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Original Research Paper

Cardiology

LEFT VENTRICULAR DYSFUNCTION ASSESSMENT USING HEMOGRAM - A STUDY OF PLATELET LYMPHOCYTE RATIO IN ACUTE CORONARY SYNDROME IN TERTIARY CARE CENTRE

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ABSTRACT

Introduction – Blood platelet count if high, has been demonstrated as predictor of poor clinical outcome in patients with ST-Elevation Myocardial Infarction (STEMI), which includes left ventricular dysfunction, acute pulmonary edema, heart failure, conduction abnormalities, chances of repeat infarction, hence showing its pivotal role in thrombosis and atherogenesis. Lymphopenia have been associated independently with increased risk of heart failure. Therefore, we want to study effect of Platelet lymphocyte ratio (PLR) on Left ventricular dysfunction in patients of acute coronary syndrome (ACS). **Methods-** This observational study included 100 patients with first episode of ACS, admitted in cardiac intensive unit in MGM medical college from November 2020 to April 2021. Complete blood count (CBC) and left ventricular Ejection Fraction (LVEF) was assessed using 2D Echocardiography. Data was analysed using student t test, chi square and Spearmen correlation. **Results-** 100 patients were divided into three tertile based on PLR, 60% were in Medium tertile (PLR 95-130), 28% in lower tertile (PLR<95) and 12% belonging to higher PLR group (>130). 70% patients had reduced LVEF (<40%) of which 83.5% belong to medium PLR tertile. PLR and LVEF has a negative correlation (p value < 0.001). Lymphopenia was present in patients who belonged to High PLR tertile and also associated with reduced ejection fraction. **Conclusion-** We found association of Platelet Lymphocyte Ratio (PLR) and LVEF of patients, presenting for first time with ACS, with increase in PLR, patient's ejection fraction was reduced. Also lymphocyte count and its relevance as a marker for prognosis in ACS was found, as lymphopenia was directly associated with reduced ejection fraction.

KEYWORDS : Acute coronary syndrome, Left ventricular Dysfunction, Platelet Lymphocyte Ratio

INTRODUCTION:

Heart failure is a frequently encountered detrimental effect of Acute Coronary Syndrome (ACS) and worsens the prognosis of patients with coronary artery disease (CAD). In view of association between ACS and heart failure, it is important to highlight the determinants of heart failure in patients hospitalized with ACS, and the impact of heart failure on its outcomes.[1] The percentage of patients below 45 years suffering from myocardial infarction is reported to be 25-40%.[2] Angiographic studies done in patients of myocardial infarction or unstable angina demonstrate a pivotal role of platelets in the formation of thrombus and subsequent embolisation.[3] There are multiple predictors of poor outcome in myocardial infarction which include cardiac biomarkers (Trop I, Trop T , CK-MB), high sensitivity C Reactive Protein (CRP), leucocyte count (WBC), also platelet counts at presentation of STEMI is now being defined as a prognostic marker. High platelet number in circulation can be associated with increased incidence of poor clinical outcomes in ST-elevation myocardial infarction (STEMI), like left ventricular failure, conduction defects, chances of repeat infarction.[4]

Severity of atherosclerosis can be assessed by high PLR ratio, even when used as an independent factor. Coronary atherosclerosis formation is influenced by number of factors of which inflammatory state is starting point.

Lymphopenia is frequently seen with chronic inflammation owing to mechanism of lymphocyte apoptosis in these conditions. Any form of stress, with increase cortisol in body is capable of shifting bone marrow to increase production of neutrophils with decrease in lymphocyte production. Lymphocytes and neutrophils are responsible for immune activation, but neutrophils host a reaction which involves killing of diseased cell. Low lymphocyte level in blood has also been demonstrated with coronary artery disease and is being used as a prognosis marker, it is also reflects risk of heart failure in these patients.[5]

Therefore there is a need to find readily available and inexpensive measures for assessment and prognostication of acute coronary syndrome such as PLR, in resource limited settings.

MATERIAL AND METHODS:

Study design

It is a cross sectional study conducted in tertiary care centre in Central India, patients who came to emergency department with complains of chest pain or angina equivalents (dyspnea, fatigue, palpitations and faintness) were involved in study.

Participants

Adults from age of 18-65 years were enrolled who had ECG changes suggestive of STEMI, NSTEMI, along with elevated cardiac biomarkers. Patients were admitted in cardiac ICU. If patient came in window period of 12 hours from onset of chest pain, was thrombolysed. Total 100 patients with first episode of ACS, were enrolled after taking written informed consent. Patients who had previous heart failure, on chemotherapeutic drugs, carcinoma, haematological malignancies, hepatic and renal failure, autoimmune diseases were excluded.

Assessment

Patients sample was sent for routine biochemistry, CBC, ESR, CRP, renal function test, liver function test, Troponin I, lipids, random blood glucose. Demographic information, history, vitals, physical examination was done. Left ventricular function was assessed by 2D Echocardiography after stabilisation and Ejection fraction was noted. LV dysfunction was described as LVEF < 40%. Platelet lymphocyte ratio was calculated for all patients and then patients divided into three tertiles, high PLR value (>130), medium PLR (95-130) and low PLR (< 95)3

Statistical analysis

The quantitative variables will be expressed as mean value + standard deviation or median. Qualitative as percentages (%). p value of < 0.05 was be considered statistically

significant. Categorical variables were compared using Chi-square test. Spearman correlation analysis was used for establishing relation between two qualitative variables.

Ethical consideration

The analysis protocol was reviewed and approved by Ethics committee of institution (no. EC/MGM/ 20/107).

RESULTS

1. In our study, total of 100 ACS subjects were studied of which 81 were STEMI and 19 were NSTEMI. As shown in table 1, patients were divided into three tertile based on platelet lymphocyte ratio (PLR) as low PLR (<95), Medium PLR (95-130), high PLR (>130). Amongst 100 patients, 60% were in medium tertile, followed by low tertile 28% and 12% in high tertile. Minimum PLR was 65.60, with maximum being 158.5 with median of 10
2. Patients with high PLR have least ejection fraction with mean of 27% compared to patients with low PLR having mean ejection fraction above 40% , thus relation of LVEF & PLR is statistically significant (p <0.001) [Table 2]
3. Mean lymphocyte count of 2110 was found in patients having high PLR tertile with average of 2400 lymphocyte count in low PLR group. Medium PLR group had average of 2200 cell count. The relation between the two was significant by Chi square test (p< 0.001) [Table 3]

DISCUSSION

Inflammation and thrombosis together play a major role in pathogenesis of ACS [6]. Platelets may reflect inflammatory status and thrombotic activity. The role of high platelet counts have been demonstrated in multiple researches and was found to have predictive value for adverse outcomes.[7] Studies have also proven lymphocyte to have role in maintenance of plaque stability, therefore suggesting relation of decrease lymphocyte count to worse cardiovascular outcomes.

In our study we found that maximum patients in high and medium PLR tertile had left ventricular systolic dysfunction (LVEF < 40%).

Li H, Zhou Y, Ma Y, Han S, Zhou L demonstrated association of PLR with Global Registry of Acute Coronary Events (GRACE) risk score in ACS and can help in prediction of its long term events. The meta analysis of eight studies showed that when patients were divided into high (>150) and low PLR (<150) groups, the high PLR group had significant increased risk of in-hospital as well long term cardiovascular events.[8]

Ramezani J., Kalat H., Hashemian A., Mehramiz N., and Foroughian M. demonstrated that coronary atherosclerosis is associated with inflammatory markers, and PLR and NLR can be used to assess severity of coronary artery involvement. The best cut-off point of PLR and NLR in the non-spontaneous reperfusion group (abnormal) was 103 and 3.3 in the Acute coronary syndrome patients.[9]

Temiz A. et al studied role of high PLR (>144) in STEMI and was found to have higher in hospital mortality compared to low PLR. It can also be used as independent predictor for the same.[10]

In our study lymphopenia (< 4*10) with mean count of 2200 was found in 72% patients lying in middle and high PLR tertile group. Low lymphocyte count has a correlation (p<0.001) with left ventricular dysfunction in patients of ACS.

Steve R. Ommen et al in their study on prognostic significance of lymphocyte count in symptomatic heart failure concluded that lymphocyte count could be used in patients of heart failure as an independent factor.[11]

Thomson S.P. et al found in their study that relative lymphopenia (decrease < 20.3) along with elevated CK-MB could be used as an early marker for diagnosis of ACS.[12]

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Conflict of interest: None

Ethical statement:

The analysis protocol was ethically approved by Ethics committee of institution (no. EC/MGM/ 20/107).

Table 1: Study Population into PLR tertile

	Frequency(n)	Percent (%)
High PLR	12	12
Medium PLR	60	60
Low PLR	28	28

PLR- platelet lymphocyte ratio

Table 2: PLR and Left ventricular Ejction Fraction

	LVEF (mean %)	p value
Low PLR	43.4	< 0.01
Medium PLR	31.8	
High PLR	27.5	

LVEF- Left Ventricular Ejection Fraction

Table 3: Lymphocyte count with PLR

PLR				P value
Lymphocyte count	Low	Medium	High	<0.001
	2410.71	2210	2116.66	

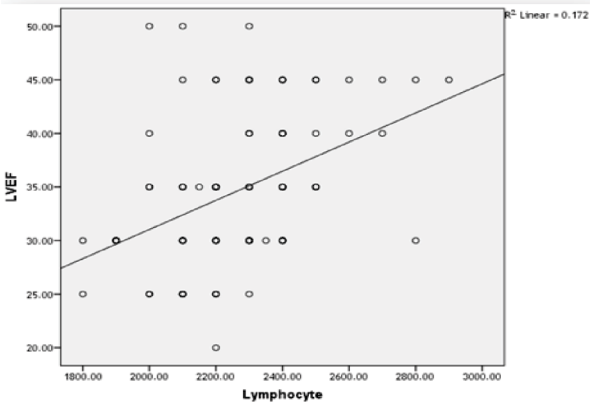

Figure 4: Pearson Correlation Between LVEF and lymphocyte count

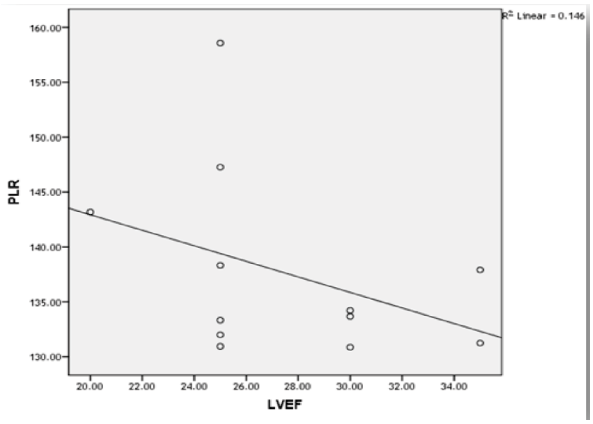

Figure 5: Pearson correlation between PLR and LV dysfunction

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