ASIAN JOURNAL OF PHARMACEUTICAL AND CLINICAL RESEARCH

INNOVARE ACADEMIC SCIENCES
Knowledge to Innovation

Vol 17, Issue 7, 2024

Online - 2455-3891
Print - 0974-2441

Research Article

PLATELET TO LYMPHOCYTE RATIO IN PATIENTS WITH ACUTE MYOCARDIAL INFARCTION

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Received: 04 May 2024, Revised and Accepted: 18 June 2024

ABSTRACT

Objective: Acute myocardial infarction (AMI) results from the total occlusion of a coronary artery, often due to thrombus formation on a complicated atherosclerotic plaque. Despite advances in reperfusion techniques, patients with AMI face poor prognosis and high early mortality rates. Inflammatory markers, such as the platelet-to-lymphocyte ratio (PLR), have shown potential in predicting poor prognosis and major adverse cardiovascular events (MACE). This study aims to evaluate the prognostic value of PLR in predicting immediate outcomes in AMI patients by examining the relationship between PLR and the Killip classification, a tool used to assess heart failure severity.

Methods: This prospective observational study included 75 patients diagnosed with AMI based on clinical presentation, electrocardiographic changes, and elevated cardiac biomarkers. Ethical committee clearance and informed consent were obtained. Baseline demographic and clinical data, including smoking status, hypertension, and diabetes mellitus, were collected. The Killip classification assessed heart failure severity at admission. Blood samples were collected at admission (day 1) and at the end of the 1st week (day 7) to measure PLR values using automated hematology analyzers. Descriptive statistics summarized sociodemographic characteristics. T-tests compared PLR values between day 1 and day 7 for each Killip score, and analysis of variance assessed differences in PLR across different Killip scores. Correlation analysis evaluated the relationship between Killip scores and PLR at admission and the end of the 1st week.

Results: The majority of patients were aged 40–59 years (44%) or older than 60 years (41.33%), with a predominance of male patients (70.67%). A significant number of patients were smokers (61.33%), many had hypertension (61.33%), and diabetes mellitus (57.33%). Analysis showed a significant reduction in PLR from day 1 to day 7 for all Killip scores. For instance, Killip score 1 saw a reduction from 112.34±21.09 to 93.83±15.27 ($t=6.157$, $p<0.001$). Higher Killip scores were consistently associated with higher PLR values at both time points. Correlation coefficients were 0.85 at admission and 0.82 at the end of the 1st week ($p<0.001$ for both), indicating a strong positive relationship.

Conclusion: The study highlights the prognostic significance of PLR in AMI patients, with higher Killip scores associated with significantly higher PLR values. This consistent relationship suggests that PLR can serve as a reliable marker for early risk assessment and prognosis in AMI patients, supporting its potential utility in clinical practice. Further research is warranted to confirm these findings and explore the integration of PLR into the routine clinical management of AMI.

Keywords: Acute myocardial infarction, Platelet-to-lymphocyte ratio, Killip classification, Prognosis, Inflammatory markers.

 DOI: http://dx.doi.org/10.22159/ajpcr.2024v17i7.51927. Journal homepage: https://innovareacademics.in/journals/index.php/ajpcr

INTRODUCTION

Acute myocardial infarction (AMI) results from the total occlusion of a coronary artery, usually due to thrombus formation on a complicated atherosclerotic plaque [1]. Patients with AMI have higher mortality rates, particularly within the 1st 30 days [2]. Globally, cardiovascular diseases (CVD) are responsible for approximately 17.9 million deaths annually, with ischemic heart disease and stroke constituting 85% of all CVD deaths. In India, CVD accounts for 36% of all deaths among individuals aged 30–69 years [3].

Inflammation is a fundamental mechanism underlying many CVD, especially those involving atherosclerosis, which is a primary mechanism in coronary artery disease. The body's inflammatory response involves the production of white blood cells, notably neutrophils from the bone marrow, with lymphocytes and monocytes playing key roles in early plaque formation [4]. Despite advances in reperfusion techniques, patients with AMI continue to face poor prognosis and inadequate survival rates. Therefore, improving AMI treatment and prognosis requires the identification of prognostic and diagnostic biomarkers for early risk assessment and timely therapeutic intervention [5].

Troponin is one of the most selective markers for detecting myocardial damage. However, its use in emergency settings is ambiguous due to prolonged elevations in serum troponin levels and the need for successive measurements to observe increasing trends. This delay limits its utility in the rapid triage of patients with myocardial infarction (MI). Consequently, there is a need for novel biomarkers. D-dimer levels, for instance, are expected to increase more rapidly in acute ischemic events than other cardiac markers [4,6]. In addition, the CD40 ligand has been shown to regulate the thrombotic potential of human atherosclerotic lesions by inducing tissue factor expression [7].

The neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) have garnered attention as inflammatory markers capable of predicting poor prognosis and major adverse cardiovascular events (MACEs) [8,9]. NLR is advantageous due to its cost-effectiveness and rapid testing, which facilitates swift decision-making and planning for referrals to higher-level care if a poor prognosis is predicted [10]. However, research on the prognostic value of PLR, particularly in comparison to the established thrombolysis in MI (TIMI) scoring, remains inadequate. The TIMI score is a well-established tool for analyzing 30-day mortality in patients with STEMI. The effect of PLR on CVD is still unclear, and its prognostic significance in patients with MI is not well established [4,11].

The Killip classification is a clinical tool used to evaluate the severity of heart failure in patients with acute MI, with higher Killip scores

indicating a worse prognosis. Therefore, this study aims to determine the prognostic value of PLR in predicting immediate outcomes (1 week) in patients with acute MI by assessing the relationship between Killip score and PLR [12,13].

METHODS

This prospective observational study aimed to evaluate the prognostic value of the PLR in predicting immediate outcomes (1 week) in patients with AMI. Ethical committee clearance was obtained before the commencement of the study. Each patient received a patient information sheet, and informed consent was obtained either from the patient or from the legally authorized representative (LAR) if the patient was unconscious or under significant stress at the time of admission. In cases where consent was initially obtained from the LAR, informed consent was later sought from the patient once they were stabilized and capable of making an informed decision. If the patient chose not to participate upon regaining consciousness, they were withdrawn from the study.

A total of 75 patients diagnosed with AMI were enrolled in the study. Patients were selected based on the inclusion criteria of having a confirmed diagnosis of AMI through clinical presentation, electrocardiographic changes, and elevated cardiac biomarkers. Patients with hematological disorders, active infections, malignancies, or those who had undergone recent surgery were excluded from the study.

Baseline demographic and clinical data were collected from all participants using a structured questionnaire that included questions on socio-demographic factors, smoking status, hypertension, and diabetes mellitus. The Killip classification was used to assess the severity of heart failure at the time of admission. Blood samples were collected at admission (day 1) and at the end of the 1st week (day 7) to measure PLR values, with platelet and lymphocyte counts obtained using standard automated hematology analyzers.

The data collected were analyzed using descriptive statistics to summarize the sociodemographic characteristics of the patients. Mean PLR values for each Killip score were calculated for both day 1 and day 7. Statistical comparisons between day 1 and day 7 PLR values for each Killip score were conducted using t-tests, and analysis of variance (ANOVA) was used to assess differences in PLR values across different Killip scores. Correlation analysis was performed to evaluate the relationship between Killip scores and PLR values at admission and the end of the 1st week, with correlation coefficients and p-values calculated to determine the strength and significance of these relationships.

Table 1: Sociodemographics of patients

Variable	Category	Number of patients (n=75)	Percentage
Age (years)	<40	11	14.67
	40–59	33	44.00
	≥60	31	41.33
Gender	Male	53	70.67
	Female	22	29.33
Smoking Status	Non-Smoker	29	38.67
	Smoker	46	61.33
Hypertension	Yes	46	61.33
	No	29	38.67
Diabetes Mellitus	Yes	43	57.33
	No	32	42.67

RESULTS AND DISCUSSION

The sociodemographic analysis of the 75 patients (Table 1) shows that the majority fall within the 40–59 years age group (44%), with a substantial proportion aged 60 years or older (41.33%), and a smaller segment younger than 40 years (14.67%). The gender distribution reveals a predominance of male patients (70.67%) over female patients (29.33%). A significant number of patients are smokers (61.33%), with non-smokers comprising 38.67%. Regarding comorbidities, 61.33% of the patients have hypertension, and 57.33% have diabetes mellitus, indicating a high prevalence of these conditions within the study group.

The analysis of mean PLR across different Killip scores from day 1 to the end of the 1st week shows a statistically significant reduction in PLR for all Killip scores. For Killip score 1, the PLR decreased from 112.34±21.09 to 93.83±15.27 ($t=6.157$, $p<0.001$). For Killip score 2, it dropped from 141.69±25.11 to 119.89±21.54 ($t=5.707$, $p<0.001$). Killip score 3 showed a reduction from 198.35±31.70 to 140.98±25.31 ($t=12.248$, $p<0.001$), and Killip score 4 decreased from 211.88±35.39 to 158.37±32.35 ($t=9.665$, $p<0.001$). The ANOVA test was also done between the mean PLR values within day 1 and day 7. The results revealed that as the Killip score increased, the PLR also increased on day 1 and day 7 (Table 2).

The correlation analysis reveals a strong positive relationship between Killip score and PLR at both admission and the end of the 1st week. The correlation coefficient (r) at admission is 0.85 ($p<0.001$), indicating a very strong correlation, while at the end of the 1st week, the correlation coefficient is 0.82 ($p<0.001$), also indicating a strong correlation (Table 3 and Fig. 1). These findings suggest that higher Killip scores are associated with higher PLR values both at admission and after 1 week, supporting the prognostic significance of PLR in patients with different Killip scores.

The sociodemographic characteristics of the patients in this study are consistent with those observed in similar studies, indicating that our results are comparable to existing literature [3,4,10]. The majority of patients were aged between 40 and 59 years, with a significant portion being 60 years or older, and a smaller group younger than 40 years. The predominance of male patients and a high prevalence of smokers, hypertension, and diabetes mellitus align with previous studies on AMI populations. This demographic similarity supports the external validity of our findings, allowing for broader generalization and comparison with other studies on AMI and inflammatory markers.

Our study found that the PLR is proportionately high with respect to the Killip score. Specifically, as the cardiac severity indicated by the Killip score increases, the PLR also increases. This trend is well established in the results observed on both day 1 and day 7. For instance, patients with higher Killip scores (indicative of more severe heart failure) had significantly higher PLR values at admission and at the end of the 1st week. This finding suggests that PLR could serve as a valuable prognostic marker in patients with acute MI, offering insights

Table 2: Mean PLR for each Killip score on day 1 and end of the 1st week, with *P* values and ANOVA

Killip score	Day 1 mean PLR±SD	Day 7 mean PLR±SD	t-value	p-value (t-test)
1	112.34±21.09	93.83±15.27	6.157	<0.001
2	141.69±25.11	119.89±21.54	5.707	<0.001
3	198.35±31.70	140.98±25.31	12.248	<0.001
4	211.88±35.39	158.37±32.35	9.665	<0.001
ANOVA F-value	198.7	97.468		
ANOVA *P* value	<0.001	<0.001		

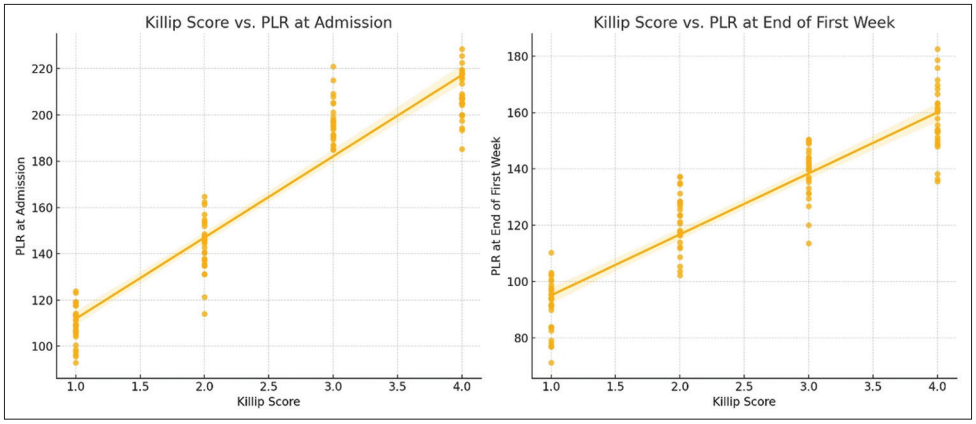

Fig. 1: Correlation between Killip score and PLR at admission and end of the 1st week

Table 3: Correlation between Killip score and PLR at admission and end of 1st week

Variable	Correlation coefficient (r)	p-value
Killip Score versus PLR (Admission)	0.85	<0.001
Killip Score versus PLR (End of Week 1)	0.82	<0.001

into the severity of their condition and potentially guiding therapeutic decisions [4,5].

In addition, the strong positive correlation between Killip scores and PLR values at both admission and the end of the 1st week further underscores the prognostic utility of PLR. The correlation coefficients of 0.85 at admission and 0.82 at the end of the 1st week indicate a very strong relationship, suggesting that higher PLR values are consistently associated with more severe cardiac conditions as classified by Killip scores. This consistent relationship across different time points highlights the potential of PLR as a reliable marker for early risk assessment and prognosis in AMI patients. These findings are supported by previous studies that have identified inflammatory markers, such as the NLR and PLR, as significant predictors of poor prognosis and MACE in CVD [4,5,9,10].

CONCLUSION

This study highlights the prognostic significance of the PLR in patients with AMI. Our findings indicate that PLR is proportionately higher in patients with more severe cardiac conditions as indicated by higher Killip scores. This relationship is consistent and significant both at the time of admission and at the end of the 1st week, suggesting that PLR can serve as a reliable marker for early risk assessment in AMI patients. This study provides novel insights into the use of PLR for early risk stratification and prognosis in AMI patients. Further research is warranted to confirm these findings and to explore the integration of PLR into routine clinical practice for managing AMI.

AUTHORS CONTRIBUTION

Siddharth yaswanth: Conceptualization of the study, Designing the study, Conducting the study, Manuscript writing. Manoj Kumar Prasad: Conceptualization, Methodology Guidance, Manuscript Review and Editing. Palamalai Thamilmani Prabakaran: Conceptualization, Methodology Guidance, Manuscript Review and Editing. Sivakumar Karunantham: Methodology Guidance, Manuscript Review and Editing.

CONFLICT OF INTEREST

Nil.

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