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RESEARCH ARTICLE

Impact of Platelet-lymphocyte and Neutrophil-lymphocyte Ratios on Postoperative Mortality After Coronary Artery Bypass Surgery

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ABSTRACT

Objectives: Inflammation plays a crucial role in postoperative outcomes following coronary artery bypass grafting (CABG) surgery. Readily available hematological markers, such as the platelet-to-lymphocyte ratio (PLR) and neutrophil-to-lymphocyte ratio (NLR), have been increasingly recognized as indicators of systemic inflammation. However, their relationship with postoperative mortality in coronary artery bypass grafting (CABG) surgery remains uncertain. This study aims to evaluate the effect of postoperative PLR and NLR on mortality in patients undergoing CABG surgery.

Methods: This retrospective observational study included 470 patients who underwent CABG surgery between March 2020 and June 2022. Postoperative blood samples were analyzed to assess PLR and NLR levels. The primary outcome of the study was postoperative mortality. Logistic regression models were used to evaluate the association between these inflammatory markers and mortality risk.

Results: Preoperative PLR and NLR values were not significantly associated with postoperative mortality ($p>0.05$). However, postoperative NLR was found to be a significant predictor of mortality ($p<0.05$), with each unit increase in postoperative NLR correlating with a 1.05-fold increase in mortality risk (95% CI: 1.02–1.09). Although postoperative PLR levels were elevated, they did not show a statistically significant relationship with mortality.

Conclusion: This study demonstrates that postoperative NLR is significantly associated with mortality in patients undergoing CABG surgery, while postoperative PLR does not show a significant correlation. Regular monitoring of postoperative NLR may help identify high-risk patients early and enable timely interventions to improve outcomes. Given its accessibility and cost-effectiveness, incorporating NLR into routine postoperative monitoring could enhance patient management. Further multicenter studies are needed to validate these findings and refine the clinical implications of NLR and PLR in CABG patients.

Keywords: Coronary artery bypass grafting (CABG), inflammation, mortality risk, neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR)

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Introduction

Coronary artery disease (CAD) is a leading cause of cardiovascular mortality worldwide, responsible for over 4.5 million deaths in developing countries.[1] Coronary artery bypass grafting (CABG) has been shown to improve overall health-related quality of life and reduce mortality.[2,3] Outcomes related to cardiac surgery, particularly CABG, have been extensively reported in the United States, Canada, and Western Europe.[4–8] Technological advancements and new surgical techniques have so far been insufficient in reducing the high mortality and morbidity risks associated with cardiac surgery.[9–11] Factors contributing to mortality and morbidity rates include left ventricular dysfunction, preoperative anemia, chronic kidney failure, the diameter of the coronary artery, advanced age, and socioeconomic status.[12–17]

Inflammation plays a crucial role in the pathogenesis and progression of cardiovascular diseases. Emerging research highlights the importance of systemic inflammatory responses not only in the progression of disease but also as a critical factor in determining surgical outcomes and patient recovery. Early identification of heightened inflammatory responses could lead to targeted

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interventions that mitigate adverse outcomes, particularly in high-risk patient populations. Surgical interventions activate the inflammatory system response and can trigger a chain reaction that affects patient survival.[18–20] The use of inflammatory ratios in surgical interventions has been explored in previous studies.[21–27] Therefore, many inflammatory parameters have been investigated regarding their ability to reflect the progression of CABG procedures. One of the most important and frequently studied parameters is the neutrophil-to-lymphocyte ratio (NLR). NLR has emerged as a simple yet highly informative marker, providing insights into the patient's immune response during and after surgery. During cardiac surgery, systemic inflammatory responses are triggered by the pump, leading to negative effects on NLR, which may result in adverse postoperative outcomes.[28,29] Platelets are significant mediators of inflammatory and ischemic damage in vital organs. A low platelet count following CABG has been associated with early mortality and poor prognosis.[30–32] The platelet-to-lymphocyte ratio (PLR) has been found to be an indicator of the severity of atherosclerosis in stable coronary disease.[33] This study aims to investigate the role of postoperative NLR and PLR in predicting mortality following CABG under cardiopulmonary bypass.

Methods

This retrospective, observational cohort study was conducted in the Cardiothoracic Surgery Department of Mersin University Faculty of Medicine Training and Research Hospital, a single tertiary academic hospital. The study includes a consecutive cohort of patients who underwent CABG at our institution between March 1, 2020 and June 1, 2022, providing a comprehensive data set for analyzing the effects of inflammatory markers on postoperative outcomes. This cohort was selected to ensure a broad representation of patient demographics, comorbid conditions, and a range of surgical outcomes, thereby enhancing the robustness of our findings.

Data Collection

In patients undergoing coronary artery bypass surgery, a nested case-control research design was used to compare factors associated with mortality. The number of patients to be included in the study was determined to be 445, considering that the odds ratio for exposure associated with mortality (PLR, NLR, and other factors) was 1.5 times (the smallest clinically significant ratio) and the width of the confidence interval was set at 25%. The number of patients with mortality (cases) was matched at a 1:4 ratio with patients without mortality (controls). Data on patients' demographic characteristics, laboratory test results, procedure duration, left ventricular ejection fraction, and the presence of multivessel disease were examined according to a predefined protocol. Venous blood was collected during admission and postoperatively on a daily basis in vacuum tubes containing ethylenediaminetetraacetic acid (EDTA) for CBC measurements at multiple time points. CBC, which includes WBC count, hemoglobin level, and platelet count, was analyzed using an automated blood cell analyzer.

Data Analysis

For data analysis, mean and standard deviation were used for continuous variables, while median, minimum, and maximum values were used for characteristics. Frequency and percentage values were used to describe categorical variables. Student's t-test was used to compare age, EF, and biochemical measurement means according to mortality status, while the paired t-test was used for repeated measures. The Chi-square test was used to assess the relationship between mortality status and variables such as gender, DM, and HT. Odds ratio and 95% confidence intervals were provided for age, gender, EF, DM, HT, and biochemical parameters associated with mortality. A significance level of $p<0.05$ was considered statistically significant. Data were analyzed using IBM SPSS 21 and MedCalc statistical software. Parametric tests were used without normality testing for continuous measurements, due to adherence to the Central Limit Theorem.[34]

Data Availability Statement

Data sets created and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Ethical Approval

Ethical approval for the study was obtained from the Mersin University Ethics Committee with the decision numbered 2024/474 and dated 22/05/2024.

Declaration of Helsinki

The study and the writing of the article were prepared in accordance with the Declaration of Helsinki.

Informed Written Consent

Informed written consent was obtained in the surgical consent form before the subjects were included in the study.

Results

A total of 470 patients were included in the study. Their basic characteristics and clinical data are presented in Table 1.

Table 1. Distribution of socio-demographic characteristics in patients undergoing open heart surgery (n=470)

Characteristic	Mean±SD (min-max)	Median
Age (year)	64.7±9.8	67 (27–85)
	Count (n)	**%**
Gender		
Male	328	69.7
Female	142	30.3
DM		
No	177	37.7
Yes	293	62.3
HT		
No	266	56.7
Yes	204	43.3
Mortality		
Alive	353	75.1
Exitus	117	24.9
	Mean±SD (min-max)	**Median**
EF	52.44±7.52	56 (30–65)

Continuous variables are presented as mean±standard deviation and median (minimum–maximum); categorical variables are expressed as count (percentage). Statistical comparisons were performed using Student's t-test or Mann–Whitney U test for continuous variables, and the Chi-square test for categorical variables. This table presents only descriptive statistics; p-values are not provided. SD: Standard deviation; DM: Diabetes mellitus; HT: Hypertension; EF: Ejection fraction.

According to Table 1, the patient cohort in this study spans a wide age range, from 27 to 85 years, with a mean age of 64.7 years. The gender distribution is 69.7% male and 30.3% female. 62.3% of the patients have diabetes mellitus (DM), and 43.3% have hypertension (HT). The mortality rate is 24.9%, with 117 patients experiencing mortality and 353 surviving. The mean left ventricular ejection fraction (EF) is 52.44, with a range from 30 to 65.

According to Table 2, ejection fraction (EF) was significantly lower in the mortality group compared to the survivors (50.22±9.34 vs. 53.17±6.6, p=0.002). Postoperative creatinine levels were higher in the mortality group (1.31±0.66) than in the survivors (0.94±0.52, p<0.001), whereas preoperative creatinine levels did not differ significantly between the two groups (0.97±0.27 vs. 0.95±0.45, p=0.68). Urea levels were significantly higher both preoperatively (42.99±15.95 vs. 37.68±16.61, p=0.003) and postoperatively (64.93±31.58 vs. 40.47±22.65, p<0.001) in the mortality group.

Postoperative neutrophil counts were significantly higher in the mortality group (11.49±4.79 vs. 10.8±3.94, p=0.006), while preoperative neutrophil levels were not significantly different (p=0.21). Lymphocyte counts showed no significant difference preoperatively (p=0.74) or postoperatively (1.29±0.62 vs. 1.33±0.71, p=0.86). Platelet counts were similar preoperatively (p=0.74), but postoperative values were significantly lower in the mortality group (144.31±66.53 vs. 158.01±49.25, p=0.04).

There was no significant difference in platelet-to-lymphocyte ratio (PLR) either preoperatively (135.35±49.64 vs. 131.68±39.55, p=0.59) or postoperatively (167.59±42.58 vs. 162.82±40.47, p=0.72). Likewise, preoperative neutrophil-to-lymphocyte ratio (NLR) showed no significant difference between the groups (3.04±1.82 vs. 3.07±1.91, p=0.87), whereas postoperative NLR was significantly higher in the mortality group (12.64±6.94 vs. 10.09±5.64, p=0.006).

Preoperative CRP values did not differ significantly (p=0.09), while postoperative CRP levels were higher in the mortality group (312.27±34.34 vs. 152.04±39.79, p=0.03). Both preoperative (36.53±4.51 vs. 38.19±3.61, p=0.001) and postoperative albumin levels (25.84±3.95 vs. 28.74±8.59, p=0.02) were lower in the mortality group. No statistically significant difference was found in gender distribution (p=0.08). However, both diabetes mellitus (p=0.04) and hypertension (p=0.04) were significantly associated with mortality.

According to Table 3, ejection fraction (EF) was significantly associated with mortality, with each 1-unit increase in EF reducing the risk of mortality (Odds Ratio=0.93, 95% CI: 0.93–0.98, p<0.001). Male gender was also significantly associated with higher mortality (OR=1.76, 95% CI: 1.12–2.76, p=0.01). Diabetes mellitus (DM) was associated with a decreased risk of mortality (OR=0.63, 95% CI: 0.41–0.98, p=0.04), whereas hypertension (HT) was associated with an increased risk (OR=1.55, 95% CI: 1.01–2.28, p=0.04). Age was not significantly associated with mortality (OR=1.02, 95% CI: 0.99–1.04, p=0.17).

According to Table 4, preoperative urea levels were significantly associated with mortality, with each 1-unit increase corresponding to an increased risk (OR=1.04, 95% CI: 1.01–1.03, p=0.004). Preoperative albumin levels were also significantly associated with mortality, with each 1-unit increase reducing the risk (OR=0.90, 95% CI: 0.85–0.95, p<0.001). Other preoperative biochemical parameters, including creatinine, neutrophil (NEU), lymphocyte (LYM), platelet (PLT) counts, platelet-to-lymphocyte ratio (PLR), neutrophil-to-lymphocyte ratio (NLR), and C-reactive protein (CRP), did not show statistically significant associations with mortality (p-values: 0.68, 0.21, 0.68, 0.74, 0.58, 0.87, and 0.11, respectively).

According to Table 5, postoperative creatinine levels were significantly associated with mortality, with each 1-unit increase corresponding to a 1.88-fold increase in risk (95% CI: 1.33–2.65, p<0.001). Postoperative urea levels were also significantly associated with mortality (OR=1.02, 95%

Table 2. Evaluation of differences and relationships in socio-demographic and biochemical measurements according to mortality status (n=470)

Features	Alive (n=353) mean±SD	Exitus (n=117) mean±SD	p*/***
Age (year)	63.4±9.4	65±13.1	0.17
EF	53.17±6.6	50.22±9.34	**0.002**
Pre-creatinine (mg/dL)	0.95±0.45	0,97±0.27	0.68
Post-creatinine (mg/dL)	0.94±0.52	1.31±0.66	**<0.001**
p**	0.92	**<0.001**	
Pre-ure (mg/dL)	37.68±16.61	42.99±15.95	**0.003**
Post-ure (mg/dL)	40.47±22.65	64.93±31.58	**<0.001**
p**	**0.01**	**<0.001**	
Pre-NEU (10^3mcL)	5.64±2.39	5.23±2.07	0.21
Post- NEU (10^3mcL)	10.8±3.94	11.49±4.79	**0.006**
p**	**<0.001**	**<0.001**	
Pre-LYM (10^3mcL)	2.14±0.54	2.07±0.99	0.74
Post-LYM (10^3mcL)	1.33±0.71	1.29±0.62	0.86
p**	**<0.001**	**<0.001**	
Pre-PLT (10^3mcL)	239.06±69.43	236.74±74.54	0.74
Post-PLT (10^3mcL)	158.01±49.25	144.31±66.53	0.04
p**	**<0.001**	**<0.001**	
Pre-PLR	131.68±39.55	135.35±49.64	0.59
Post-PLR	162.82±40.47	167.59±42.58	0.72
p**	**<0.001**	**0.003**	
Pre-NLR	3.07±1.91	3.04±1.82	0.87
Post-NLR	10.09±5.64	12.64±6.94	0.006
p**	**<0.001**	**<0.001**	
Pre-CRP (mg/L)	19.32±7.24	13.17±9.33	0.09
Post-CRP (mg/L)	152.04±39.79	312.27±34.34	0.03
p**	**<0.001**	**<0.001**	
Pre-albumin (mg/L)	38.19±3.61	36.53±4.51	0.001
Post-albumin (mg/L)	28.74±8.59	25.84±3.95	0.02
p**	**<0.001**	**<0.001**	
Gender, n (%)			
Male	257 (72.8)	71 (60.4)	0.08***
Female	96 (27.2)	46 (39.6)	
DM+	227 (77.5)	66 (22.5)	**0.04*** **
HT+	141 (69.1)	63 (30.9)	**0.04*** **

*: Student's t test; **: Paired t test; ***: Chi-Square test (p<0.05 significance). Statistical tests applied include Student's t-test for continuous variables, paired t-test for repeated measures, and the Chi-Square test for categorical variables. In the table, statistical values that are significant are marked in bold. The p-value indicates the level of statistical significance, where values less than 0.05 are considered significant. SD: Standard deviation; EF: Ejection fraction; NEU: Neutrophils; LYM: Lymphocytes; PLT: Platelet; PLR: Platelet-to-lymphocyte ratio; NLR: Neutrophil-to-lymphocyte ratio; CRP: C-Reactive protein; DM: Diabetes mellitus; HT: Hypertension.

CI: 1.01–1.03, p<0.001). Postoperative neutrophil (NEU) counts were associated with increased mortality (OR=1.08, 95% CI: 1.03–1.13, p=0.003), whereas postoperative lymphocyte (LYM) counts were not significantly associated (p=0.86). Postoperative platelet (PLT) counts were inversely associated with mortality (OR=0.95, 95% CI: 0.90–0.97, p=0.017). Postoperative neutrophil-to-lymphocyte ratio (NLR) showed a significant association with mortality (OR=1.05, 95% CI: 1.02–1.09, p=0.001), while postoperative platelet-to-lymphocyte ratio (PLR) did not reach statistical significance (p=0.067). Postoperative albumin levels were significantly associated with decreased mortality risk (OR=0.83, 95% CI: 0.76–0.89, p<0.001).

Table 3. Evaluation of the relationship between mortality and age, gender, and chronic disease status (n=470)

Variables	OR	95% CI	p
Age	1.02	0.99–1.04	0.17
EF	0.93	0.93–0.98	**<0.001**
Gender (Risk: Male)	1.76	1.12–2.76	**0.01**
DM (Risk: 1)	0.63	0.41–0.98	**0.04**
HT (Risk: 1)	1.55	1.01–2.28	**0.04**

Statistical tests applied include logistic regression analysis to evaluate the effects of age, gender, and chronic disease status on mortality. In the table, statistical values that are significant are marked in bold. The p-value indicates the level of statistical significance, where values less than 0.05 are considered significant. OR: Odds ratio; CI: Confidence interval; EF: Ejection fraction; DM: Diabetes mellitus, HT: Hypertension.

Table 4. Evaluation of the relationship with preoperative biochemical parameters (n=470)

Variables	OR	95% CI	p
Pre-creatinine (mg/dL)	1.06	0.79–1.43	0.68
Pre-ure (mg/dL)	1.04	1.01–1.03	**0.004**
Pre-NEU (10^3mcL)	0.94	0.85–1.03	0.21
Pre-LYM (10^3mcL)	1.06	0.81–1.37	0.68
Pre-PLT (10^3mcL)	0.97	0.96–1.02	0.74
Pre-PLR	1.001	0.98–1.01	0.58
Pre-NLR	1.01	0.88–1.11	0.87
Pre-CRP (mg/L)	0.98	0.95–1.001	0.11
Pre-albumin (mg/L)	0.90	0.85–0.95	**<0.001**

Statistical tests applied include logistic regression analysis to evaluate the effect of preoperative biochemical parameters on mortality. In the table, statistical values that are significant are marked in bold. The p-value indicates the level of statistical significance, where values less than 0.05 are considered significant. OR: Odds ratio; CI: Confidence interval; NEU: Neutrophils; LYM: Lymphocytes; PLT: Platelets; PLR: Platelet-to-lymphocyte ratio; NLR: Neutrophil-to-lymphocyte ratio, CRP: C-reactive protein.

Table 5. Evaluation of the relationship with postoperative biochemical parameters (n=470)

Variables	OR	95% CI	p
Post-creatinine (mg/dL)	1.88	1.33–2.65	**<0.001**
Post-ure (mg/dL)	1.02	1.01–1.03	**<0.001**
Post- NEU (10^3mcL)	1.08	1.03–1.13	**0.003**
Post-LYM (10^3mcL)	0.99	085–1.14	0.86
Post-PLT (10^3mcL)	0.95	0.9–0.97	**0.017**
Post-PLR	1.01	0.99–1.02	0.067
Post-NLR	1.05	1.02–1.09	**0.001**
Post-CRP (mg/L)	1.01	0.99–1.02	0.62
Post-albumin (mg/L)	0.83	0.76–0.89	**<0.001**

Statistical tests applied include logistic regression analysis to evaluate the effect of postoperative biochemical parameters on mortality. In the table, statistical values that are significant are marked in bold. The p-value indicates the level of statistical significance, where values less than 0.05 are considered significant. OR: Odds ratio; CI: Confidence interval; NEU: Neutrophils; LYM: Lymphocytes; PLT: Platelets; PLR: Platelet-to-lymphocyte ratio; NLR: Neutrophil-to-lymphocyte ratio, CRP: C-reactive protein.

Discussion

This study aimed to evaluate the prognostic value of postoperative platelet-to-lymphocyte ratio (PLR) and neutrophil-to-lymphocyte ratio (NLR) in predicting mortality after coronary artery bypass grafting (CABG). Our findings clearly demonstrate that postoperative NLR is significantly associated with increased mortality, whereas postoperative PLR does not show a statistically significant relationship. Based on both preoperative and postoperative data, we constructed a multifactorial model to estimate mortality risk. The growing reliance on simple, cost-effective inflammatory indices such as NLR and PLR stems from their accessibility and integration within routine blood tests.

The biological mechanism linking NLR to adverse outcomes likely stems from the central role of inflammation in postoperative complications. Neutrophils, as key effectors of acute inflammation, release reactive oxygen species that contribute to endothelial damage and tissue injury.[35,36] They also generate extracellular traps and activate platelets, facilitating thrombogenesis and amplifying immune responses.[37–39]

Moreover, this elevation in postoperative neutrophil count was found to be an independent predictor of mortality. These findings reinforce the role of neutrophils not only as inflammatory mediators but also as prognostic markers that may indicate systemic immune activation and tissue injury after CABG. In addition to the neutrophil-driven inflammatory response, our findings also revealed that postoperative platelet counts were significantly lower in patients who experienced mortality. Thrombocytopenia following CABG may indicate excessive platelet consumption or sequestration secondary to systemic inflammation, microvascular thrombosis, or extracorporeal circuit-related platelet activation. This inverse relationship between platelet count and mortality risk supports the hypothesis that platelet dynamics play a critical role in postoperative outcomes and could serve as an additional early warning marker in high-risk patients.

Interestingly, our analysis revealed that diabetes mellitus (DM) was associated with a reduced risk of postoperative mortality. This finding appears counterintuitive, given the well-established association between diabetes and adverse cardiovascular outcomes. One possible explanation is that diabetic patients often receive more rigorous perioperative monitoring, including tighter glycemic control, early nutritional support, and closer cardiovascular surveillance, which may positively influence surgical outcomes. However, this association should be interpreted with caution, as residual confounding and selection bias cannot be entirely ruled out. Further studies are needed to explore whether specific management protocols in diabetic patients truly contribute to improved postoperative survival.

In contrast to diabetes mellitus, hypertension was found to be significantly associated with increased postoperative mortality in our cohort. This finding is consistent with prior studies suggesting that hypertensive patients may have greater baseline vascular stiffness, end-organ damage, or impaired microcirculatory reserve, all of which may compromise postoperative recovery.[40–42] Unlike diabetes, perioperative management protocols for hypertension may not be as aggressive or standardized, which could partly account for the increased risk. However, the association likely reflects complex hemodynamic and structural factors rather than insufficient monitoring alone.

Another unexpected finding in our study was the lower mortality rate among female patients. Although previous studies have shown that women may experience higher short-term mortality after CABG due to smaller coronary vessel diameter, delayed diagnosis, or atypical presentation,[15,16] our results did not confirm this trend. Possible explanations include the relatively smaller number of female patients in our cohort, potential selection bias, or specific institutional practices that may have provided more uniform care. These findings suggest that sex-related differences in CABG outcomes remain complex and should be further explored in future studies with larger and more diverse populations.

In contrast, the prognostic value of lymphocyte count was limited in our dataset. Although low lymphocyte levels have been linked to poor cardiovascular outcomes,[43] we did not find a significant association between postoperative lymphocyte count and mortality (p=0.86). This might reflect transient postoperative immunosuppression or variability in lymphocyte subtypes, which may exert either protective or harmful effects depending on context.[40–42]

NLR, as a composite index reflecting both neutrophil-driven inflammation and lymphocyte-mediated immunity, has garnered attention as a prognostic tool. Weedle et al.[44] reported that increased preoperative NLR was predictive of postoperative complications, and similar findings were echoed by Giakoumidakis et al.,[45] who linked perioperative NLR to both short-term mortality and prolonged hospitalization. Green et al.[46] confirmed the temporal stability and prognostic utility of NLR in cardiac surgery patients. While Haran et al.[47] emphasized the predictive value of preoperative NLR>3.36, our findings highlight that postoperative NLR may be an even more sensitive indicator of mortality risk.

Additionally, high preoperative NLR values have been inversely associated with venous graft patency rates,[48] likely due to endothelial injury and inflammatory signaling under shear stress.[49] A meta-analysis by Jackson et al.[50] further demonstrated a robust association between preoperative NLR and all-cause mortality, underscoring the systemic relevance of inflammatory dysregulation.

In summary, our study confirms that postoperative NLR is a significant and independent predictor of mortality in CABG patients. Monitoring postoperative NLR may provide a valuable opportunity for early identification of high-risk patients and timely intervention. Given its practicality and prognostic strength, NLR should be considered a routine component of postoperative surveillance in cardiac surgery.

Limitations of the Study

This study has several potential limitations. Firstly, the single-center and retrospective design limits the generalizability of the findings. The study focused on patients who underwent CABG using cardiopulmonary bypass (CPB) and addressed variables affecting early clinical outcomes through multivariable logistic regression analysis. However, some variables may have confounded the results.

Additionally, using patient groups operated on by the same experienced surgical team with the same technique may eliminate variations between centers, but it could complicate the assessment of the impact of different surgical teams and techniques. Mortality was addressed only in terms of overall causes, without a detailed examination of specific causes of death.

Given the ease of integrating PLR and NLR into routine blood tests, large-scale, multicenter randomized studies are essential to validate these findings and solidify the role of these inflammatory markers in predicting postoperative mortality. Additionally, future research should aim to incorporate larger, multicenter cohorts to validate the generalizability of our findings and refine the predictive models for different patient subgroups. These limitations emphasize the need for caution when interpreting the generalizability of the findings and their implications for clinical practice. Furthermore, some findings—such as the lower mortality rates among female and non-diabetic patients—differ from what is generally expected in the literature. These results may be influenced by sample size limitations, unmeasured confounding variables, or institutional-level practices. Particularly, the reduced mortality among women and diabetic patients might reflect closer clinical surveillance or selection bias rather than a true protective effect. These unexpected outcomes should therefore be interpreted cautiously and verified in future multicenter studies with broader patient populations.

Conclusion

In this study, we investigated the impact of the platelet-to-lymphocyte ratio (PLR) and the neutrophil-to-lymphocyte ratio (NLR) on postoperative mortality in patients undergoing coronary artery bypass grafting (CABG). Our findings demonstrated that preoperative PLR and NLR were not significantly associated with mortality. However, postoperative NLR emerged as a significant factor, with each unit increase in postoperative NLR elevating the mortality risk by 5% (95% CI: 1.02–1.09, p=0.001). In contrast, although postoperative PLR levels were elevated, they did not exhibit a significant relationship with mortality.

These results highlight the critical role of postoperative NLR as a prognostic marker for identifying high-risk patients after CABG. Given its accessibility and cost-effectiveness as part of routine blood tests, incorporating NLR into postoperative risk stratification may enhance patient management. Further large-scale, multicenter studies are warranted to confirm these findings and optimize the clinical utility of NLR in predicting postoperative mortality.

Key points

What is known about the topic?

Inflammation plays a crucial role in the pathogenesis and progression of cardiovascular diseases, particularly in conditions such as coronary artery disease (CAD). The platelet-to-lymphocyte ratio (PLR) and neutrophil-to-lymphocyte ratio (NLR) are widely recognized as simple, cost-effective inflammatory markers derived from routine complete blood count tests. These ratios provide valuable insights into the immune response and systemic inflammation. Several studies suggest that elevated levels of these markers are associated with worse clinical outcomes, including increased mortality and complications following cardiac surgery, particularly in patients undergoing coronary artery bypass grafting (CABG). While existing literature highlights NLR as a significant prognostic tool for predicting postoperative morbidity and mortality in CABG patients, the predictive value of PLR remains inconclusive, with inconsistent findings across studies.

What does this study add?

This study contributes to the existing literature by directly comparing the prognostic value of PLR and NLR in predicting postoperative mortality in CABG patients and determining which marker is more valuable. Our findings reveal that while preoperative PLR and NLR do not significantly correlate with mortality, postoperative NLR is a stronger predictor, with each 1-unit increase associated with a 1.05-fold increase in mortality risk (95% CI: 1.02–1.09, p=0.001). Conversely, postoperative PLR, despite being elevated, does not exhibit a statistically significant association with mortality. These results emphasize the importance of postoperative NLR as a practical and easily accessible prognostic marker for identifying high-risk patients, enabling early interventions, and improving surgical outcomes. This study highlights the necessity of integrating NLR into routine postoperative monitoring protocols in clinical practice, providing a more refined approach to risk stratification and patient management following CABG.

Disclosures

Ethics Committee Approval: The study was approved by the Mersin University Clinical Research Ethics Committee (no: 2024/474, date: 22/05/2024).

Informed Consent: Informed consent was obtained from all participants.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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