggestive of acute myocardial infarction, such as chest pain, dyspnoea, sweating, palpitation, syncope with history of exposure to risk factors or a family history of ACS were assessed. Diagnosis was confirmed by conventional 12 lead ECG, estimation of biomarkers of ACS (eg, CK-MB, Troponin I) together with echocardiography.

Inclusion Criteria

Patients of both gender were eligible if they met the criteria for acute myocardial infarction according to the criteria laid down by 4th Universal definition of myocardial infarction, 2018[(10,1)]i.e. detection of a rise and/or fall in cardiac biomarker values (preferably cTn), with at least one value above the 99th percentile URL and with at least one of the following:1) Symptoms of ischemia. 2) New or presumed new significant ST-segment or T wave (ST-T) changes or new LBBB. 3) Development of pathologic Q waves on the ECG. 4) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality. 5) Identification of an intracoronary thrombus by angiography or autopsy.

Exclusion Criteria

Patients were not eligible if they had anemia with haemoglobin < 11 g/dl, recently received blood transfusion within past 3 months, suffering from haematological malignancy, any patient on previous

therapy for myocardial ischemia, any patient with other debilitating conditions like stroke, sepsis, pneumonia; patient receiving anti-platelet drugs, anticoagulant therapy, immunosuppressants.

Statistical Analysis

All data were analysed using SPSS software version 22.0 (IBM, NY, USA). Results were presented as mean value ± standard deviation for normally distributed continuous numerical variables, and absolute number with percentages for categorical variables. Pearson Chi-square, Mann-Whitney U test were used to identify possible factors affecting in-hospital outcomes. All variables with a p-value of < 0.05 from univariate analysis were subjected to multivariate logistic regression analysis to determine the independent predictors of outcome parameters. A p-value of < 0.05 was considered statistically significant.

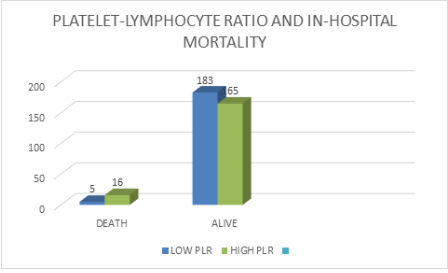
RESULTS

A total of 369 patients participated in the study, out of which 293 were male patients and 76 patients were female.The study population was divided into two groups based on the 50th percentile value of on admission PLR, i.e. patients with PLR > 132.05 as High PLR group (N=181) and PLR < 132.05 as Low PLR group (N=188).

The mortality rate in patients in High PLR group was 9.70% and the mortality rate in patients in Low PLR group was 2.73 %

Table 1 : **Mortality In Patients With Low And High Plr Ratio With Ami**

	DEATH	ALIVE	TOTAL	Chi-square Statistic	p-value
LOW PLR	5	183	188	X^2 (1, N =369) = 6.56	p <.05.
HIGH PLR	16	165	181		
	21	348	369		



Graph 1: Bar Chart Showing Association Between Platelet-lymphocyte Ratio Values And In-hospital Mortality

DISCUSSION

This study shows that platelet-lymphocyte ratio can be used as an independent marker of mortality in acute myocardial infarction. Azab et al. reported that PLR above 170 is an independent predictor of long-term mortality in non-ST-elevated AMI patients [11].

Myocardial infarction generally occurs in the presence of extensive coronary and systemic atherosclerotic plaque, which may serve as the site for the formation of platelet aggregates—a sequence suggested as an early step in the process of coronary thrombosis, coronary occlusion, and subsequent MI. Platelets from patients with myocardial infarction have an increased propensity for aggregation both systemically and locally in the area of disrupted plaque and release vasoactive substances. Platelets play an important role in development, destabilization, and rupture of the atherosclerotic plaque, as well as in formation of circulating arterial platelet–fibrin thrombi at the complicated atherosclerotic plaque[12-14]**.** Gary et al found that increasing platelet volume can change blood viscosity and promote inflammation [15]. Temizet al found that increasing platelet activity was associated with a high incidence of cardiovascular events in hospital[16].These studies indicated that the increase in platelet count was significantly correlated with the occurrence of AMI and poor prognosis.The platelet count is thus associated with increased risk of acute myocardial infarction (AMI) and short and longterm mortality after AMI [17-19].

Lymphocytes are an important part of chronic inflammation in the atherosclerotic process [20]. In case of AMI, lymphocytes infiltrate to the ischemic and reperfused myocardium and express various interleukins (ILs) that play a significant role in transmigration of mononuclear cells and induce the expression of tissue inhibitor of metalloproteinases[21]. Lower lymphocyte count is associated with increased CV risk and mortality in AMI. (20,21). Leukocytosis usually accompanies MI in proportion to the magnitude of the necrotic process, elevated glucocorticoid levels, and possibly inflammation in the coronary arteries. The magnitude of the elevation in leukocyte count is associated with in-hospital mortality after MI. Experimental evidence suggests that the surge in catecholamines after coronary occlusion can mobilize leukocyte progenitors from bone marrow, thereby sustaining the inflammatory response following infarction.

Platelet/lymphocyte ratio (PLR) has been reported as a novel marker of long-term mortality in patients with non-ST-elevated AMI [11].

Limitations

The study was conducted over a sample size of 369 patients and the patients were followed up till their hospital stay only, long term prognosis could not be assessed. Lack of percutaneous interventional therapy in our set-up affected significantly the complication and mortality rates in our study.

CONCLUSION

From our study, we conclude that lymphocyte-to-platelet ratio is strongly associated with patients having poor prognosis after suffering from acute myocardial infarction. We came to this conclusion, as from the study we observe that the patients with higher lymphocyte-to-platelet ratio in acute MI have higher incidence of in-hospital mortality.

Finally, it can be inferred from this study that lymphocyte-to-platelet ratio can be regarded as an inexpensive prognostic marker of prognosis in patients with acute myocardial infarction.

The result of this study is in agreement with other national and international studies. It is hoped that further studies will be done on this easily available, upcoming marker be used as a screening tool to predict the prognosis of a dreaded disease, with high global burden. i.e acute myocardial infarction.

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