

**PLATELET LYMPHOCYTE RATIO (PRL) AND GRACE (GLOBAL REGISTRY OF ACUTE CORONARY EVENTS) SCORE AS PROGNOSTIC INDICATORS OF MORTALITY IN ACUTE CORONARY SYNDROME**

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**Article History**

Received : October-2025

Revised : October-2025

Accepted : November-2025

Published : November-2025

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**Cite This Article:**

Alisa, N., Rahadiyan, T., & Syauqi, A. (2025). Platelet Lymphocyte Ratio (Prl) And Grace (Global Registry Of Acute Coronary Events) Score As Prognostic Indicators Of Mortality In Acute Coronary Syndrome. Jurnal Ilmiah Multidisiplin, 4(6), 75–79.

**DOI:**

<https://doi.org/10.56127/jukim.v4i6.2328>

**Abstract:** Inflammation plays a crucial role in the early stages of atherosclerosis, which can then trigger acute coronary syndrome. Acute coronary syndrome (ACS) is a potentially fatal condition. Therefore, accurate predictive tools are needed to estimate mortality risk, allowing for more appropriate patient management. One commonly used method is the GRACE (Global Registry of Acute Coronary Events) score. Several studies have shown that combining the GRACE score with clinical and laboratory parameters can improve the accuracy of mortality prediction in ACS patients. In this regard, an easily obtained and assessed inflammatory indicator, the Platelet-Lymphocyte Ratio (PRL), can be an effective tool. This study is observational analytics with a retrospective approach. This study included 98 patients with a diagnosis of ACS based on medical record data. Data analysis was performed using the Statistical Package for the Social Sciences (SPSS). P-value <0.05 was considered statistically significant. A chi-square statistical test was performed on mortality rate (p-value=<0.001). The same test was performed on the Grace score on mortality (p-value=<0.001). These findings indicate that both RPL and GRACE score can be used as effective prognostic indicators of mortality in patients with acute coronary syndrome.

**Keywords:** ACS, PRL, GRACE Score.

**INTRODUCTION**

According to data from the American Heart Association (AHA), the leading cause of death globally is cardiovascular disease. The death toll from cardiovascular disease worldwide reached 17.8 million [1]. Approximately 32% of deaths are caused by cardiovascular disease, of which 85% are caused by heart attacks and strokes [2]. One of the frightening threats to the Indonesian nation is cardiovascular disease. According to data from the World Heart Federation, Indonesia has reached 651,481 deaths caused by cardiovascular disease and is one of the highest causes of death in Indonesia [3].

The Global Registry of Acute Coronary Event (GRACE) risk score and the CRUSADE score are among the most widely used tools for estimating mortality risk in ACS. However, research by Katharina Tscherny et al. (2019) found that the GRACE score is superior to the CRUSADE score in predicting mortality [4]. Several studies have found that combining the GRACE score with clinical and laboratory parameters can improve the predictive value of ACS [5].

Acute Coronary Syndrome (ACS) is associated with atherosclerotic plaque rupture and thrombosis in the arteries. Inflammation plays a key role in the initiation of atherosclerosis, leading to ACS. A laboratory parameter that can be used is the Platelet Lymphocyte Ratio (RPL), where an increase in the RPL reflects inflammation and aggregation pathways, which are predictors of atherosclerosis in ACS[6].

RPL is an indicator of inflammation whose information is easily collected because almost all patients with heart disease undergo blood tests, and its assessment is easy to perform. This indicator can predict

mortality in ACS patients. [7] found a positive correlation between GRACE and RPL scores, where the combination of GRACE and RPL scores was more effective in predicting events in ACS patients. [8] conducted research and concluded that there is a relationship between RPL and GRACE scores in determining the mortality rate in ACS.

Based on this, researchers are interested in observing the relationship between the mortality rate with RPL and the mortality rate with the GRACE score as indicators of mortality prognosis in ACS patients at RSUD Raden Mattaher, Jambi.

## RESEARCH METHOD

### Research Design

This study is observational analytics with a retrospective approach. This study included 98 patients with a diagnosis of acute coronary syndrome based on medical record of RSUD Raden Mattaher Jambi from Januari 2021 to December 2023.

Subject of study were included if there is following criteria: patients with a diagnosis of ACS either ST elevation acute myocardial infarction (STEMI), NON-ST elevation acute myocardial infarction (NSTEMI) or unstable angina (UA) that was confirmed through presence of ischemic symptoms with ECG changes consistent with ischemia based on medical record data. PRL data is the result of a comparison between the absolute number of platelets and the absolute number of lymphocytes or a comparison between the relative percentage of platelets and the relative percentage of lymphocytes in the first blood test originating from laboratory examinations of patients with mild(<101), moderate(101-171), and severe(>171) categories. Data of patients were stratified according to the GRACE score into stratification low risk (<109), intermediate risk (109-140) and high risk (>140). we also look for the patient's life status which is divided into alive and deceased.

### Exclusion Criteria

If the medical record data is incomplete. Patients who had a clinically ACS patients with sepsis, severe liver disease, autoimmune diseases, malignancy, pneumonia, and patients who actively taking steroids and chemotherapy.

### Statistical Analysis

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) software. In this sample, univariate analysis was performed to assess the distribution of patient characteristics, including gender, age, type of ACS, RPL, GRACE score, and mortality status. Bivariate analysis using chi-square was then performed to determine the relationship between RPL and mortality rates and GRACE scores and mortality rates in ACS.

## RESULTS AND DISCUSSION

There are total 98 medical records of ACS patients in this study. The characteristics subject of study such as age, gender, type of ACS, stratification of PRL, stratification of GRACE score and the mortality rate are shown in (Tabel 3.1). The average age of patients (45-64 years) was 61 patients, this study included 71 (72%) male, there were 40 (40.8%) patients with STEMI. The mean of RPL was at the intermediate level 41 (41.8%) patients, the mean GRACE score was at low risk 46 (46%) patients and the mean mortality rate was alive with 77 (78%) patients.

Tabel

Tabel 1. Characteristic of study

Variable	n=98
Age, mean, years, n(%)	45-64 years, 61(62.2)
Male, n(%)	71 (72.4)
STEMI, n(%)	40 (40.8)
NSTEMI, n(%)	24 (24.5)
UAP, n(%)	34 (34.7)
<b>Stratification of PRL</b>	
Low risk, n(%)	38, (38.8)
Intermediate risk, n(%)	41 (41.8)

High risk, n(%)	19 (19.4)
<b>Stratification of GRACE score</b>	
Low risk, n(%)	46 (46.9)
Intermediate risk, n(%)	24 (24.5)
High risk, n(%)	28 (28.6)
<b>Mortality rate</b>	
Alive, n(%)	77 (78.6)
Deceased, n(%)	21 (21.4)

STEMI: ST Elevation Myocardial Infraction; NSTEMI: Non ST Elevation Myocardial Infraction; UAP: Unstable Angina Pectoris

Table 2. Correlation between PRL and GRACE score with mortality rate

Chi Square	Mortality Rate		P-value
	Alive	Deceased	
<b>PRL</b>			<0.001
Low risk	44	2	
Intermediate risk	22	2	
High risk	11	17	<0.001
<b>GRACE score</b>			
Low risk	35	3	
Intermediate risk	35	6	
High risk	7	12	

PRL: Platelet Lymphocyte Ratio; GRACE score: Global Registry Acute Coronary Event score

### Discussion

Based on the chi-square analysis results table above, it can be seen that there is a significant relationship between GRACE scores and mortality of ACS patients (p-value=<0.001) and after conducting a chi-square analysis of RPL scores on mortality, a significant relationship between RPL scores and mortality was also obtained (p-value=<0.001).

The majority of ACS patients were male (72.4%), consistent with several previous studies. Men are more susceptible to ACS due to greater exposure to risk factors such as smoking and unhealthy lifestyles. Furthermore, men have a higher burden of atherosclerosis and lack the protection of estrogen as women[9].

Most patients were aged 45–64 years (62.2%), consistent with other studies showing middle-aged people as the most susceptible group to ACS[10]. The risk increases with age due to changes in blood vessels, decreased elasticity, and increased blood pressure and cardiac oxygen demand, which increase susceptibility to ischemia and infarction[11].

The most common type of ACS was STEMI (40.8%). This is consistent with several local studies, but differs from studies that show a predominance of NSTEMI[8]. STEMI has seen a decrease in mortality due to faster and more effective treatment, while NSTEMI still has a high mortality rate due to patient complexity and delayed treatment[12].

The majority of ACS patients had moderate RPL (41.8%), similar to the findings of Muliana et al. RPL tended to be higher in the NSTEMI and STEMI groups compared to UAP due to the presence of larger thrombi and arterial occlusions. Harun et al[13] showed no significant difference in coronary artery disease between PLR  $\leq 150$  and  $>150$ , but there was a significant difference in the incidence of infarction. High RPL reflects increased inflammation and thrombosis, while lymphopenia is associated with a poor prognosis. The combination of thrombocytosis and lymphocytopenia makes RPL a potential indicator of ACS progression.

The majority of ACS patients were classified as low-risk according to the GRACE score (46.9%), consistent with the studies of Kumar et al[14] and Korespondent et al[10] Conversely, Abu-Assi et al[15] found the majority of their patients were high-risk. The GRACE score proved more accurate than the

TIMI score in predicting both short- and long-term mortality in ACS patients, especially in Asian populations.

The significance of RPL in predicting ACS prognosis can also be validated through its relationship with other predictors. Ayhan et al [16] found that patients with higher RPL levels showed higher peak CK-MB, creatinine clearance, Killip class, glucose intake, and anemia in their study. Zhou et al [7] demonstrated a positive association between the GRACE risk score and RPL. RPL has also been reported to correlate significantly with other inflammatory markers such as C-reactive protein (CRP) and fibrinogen, which have been shown to have predictive and prognostic significance in cardiovascular disease. According to Wenzhang et al [17] to date, no systematic studies have found comparing the significance of these predictors. Whether an independent or combined predictor is the best choice remains a matter of debate. However, with its easy and rapid availability and relatively low cost, PLR is undoubtedly a promising marker that deserves further exploration.

Most ACS patients in this study survived (78.9%), consistent with studies by Kumar et al [14] and Abu-Assi et al [15]. Based on research conducted by Kumar et al [14] it was found that the GRACE score was significantly associated with the 6-month mortality rate of ACS patients. The GRACE score [The Global Registry of Acute Coronary Events] is one of the scores developed to identify patients in coronary care units or emergency departments who are at greatest risk of adverse events after ACS. It has been observed that the likelihood of in-hospital mortality increases significantly with increasing GRACE score. The GRACE score parameters (range 2 to 372) are heart rate, age, systolic blood pressure, cardiac arrest, Killip class, ST segment deviation, serum creatinine, and cardiac biomarker status. Mortality increased with increasing risk based on the GRACE score, especially in the STEMI group. However, for NSTEMI, the difference in mortality between low and intermediate risk was not significant.

There was a significant correlation between RPL and GRACE score on mortality in ACS patients ( $p = 0.001$ ). High RPL is associated with inflammation, platelet activation, and lymphocytopenia, which worsen the condition. The GRACE score encompasses important clinical variables and has been shown to be a strong predictor of mortality. Both can be used as complementary prognostic tools for ACS.

## CONCLUSION AND SUGGESTIONS

### Conclusion

This study was conducted with a total of 98 samples from patients diagnosed with ACS at Raden Mattaher Jambi Regional Hospital during the 2021-2023 period who met the inclusion criteria. The data collection method used in this study was purposive sampling using secondary data through patient medical records that had been carried out from February to March 2023. The data were processed using univariate and bivariate tests. From the bivariate test using chi-square, a significant relationship was obtained between RPL and the mortality rate and Grace score with the mortality rate, both of which can be as prognostic indicators of the mortality rate in ACS.

### Suggestion

The limitation of the study, this was a retrospective study included a relatively small number of patients. It is recommended that further research be conducted to determine which is better in determining the mortality rate.

### Acknowledgement

I would like to express my sincere gratitude to my supervisor from Medical Study of Jambi University for their guidance and support. I also want to thank all lecturers, staff, and everyone who helped me throughout this process.

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