Value of Platelet-to-Lymphocyte Ratio in Acute Coronary Syndrome for Predicting In-Hospital Complications and Mortality

Amanj Abubakr jalal Khaznadar [1*], Omed Hama Karem [1]

Abstract

Background: Acute coronary syndrome (ACS) refers to a spectrum of urgent heart conditions caused by a sudden decrease in blood flow to the heart. This condition demands immediate medical attention as it can lead to severe complications, including heart attack and death. The platelet-to-lymphocyte ratio (PLR) has recently gained attention as a potential biomarker for assessing the inflammatory status in ACS patients. Inflammation plays a crucial role in the pathophysiology of ACS, and biomarkers like PLR can offer insights into the severity and prognosis of the disease. Methods: This study was a prospective cross-sectional analysis conducted in Sulaymaniyah city, spanning from December 2021 to December 2022. The study included 100 patients who were diagnosed with ACS and subsequently hospitalized. Data collection involved comprehensive clinical histories, physical examinations, and laboratory analyses. Among the laboratory tests, complete blood counts were performed to calculate the PLR for each patient. Based on their PLR levels, patients were categorized into two primary groups for comparative analysis. Results: In a study of 100 ACS patients (mean age 61.54 years, 69% male), elevated PLR correlated with lower oxygen saturation, more frequent STE-ACS (70.6%), and higher in-hospital complications, including mortality (11.8%). No significant links were found between PLR and traditional CAD risk factors. Conclusion: The findings of this study underscore the potential prognostic value of PLR in ACS patients. Elevated PLR was significantly associated with worse oxygen saturation, a higher prevalence of STE-ACS, and an increased occurrence of in-hospital complications and mortality.

Keywords: Platelet-to-Lymphocyte Ratio (PLR), Acute Coronary Syndrome (ACS), In-hospital Mortality, Oxygen Saturation, Cardiovascular Complications

Significance | This study determined the prognostic value of PLR in predicting complications and mortality in ACS patients, particularly in resource-limited settings.

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Introduction

Cardiovascular diseases (CVDs) are the main cause of mortality worldwide, with an approximate annual death toll of 17.9 million. Acute coronary syndromes (ACS) are a major cause of CVD death (Timmis et al. 2023). ACS encompasses ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina. This particular kind of coronary heart disease (CHD) accounts for one-third of all fatalities in those over 35 (Vakaliuk et al, 2021; Alomari et al, 2019). The etiology of ACS is multifactorial, involving a complex interplay between genetic predisposition, environmental factors and pollution (Salehi et al, 2023), and lifestyle choices.

The pathophysiology is characterized by the disruption of an atherosclerotic plaque, leading to platelet aggregation and

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thrombus formation that acutely obstructs coronary blood flow. This obstruction results in ischemia and necrosis of the myocardium if not promptly resolved (Gherasie et al, 2023; Theofilis et al, 2023; Singh et al, 2024). Male sex, physical inactivity, family history of obesity, cocaine use, diabetes, hypertension (8), male sex, smoking, and poor dietary practices are prominent risk factors for the condition (Singh et al, 2024, Sharif et al, 2022).

Patients with ACS typically present with a range of signs and symptoms, including chest pain, which may radiate to the arms, neck, or jaw, shortness of breath, diaphoresis, and nausea. The presentation can vary significantly (Subramanyam et al, 2024). Complications of ACS are severe and can include heart failure, arrhythmias, recurrent angina or MI, and sudden cardiac death. These complications underscore the critical need for prompt diagnosis and treatment to improve outcomes (Balakumaran 2020; Byrne et al, 2024).

Diagnosis of ACS relies on a combination of clinical assessment, electrocardiograms (ECG), and cardiac biomarkers such as troponins (Estrada et al, 2024). Additionally, Non-invasive diagnostic tools such as echocardiography, computed tomography (CT), and cardiac magnetic resonance (CMR) are also available for patients with inconclusive ECG and hs-cTn results (Rafael et al, 2024).

Among emerging diagnostic modalities, the Platelet to Lymphocyte Ratio (PLR) has gained attention. Within the context of ACS, platelets play a crucial role in thrombus formation, while lymphocytes are indicative of the inflammatory response to myocardial injury. The PLR has emerged as a potential marker of inflammation and thrombosis. Elevated PLR values have been associated with adverse cardiovascular outcomes and reflect a heightened prothrombotic and inflammatory state (Oylumlu et al, 2020; Oylumlu et al, 2015). The PLR has been shown to predict adverse outcomes in patients with ACS, including the onset of new symptomatic heart failure (HF) within 6 months (Intan et al, 2022). Additionally, the study conducted by Kazem et al. (2022), showed that the PLR prognostic value is particularly significant in elderly patients, as it is an independent predictor of cardiovascular mortality in individuals aged 65 years and older.

The necessity for the present study arises from the need for affordable and readily available prognostic markers in the resource-constrained settings of countries like Iraq. Since there have been limited studies in the Middle East in this field, especially in Iraq, it was necessary to conduct the present study with the aim of investigating the relationship between PLR and in-hospital complications and mortality in patients with ACS.

Materials and Methods

Study Design and Setting

This study was designed as a prospective cross-sectional study and conducted in Sulaymaniyah city, specifically at the Sulaymaniyah Cardiac Teaching Hospital and the Cardiac Unit at Shar Hospital. The study period was from December 2021 to December 2022.

Participants

A total of 100 patients diagnosed with ACS were included in the study through convenience sampling. The participants were selected based on the inclusion criteria from the patient admission logs.

Inclusion criteria were patients diagnosed with ACS as per the ESC (The fourth universal definition of MI, published in 2018 by Intan et al. 2018) and all participants were aged over 18 years and had informed consent. Patients with known platelet disorders, liver diseases (including cirrhosis and cancer), active malignancies (such as leukemia and lymphoma), clinical evidence of acute infection (including COVID-19), or those who had undergone surgery or sustained trauma in the preceding 10 days were all systematically excluded from participation.

Data Collection

Clinical histories were obtained, and physical examinations were conducted. Vital signs including blood pressure, pulse rate, and oxygen saturation (SpO2) were measured using a cardiac monitor in the Critical Care Unit. Random blood glucose levels were determined through fingerstick testing. Demographic details and medical histories, including smoking status, alcohol consumption, drug use, and the presence of comorbidities such as hypertension, diabetes, chronic kidney disease, malignancy, rheumatoid arthritis, cerebrovascular accidents, and preexisting coronary artery disease (CAD), were documented.

Grouping of ACS

Participants were categorized into two primary groups based on initial electrocardiogram (ECG) findings and cardiac biomarkers, specifically cardiac Troponin I levels, as outlined by the ESC guidelines.

First group: ST-Elevation Acute Coronary Syndrome (STE-ACS)

Second group: Non-ST-Elevation Acute Coronary Syndrome (NSTE-ACS)

STE-ACS patients were further subdivided based on ECG findings into: Anterior (anterolateral, anteroseptal, and anterior ST-segment MI); Posterior and inferior ST-segment MI; Inferolateral and lateral ST-segment MI.

Patients not meeting the ECG criteria for STE-ACS were classified under NSTE-ACS.

Laboratory Analysis and Platelet to Lymphocyte Ratio (PLR)

Upon admission, venous blood samples were collected, and complete blood counts (CBCs) were analyzed using an automated cell counter within 30 minutes of collection. The PLR was calculated by dividing the absolute platelet count by the lymphocyte count. The WBC and hemoglobin (Hb) levels were also measured. Patients

were then divided into: Normal PLR Group: PLR < 150, and High PLR Group: PLR ≥ 150.

Treatment Modalities

Treatment modalities, as per the ESC guidelines, were categorized into medical management, where patients were solely treated with medication, and interventional approaches, involving patients who had undergone percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). Patients who underwent PCI were classified based on the site of critical stenosis, identified as greater than 70% narrowing on angiography, which included the left anterior descending artery (LAD) and its branches, the right coronary artery (RCA) and posterior descending artery, and the left circumflex artery (LCX).

Monitoring and Outcomes

All patients were admitted to the coronary care unit for intensive monitoring. The development of complications such as acute kidney injury (AKI) as defined by KDIGO 2012 guidelines, heart failure, pulmonary edema, GI bleeding, and arrhythmias were documented. Echocardiography and chest X-ray were utilized for diagnostic confirmation. The in-hospital outcomes were recorded as either discharge or death.

Ethical Endorsement

The study protocol was reviewed and approved by the relevant ethics committees. Compliance with ethical standards, including the Declaration of Helsinki, was ensured throughout the study. Patient confidentiality was maintained at all times, with data being anonymized for analysis.

Statistical Analysis

Data were analyzed using SPSS version 23. Descriptive statistics including frequencies and percentages were computed for categorical variables, while measures of central tendency and dispersion were used for continuous variables. The T-independent test was employed for continuous variables and the chi-square test with post-hoc testing for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

There were 100 hospitalized ACS patients during the study period that were eligible for analysis. The examination of the demographic characteristics of the participants revealed that the mean age was 61.54 ± 11.128, with the 46-65 age group comprising the majority at 54 individuals (54.0%). The sex analysis indicated that a predominance of the participants was male, accounting for 69 individuals (69.0%). In terms of residency status, it was observed that 53 participants (53.0%) resided outside of the city, while 47 individuals (47.0%) lived inside the city. Furthermore, the majority of participants 91 (91.0%), were Kurdish. An assessment of risk factors showed that 58 individuals (58.0%) were non-smokers, 41 (41.0%) had a family history of premature ischemic heart disease (IHD), and 94 (94.0%) reported not consuming alcohol (Table 1).

The results of the study revealed that PLR did not have any significant relationship with patients' demographic data including the patient's age group (p=0.828), sex (p=0.726), residency (p=0.430), or nationality (p=0.372). The results also demonstrated that PLR did not have any significant relationship with any of the patient's risk factors for CAD including family history of premature IHD (p=0.11), smoking (p=0.330), or alcohol drinking (p=0.678) (Table 1).

The study presents a comprehensive overview of the vital signs and laboratory values among the patient cohort. The mean systolic blood pressure (SBP) was observed at 138.47 ± 26.327 mmHg. The mean diastolic blood pressure (DBP) was at 78.69 ± 13.256 mmHg. The mean pulse rate (PR) variable was 84.34 ± 17.518 bpm. The mean oxygen saturation (SpO2) level was noted to be 93.17% ± 5.826%. Regarding random blood sugar (RBS), the mean was substantially higher at 171.57 ± 84.375 mg/dL (Table 2).

For laboratory values, the white blood cell count (WBC) had a mean of (10.166 ± 2.4680) x 109/L. Hemoglobin (Hb) levels were on mean 13.687 ± 1.8727 mg/dL. Platelet count (PLT) displayed a mean of (262.74 ± 82.356) x 109/L. Lymphocyte counts showed a mean of (1.8408 ± 0.77768) x 109/L. The mean of PLR was 194.3826 ± 292.05004 (Table 2).

The results of the study indicated, past history of Ischemic heart disease was observed in 22 (22%) of the patients, Hypertension in 57 (57%), Diabetes Mellitus in 35 (35%), Chronic Kidney Disease in 1 (1%), asthma or COPD in 5 (5%), CVA or TIA in 4 (4%), rheumatoid arthritis in 1 (1%), and malignancy in 2 (2%). In terms of the presenting symptoms, the results of the study showed that 88 (88%) of the patients had chest pain during presentation to the hospital, 31 (31%) had shortness of breath, 53 (53%) had nausea and vomiting, 63 (63%) had sweating, 5 (5%) had palpitation, and 19 (19%) had epigastric pain. As revealed by the results, PLR did not have any significant association with the patient's past history of medical diseases and conditions, and presenting symptoms (P>0.05) (Table 3).

According to the findings, there was a notable correlation between PLR and the oxygen saturation levels of the patients (p = 0.035). It was observed that a higher PLR was associated with a lower mean oxygen saturation. However, no significant associations were found between PLR and other crucial signs such as systolic blood pressure (p = 0.839), diastolic blood pressure (p = 0.832), pulse rate (p = 0.188), or random blood glucose (p = 0.800) (Table 5).

The study findings indicate that the PLR is significantly associated with the presentation of ACS subtypes (p=0.005). A higher PLR (>150) was more frequently observed in patients with ST-elevation ACS (STE-ACS) 36 (70.6%), while a PLR within the normal range (<150) was more commonly associated with non-ST-elevation ACS

(NSTE-ACS) 28 (57.1%). Additionally, the ECG results demonstrated a significant association between elevated PLR levels and the incidence of anterior and inferior STE-ACS (p=0.020). Conversely, no significant correlation was found between PLR levels and cardiac biomarkers (p=0.511), the identity of the culprit artery implicated in the ACS (p=0.308), angiographic abnormalities in vessels other than the culprit artery (p=0.723), or the management strategies employed (p=0.089) (Table 5).

In the present study, the relationship between the platelet-to-lymphocyte ratio and the occurrence of various complications post-operatively was studied. The analysis revealed that pulmonary edema occurred in 17 patients (17.0%), with a significantly higher incidence in patients with a PLR >150, 13 cases (25.5%), as opposed to those with ≤150 or below, 4 cases (8.2%) (P = 0.021). Similarly, heart failure developed in 27 patients (27.0%), with 19 cases (37.3%) in the >150 groups and 8 cases (16.3%) in the ≤150 group (P = 0.018). Acute kidney injury was reported exclusively in the >150 groups, affecting 8 patients (15.7%) (P = 0.006). Gastrointestinal bleeding was comparatively rare, occurring in just 2 cases (2.0%), with no significant difference between the groups (P = 0.495). Arrhythmias were observed in 43 patients (43.0%), with a statistically significant higher prevalence in the >150 ratio group, 29 cases (56.9%), compared to the ≤150 group, 14 cases (28.6%) (P = 0.004).

Additionally, the study's findings indicate that the PLR was significantly correlated with patient outcomes over the short term during hospitalization. In terms of discharge rates, there was no statistically significant distinction between patients with a high PLR (> 150) and those with a normal PLR (≤ 150). However, concerning mortality, it was observed that all cases of death, irrespective of age, sex, and underlying risk factors, were more prevalent in the high PLR group (> 150), with the association being statistically significant (p=0.027).

Discussion

Due to the fact that atherosclerosis is a chronic inflammatory disease, inflammation is an essential part of ACS (5). Sönmez et al. have shown a correlation between elevated levels of inflammatory markers and worsening cardiovascular outcomes as well as the severity of CAD. Because platelets are vital components of thrombosis, they play a major role in the development and course of coronary thrombosis. They also contribute significantly to the development of atherosclerosis (Sönmez et al. 2013). The current study concentrated on the PLR as a short-term prognostic factor in individuals with ACS.

The study involved 100 hospitalized patients with ACS. The majority of the patients were middle-aged, men, lived outside the city, and were of Kurdish ethnicity. Most of them didn't smoke or drink alcohol and had no family history of ischemic heart disease. In line with the present study, a study by Kerman et al aimed to determine sex and age-based differences in risk factors and symptoms of ACS in a sample of Iranian patients. The study found that more than half of the patients with ACS were males (53.4%) (Moazenzadeh et al. 2023). In a study conducted by Duan et al. (2015), it was found that the incidence of ACS increased with age for both men and women, with men having a higher prevalence across age groups and follow-up periods.

Nearly half of the patients in the present study had a family history of premature IHD. A previous study by Hindieh et al. (2016) found a strong link between IHD and certain genetic mechanisms, as well as environmental factors. It was noted that a family history of IHD is associated with incident cardiovascular disease, regardless of traditional risk factors .

The present study revealed that hypertension was present in more than half of the patients. In line with the findings of the current study, research by Frąk et al. (2022), and Beverly et al. (2020), has demonstrated that atherosclerosis and hypertension are notable risk factors for CVDs, including ACS. Similarly, the present study found that diabetes mellitus affected over one-third of the patients, echoing the research conducted by Babes et al.(2022) who indicated that type 2 diabetes increases the likelihood of myocardial infarction and worsens prognosis.

The present study results showed that the most prevalent symptoms among participants were chest pain, shortness of breath, nausea and vomiting, and sweating. This is consistent with the findings of King-Shier et al. (2019) and Menezes et al. (2022), although factors such as medical conditions, sex, and age can influence the presentation of symptoms. Additionally, the present study revealed that the incidence of ST-elevation ACS (STE-ACS) was higher than non-ST-elevation ACS (NSTE-ACS), which aligns with the findings of Hamid (2016). The present study also found that 8% of ACS patients had AKI, a complication that was reported by Kumar et al. (2022), to have a higher frequency of 24.18% among ACS patients due to a larger sample size and the absence of fluid/balance chart criteria for AKI diagnosis.

The prevalence of arrhythmia among the ACS patients in the present study was (43%). The prevalence of arrhythmia among ACS patients has been studied in various contexts, and the results have varied. In a study conducted by Zein et al. (2015), the incidence of in-hospital arrhythmias in patients with ACS was 21.55% . Additionally, Winkler et al. (2013), pointed out that patients with ACS hardly experience life-threatening arrhythmias; however, around 25% of them undergo isolated premature ventricular contractions. It is important to note that the studies have different patient populations and methodologies, which may account for the variation in results.

The present study found no association between PLR and risk factors like family history of premature IHD, smoking, and alcohol

Table 1. Association between PLR and demographic characteristics and risk factors

Variables		Platelet to Lymphocyte ratio		Total	P
		≤ 150	> 150		
Age group	19 - 45 young adults	4(8.2)	4(7.8)	8(8.0)	0.828
	46 - 65 mature adults	28(57.1)	26(51.0)	54(54.0)	
	≥ 66 Elderly	17(34.7)	21(41.2)	38(38.0)	
	Mean ± SD (61.54 ± 11.128) Min-Max (37 - 96)				
Sex	Male	33(67.3)	36(70.6)	69(69.0)	0.726
	Female	16(32.7)	15(29.4)	31(31.0)	
Residency	Inside city	25(51.0)	22(43.1)	47(47.0)	0.430
	Outside city	24(49.0)	29(56.9)	53(53.0)	
Nationality	Kurdish	43(87.8)	48(94.1)	91(91.0)	0.372
	Arabic	5(10.2)	3(5.9)	8(8.0)	
	Others	1(2.0)	0(0.0)	1(1.0)	
Smoking	Non-Smoker	26(53.1)	26(53.1)	58(58.0)	0.330
	Active Smoker	16(32.7)	10(19.6)	26(26.0)	
	Ex-Smoker	7(14.3)	9(17.6)	16(16.0)	
Family History of Premature IHD	Yes	21(42.9)	20(39.2)	41(41.0)	0.711
	No	28(57.1)	31(60.8)	59(59.0)	
Alcohol Drinking	Yes	2(4.1)	4(7.8)	6(6.0)	0.678
	No	47(95.9)	47(92.2)	94(94.0)	

Table 2. Vital Symptoms and Laboratory Values of Patients.

Variables		Min – Max	Mean ± Std
Vital Signs	SBP	70 – 280	138.47 ± 26.327
	DBP	40 – 120	78.69 ± 13.256
	PR	43 – 138	84.34 ± 17.518
	SpO2	60 – 99	93.17 ± 5.826
	RBS	87 – 517	171.57 ± 84.375
Lab Values	WBC (109/L)	5.5 - 16.2	10.166 ± 2.4680
	Hb (mg/dL)	9.1 - 18.9	13.687 ± 1.8727
	PLT (109/L)	150 - 619	262.74 ± 82.356
	Lymphocyte (109/L)	0.10 - 4.30	1.8408 ± 0.77768
	PLR	42.09 - 2940.00	194.3826 ± 292.05004

Table 3. PLR and associations with patient history and presenting symptoms

Variables		Platelet to Lymphocyte ratio		Total	P
		≤ 150	> 150		
Past history					
Ischemic Heart Disease	Yes	13(26.5)	9(17.6)	22(22.0)	0.284
	No	36(73.5)	42(82.4)	78(78.0)	
Hypertension	Yes	29(59.2)	28(54.9)	57(57.0)	0.665
	No	20(40.8)	23(45.1)	43(43.0)	
Diabetes Mellitus	Yes	21(42.9)	14(27.5)	35(35.0)	0.106
	No	28(57.1)	37(72.5)	65(65.0)	
Chronic Kidney Disease	Yes	1(2.0)	0(0.0)	1(1.0)	0.490
	No	48(98.0)	51(100.0)	99(99.0)	
Asthma, COPD	Yes	1(2.0)	4(7.8)	5(5.0)	0.363
	No	48(98.0)	47(92.2)	95(95.0)	
CVA or TIA	Yes	2(4.1)	2(3.9)	4(4.0)	1.000
	No	47(95.9)	49(96.1)	96(96.0)	
Rheumatoid Arthritis	Yes	0(0.0)	1(2.0)	1(1.0)	1.000
	No	49(100.0)	50(98.0)	99(99.0)	
Malignancy	Yes	1(2.0)	1(2.0)	2(2.0)	1.000
	No	48(98.0)	50(98.0)	98(98.0)	
Presenting Symptoms					
Chest Pain	Yes	40(81.6)	48(94.1)	88(88.0)	0.055
	No	9(18.4)	3(5.9)	12(12.0)	
Shortness of Breath	Yes	17(34.7)	14(27.5)	31(31.0)	0.434
	No	32(65.3)	37(72.5)	69(69.0)	
Nausea, Vomiting	Yes	24(49.0)	29(56.9)	53(53.0)	0.430
	No	25(51.0)	22(43.1)	47(47.0)	
Sweating	Yes	31(63.3)	32(62.7)	63(63.0)	0.957
	No	18(36.7)	19(37.3)	37(37.0)	
Palpitation	Yes	3(6.1)	2(3.9)	5(5.0)	0.675
	No	46(93.9)	49(96.1)	95(95.0)	
Epigastric Pain	Yes	10(20.4)	9(17.6)	19(19.0)	0.725
	No	39(79.6)	42(82.4)	81(81.0)	

Table 4. Relationship between platelet-to-lymphocyte ratio and the patients' vital signs

Vital sings	PLR	N	Mean ± S. D	p
Systolic Blood Pressure	≤ 150	49	139.02 ± 19.280	0.839
	> 150	51	137.94 ± 31.857	
Diastolic Blood Pressure	≤ 150	49	78.98 ± 11.095	0.832
	> 150	51	78.41 ± 15.151	
Pulse Rate	≤ 150	49	81.98 ± 15.934	0.188
	> 150	51	86.61 ± 18.794	
Oxygen Saturation	≤ 150	49	94.41 ± 2.715	**0.035***
	> 150	51	91.98 ± 7.562	
Random Blood Glucose	≤ 150	49	169.37 ± 80.717	0.800
	> 150	51	173.69 ± 88.498	

Table 5. Association of PLR with types of diagnosis

Diagnosis (Types)		Platelet to Lymphocyte ratio		Total	p
		≤ 150	> 150		
Types of ACS	STEMI	21(42.9)	36(70.6)	57(57.0)	**0.005***
	NSTE-ACS	28(57.1)	15(29.4)	43(43.0)	
ECG	Anterior	10(20.4)	20(39.2)	30(30.0)	**0.020***
	Inferior	9(18.4)	15(29.4)	24(24.0)	
	Lateral	2(4.1)	1(2.0)	3(3.0)	
	Non-STEMI	28(57.1)	15(29.4)	43(43.0)	
Cardiac Markers	Normal	8(16.3)	6(11.8)	14(14.0)	0.511
	Elevated	41(83.7)	45(88.2)	86(86.0)	
Culprit Artery	LAD	13(48.1)	18(52.9)	31(50.8)	0.308
	RCA	10(37.0)	15(44.1)	25(41.0)	
	LCX	4(14.8)	1(2.9)	5(8.2)	
Angiography Abnormalities other than Culprit Artery	Single Vessel	9(30.0)	11(29.7)	20(29.9)	0.723
	Two Vessels	16(53.3)	17(45.9)	33(49.3)	
	Three Vessels	5(16.7)	9(24.3)	14(20.9)	
Management	Medical	17(34.7)	10(19.6)	27(27.0)	0.089
	Intervention	32(65.3)	41(80.4)	73(73.0)	

Table 6. Relationship Between PLR and complications and outcomes of patients

Variables		**Platelet to Lymphocyte ratio**		**Total**	**p**
		≤ 150	**> 150**		
Complications					
Pulmonary Edema	Yes	4(8.2)	13(25.5)	17(17.0)	**0.021***
	No	45(91.8)	38(74.5)	83(83.0)	
Developed Heart Failure	Yes	8(16.3)	19(37.3)	27(27.0)	**0.018***
	No	41(83.7)	32(62.7)	73(73.0)	
Acute Kidney Injury	Yes	0(0.0)	8(15.7)	8(8.0)	**0.006***
	No	49(100.0)	43(84.3)	92(92.0)	
Gastrointestinal Bleeding	Yes	0(0.0)	2(3.9)	2(2.0)	0.495
	No	49(100.0)	49(96.1)	98(98.0)	
Arrhythmia	Yes	14(28.6)	29(56.9)	43(43.0)	**0.004***
	No	35(71.4)	22(43.1)	57(57.0)	
Outcome					
Discharge		49(100.0)	45(88.2)	94(94.0)	**0.027***
Death		0(0.0)	6(11.8)	6(6.0)	

consumption, contrary to El Rabat et al. (2020), who found a significant association. The discrepancy could be due to factors such as a lack of a health database, a small sample size, and the study being limited to one city and nationality. Additionally, Heidarpour et al. (2021) concluded that PLR is not a standalone prognostic factor in patients with premature IHD.

There was no observed association between PLR and patients' history of medical conditions, including ischemic heart disease, asthma, chronic kidney disease, and hypertension. Li et al. (2022), identified PLR as an inflammation index with prognostic value in heart failure, but not as an independent prognostic factor in acute heart failure. Beyhan et al. (2020), despite limited data, suggested PLR might predict asthma control. Additionally, no association was found between PLR and symptoms such as chest pain, shortness of breath, nausea, vomiting, sweating, and epigastric pain. In line with this finding, Intan et al. (2022), did find an independent correlation between PLR and symptomatic heart failure onset 6 months post-admission in ACS patients, advocating for PLR as a supplementary biomarker in resource-limited settings.

The present study identified a substantial relationship between PLR and patients' oxygen saturation, similar to Hedhliabir et al. (2018), who found a significant association between PLR and hypoxia and hypercapnia in acute exacerbation of COPD. As revealed by the results, PLR had significant relationships with types of ACS, with a higher incidence of STE-ACS in high PLR groups, which is consistent with Oylumlu et al.'s (2020) findings.

Demir et al. (2018), showed that PLR is associated with mortality in patients with acute cardiogenic pulmonary edema. The present study notes that 19% of patients experienced pulmonary edema, aligning with findings by Niu et al. (2022), that suggest acute cardiogenic pulmonary edema constitutes 10-20% of acute heart failure syndromes. Also, PLR, as an inflammatory marker, shows promise for predicting patient outcomes across various diseases.

The present study showed that higher PLR is associated with higher mortality, in the same line Asoglu et al. (2019), noted that inflammatory activation and increased platelet activity play a crucial role in AC. Similarly, Kazem et al. (2022) study demonstrated a significant and independent age-specific relationship between PLR and cardiovascular mortality in ACS patients. Lastly, the present study aligns with Asoglu et al.'s observation of the role of inflammation and platelet activity in ACS and supports the use of PLR as a cost-effective and reliable biomarker for forecasting complications and mortality (Asoglu et al. 2019).

Conclusion

The study underscores the significance of the Platelet-to-Lymphocyte Ratio (PLR) as a prognostic marker in patients with Acute Coronary Syndrome (ACS). Findings indicate that a higher PLR is significantly associated with severe in-hospital complications such as heart failure, pulmonary edema, and arrhythmias, particularly in patients with ST-Elevation ACS (STE-ACS). Despite no observed correlation between PLR and common risk factors like smoking or family history of ischemic heart disease, the study highlights the association between elevated PLR and reduced oxygen saturation, which could reflect a heightened inflammatory and prothrombotic state. Given the simplicity and cost-effectiveness of measuring PLR, it could serve as a valuable tool in resource-limited settings for predicting adverse outcomes in ACS patients, thereby informing clinical decisions and improving patient management. Future research should explore the utility of PLR in broader populations to validate its prognostic value across diverse clinical settings.

Author contributions

A.A.J.K. conceptualized the project, developed the methodology, conducted formal analysis, and drafted the original writing. O.H.K. contributed to the methodology, conducted investigations, provided resources, visualized the data, and contributed to the reviewing and editing of the writing.

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Competing financial interests

The authors have no conflict of interest.

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