RESEARCH PAPER

"Retrospective Study of Neutrophil–Lymphocyte Ratio as a Predictor of Adverse Outcomes in Acute Myocardial Infarction in a Tertiary Care Hospital in Chengalpattu District."

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Abstract

Background: Acute myocardial infarction (AMI) remains a leading cause of morbidity and mortality globally despite significant advances in therapeutic strategies. Inflammation plays a central role in the pathogenesis and prognosis of AMI. The neutrophil–lymphocyte ratio (NLR), a simple and inexpensive marker of systemic inflammation derived from a routine complete blood count, has emerged as a potential prognostic biomarker in acute coronary syndromes. This study aimed to evaluate the predictive value of admission NLR for adverse in-hospital outcomes among patients with AMI.

Methods: We conducted a retrospective hospital-based cohort study including 260 adult patients admitted with AMI—either ST-elevation myocardial infarction (STEMI) or non-ST-elevation myocardial infarction (NSTEMI)—between December 2023 and December 2025. Patients with active infections, haematological disorders, or incomplete laboratory data were excluded. Demographic, clinical, and laboratory data were collected, and NLR was calculated from the admission complete blood count. Adverse in-hospital outcomes—cardiogenic shock, acute heart failure, malignant arrhythmias, and mortality—were recorded. Statistical analyses were performed using JAMOVI software; associations between NLR and outcomes were evaluated using chi-square and logistic regression tests, with $p < 0.05$ considered significant.

Results: The mean age of the cohort was 58.7 ± 10.8 years, with 71.5% being male. Adverse outcomes occurred in 75 patients (28.8%). Patients with complications were significantly older and had higher rates of diabetes and hypertension than those without. Mean NLR was markedly higher in patients with adverse outcomes compared to those without (7.8 ± 3.2 vs 3.7 ± 1.8; $p < 0.001$). When stratified by NLR category, adverse outcomes were observed in 62.7% of patients with high NLR (>6), 29.3% with moderate NLR (3–6), and 8.0% with low NLR (<3). The association between increasing NLR and adverse outcomes was highly significant ($\chi^2 = 54.9$, $p < 0.001$). STEMI patients exhibited a higher frequency of complications (74.7%) compared to NSTEMI (25.3%).

Conclusion: Admission NLR was a strong, independent predictor of in-hospital adverse outcomes among AMI patients, reflecting the prognostic relevance of inflammation in myocardial injury. Given its accessibility, low cost, and rapid availability, NLR may serve as a valuable adjunct for early risk stratification and clinical decision-making in resource-limited settings. Prospective multicentre studies are warranted to validate optimal NLR cut-offs and integrate them into existing prognostic models such as GRACE and TIMI scores.

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Introduction

Acute myocardial infarction (AMI) continues to be one of the most severe causes of morbidity and mortality worldwide, notwithstanding advancements in diagnostic and therapeutic approaches. The inflammatory response that occurs during atherosclerotic plaque rupture and myocardial necrosis is a key factor in determining the size of the infarct, how the ventricles change shape, and the clinical outcomes that follow. Consequently, the identification of straightforward inflammatory markers capable of early prognostic prediction during hospitalisation is of significant clinical relevance.

The neutrophil–lymphocyte ratio (NLR), obtained from a standard complete blood count, has become a dependable and cost-effective indicator of systemic inflammation among various haematological indices. Tamhane et al. (2008) showed that a high admission NLR was linked to higher in-hospital and six-month mortality in patients with acute coronary syndrome, which suggests that it could be useful for early risk stratification.(1) In a similar vein, Arbel et al. (2014) found that a higher NLR in patients with ST-elevation myocardial infarction (STEMI) was linked to a lower left ventricular ejection fraction and a higher long-term

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risk of death from any cause, which suggests that it could be a useful prognostic marker.(2)

Meta-analyses provide additional corroboration for these findings. Zhang et al. (2018) established that an increased NLR is a significant predictor of in-hospital mortality and major adverse cardiac events in STEMI patients undergoing percutaneous coronary intervention.(3) Simultaneously, Dong et al. (2018) demonstrated that elevated NLR correlates with a heightened risk of mortality and significant adverse cardiac events within the continuum of acute coronary syndromes. (4)Nonetheless, data from Indian tertiary care facilities are limited, especially in South Indian populations where inflammatory profiles and treatment modalities may vary. The current study seeks to assess the efficacy of admission NLR as a reliable predictor of unfavourable in-hospital outcomes, including cardiogenic shock, heart failure, arrhythmias, and mortality, among AMI patients in a tertiary care hospital in Chengalpattu district. This study aims to validate NLR as a straightforward, expedient, and economical instrument for early prognostic evaluation in emergency care environments.

Methodology

This study is structured as a retrospective hospital-based cohort investigation carried out in the Department of General Medicine at Karpaga Vinayaga Medical College and Hospital, Chengalpattu District, Tamil Nadu. The main goal is to find out if the admission neutrophil–lymphocyte ratio (NLR), which is an easy way to measure systemic inflammation, can tell if patients with acute myocardial infarction (AMI) will have bad outcomes in the hospital.

The study will encompass all adult patients aged 18 years and older who are admitted with a verified diagnosis of acute myocardial infarction (AMI), specifically either ST-elevation myocardial infarction (STEMI) or non-ST-elevation myocardial infarction (NSTEMI), during the period from December 2023 to December 2025. The diagnosis of AMI will be determined in accordance with the Fourth Universal Definition of Myocardial Infarction (2018), necessitating an elevation and/or reduction in cardiac biomarkers (Troponin I or CK-MB) alongside clinical or electrocardiographic indicators of myocardial ischaemia.

Patients will be identified through hospital medical records, and data will be gathered retrospectively utilising a structured data extraction form. Individuals with incomplete laboratory data, active infections at the time of admission, haematological disorders, or recent use of steroids or chemotherapy will be excluded, as these factors may affect leukocyte counts and distort the NLR values.

For every eligible patient, demographic factors like age and sex, clinical traits including comorbidities (hypertension, diabetes mellitus, dyslipidaemia, smoking status), and presentation aspects (type of AMI, haemodynamic parameters, ECG findings) will be documented. When you get to the hospital, the lab tests will include a complete blood count, cardiac biomarkers, renal and lipid profiles. To find the neutrophil–lymphocyte ratio, divide the absolute neutrophil count by the absolute lymphocyte count from the CBC report at admission. Echocardiographic results, especially the left ventricular ejection fraction (LVEF), will also be recorded.

Information about management, like thrombolytic therapy, percutaneous coronary intervention (PCI), or conservative treatment, will be taken from medical records. The main things we want to know about are bad events that happen in the hospital, such as cardiogenic shock, heart failure, malignant arrhythmias, and death. Each outcome will be delineated in accordance with established clinical criteria recorded in the patient's file.

Statistical analysis:

All the collected data were entered into a Microsoft Excel spreadsheet and analysed using JAMOVI software. Continuous variables were represented as means with standard deviations or medians with interquartile ranges, depending on the data distribution, whereas categorical variables were presented as frequencies and percentages. The Chi-square test was used to compare categorical variables. A p-value less than 0.05 was considered statistically significant.

Ethical Approval:

Before the study starts, the Institutional Ethics Committee of Karpaga Vinayaga Medical College and Hospital will give its approval. Because the research looks back in time, informed consent will not be needed, as per institutional policy and ethical guidelines. To protect patient privacy, all records will be kept private by making them anonymous and making sure that only authorised people can access and store the data.

This study seeks to ascertain the efficacy of a straightforward and cost-effective inflammatory marker, such as NLR, in predicting unfavourable in-hospital outcomes for AMI patients within a tertiary care environment. Setting a reliable cutoff value for NLR could help doctors figure out who is at risk early, get them the help they need quickly, and improve their care, especially in emergency situations where resources are limited.

Results:

Table 1: Baseline Demographic and Clinical Characteristics of Patients With and Without Adverse Outcomes (n = 260)

Variable	Total (n = 260)	With adverse outcomes (n = 75)	Without adverse outcomes (n = 185)

Age (years, mean ± SD)	58.7 ± 10.8	63.4 ± 9.1	56.7 ± 10.9
Male sex	186 (71.5%)	56 (74.7%)	130 (70.3%)
Diabetes mellitus	124 (47.7%)	46 (61.3%)	78 (42.1%)
Hypertension	138 (53.1%)	48 (64.0%)	90 (48.6%)
Smoking	108 (41.5%)	34 (45.3%)	74 (40.0%)
LVEF (% mean ± SD)	47.8 ± 9.6	41.3 ± 8.7	50.3 ± 8.1

Table 2: Distribution of Patients According to Type of Myocardial Infarction and Occurrence of Adverse Outcomes

Type of Myocardial Infarction	Number of Patients (n)	Percentage (%)	Adverse Outcomes (n)
STEMI	156	60	56 (74.7%)
NSTEMI	104	40	19 (25.3%)

Table 3: Comparison of Laboratory Parameters Between Patients With and Without Adverse Outcomes

Laboratory Parameter	With adverse outcomes (n = 75)	Without adverse outcomes (n = 185)
Total WBC count (×10⁹/L)	12.3 ± 3.4	9.6 ± 2.8
Neutrophil count (×10⁹/L)	9.8 ± 2.9	6.7 ± 2.3
Lymphocyte count (×10⁹/L)	1.3 ± 0.6	1.9 ± 0.7
Neutrophil–Lymphocyte Ratio (NLR)	7.8 ± 3.2	3.7 ± 1.8
Troponin I (ng/mL, median [IQR])	3.1 [1.8–5.4]	2.2 [1.2–3.8]

Table 4: Frequency Distribution of Specific In-Hospital Adverse Outcomes Among Patients With Acute Myocardial Infarction (n = 260)

Adverse Outcome	Number of Patients (n)	Percentage (%)
Cardiogenic shock	28	10.8
Acute heart failure	24	9.2
Malignant arrhythmias	13	5
In-hospital mortality	10	3.8

Table 5: Association Between Neutrophil–Lymphocyte Ratio (NLR) Categories and Adverse Outcomes in Patients With Acute Myocardial Infarction

NLR Category	With Adverse Outcomes (n = 75)	Without Adverse Outcomes (n = 185)	p-value
Low NLR (<3)	6 (8.0%)	74 (40.0%)	<0.001
Moderate NLR (3–6)	22 (29.3%)	78 (42.2%)	
High NLR (>6)	47 (62.7%)	33 (17.8%)	

A total of 260 patients diagnosed with acute myocardial infarction were included in the study. The mean age of the study population was 58.7 ± 10.8 years, and males constituted 71.5% of the participants. Among the total cohort, 75 patients (28.8%) developed one or more adverse in-hospital outcomes, including cardiogenic shock, acute heart failure, malignant arrhythmias, or in-hospital death. As shown in Table 1, patients who experienced adverse outcomes were generally older and had a higher prevalence of diabetes mellitus and hypertension compared to those without complications. The mean left ventricular ejection fraction (LVEF) was notably lower in patients with adverse outcomes (41.3 ± 8.7%) than in those without (50.3 ± 8.1%), indicating poorer cardiac function among the complicated cases. There was no significant difference in sex distribution or smoking status between the two groups. The distribution of myocardial infarction subtypes is presented in Table 2. ST-elevation myocardial infarction (STEMI) accounted for 60% of cases, while non-ST-elevation myocardial infarction (NSTEMI) comprised 40%. Adverse outcomes were more frequent among STEMI patients (74.7%) compared to those with NSTEMI (25.3%). As shown in Table 3, patients with adverse outcomes had significantly higher total white blood cell and neutrophil counts and lower lymphocyte counts,

resulting in markedly elevated neutrophil–lymphocyte ratios (NLR) at admission. The mean NLR was 7.8 ± 3.2 in patients with adverse outcomes and 3.7 ± 1.8 in those without, highlighting the association between systemic inflammation and poor clinical course. Troponin I levels were also higher among patients with complications, suggesting more extensive myocardial injury.

Discussion:

The current study illustrated that a heightened admission neutrophil–lymphocyte ratio (NLR) was significantly correlated with unfavourable in-hospital outcomes, including cardiogenic shock, acute heart failure, malignant arrhythmias, and mortality, in patients with acute myocardial infarction (AMI). Patients with elevated NLR values (>6) demonstrated a significantly higher occurrence of complications in comparison to those with lower ratios, suggesting that increased systemic inflammation at admission correlates with adverse short-term outcomes in AMI.

Our results align with the foundational research conducted by Tamhane et al., which initially demonstrated that an increased NLR at presentation independently forecasted both in-hospital and six-month mortality in patients with acute coronary syndromes (ACS).(1) Sawant et al., also discovered that an NLR cutoff of 7.4 accurately forecasted both short- and long-term mortality post-revascularization in patients with ST-elevation myocardial infarction (STEMI).(5) Both studies underscore the significance of NLR as a swift, cost-effective, and autonomous prognostic indicator in acute cardiac incidents.

Our study's results corroborate the findings of Soylu et al., which indicated that elevated NLR levels were independently linked to in-hospital mortality in patients with acute myocardial infarction.(6) Additionally, Kurtul and Murat demonstrated that an elevated NLR predicted no-reflow phenomena and long-term mortality following primary percutaneous coronary intervention (PCI), indicating its significance in forecasting early outcomes and impacting reperfusion success.(7)

Extensive meta-analyses have corroborated these findings. Dong et al. performed a systematic review and meta-analysis involving more than 20,000 ACS patients, revealing that an elevated NLR was significantly correlated with heightened short-term mortality (pooled RR = 3.22, 95% CI: 2.25–4.60) and major adverse cardiovascular events (MACE).(4) Dentali et al likewise established that elevated NLR values were significantly associated with all-cause mortality and adverse cardiac outcomes in patients presenting with both STEMI and NSTEMI.(8)

The fundamental pathophysiological mechanisms elucidating the association between elevated NLR and negative outcomes are rooted in the inflammatory characteristics of myocardial injury. Neutrophils secrete proteolytic enzymes, myeloperoxidase, and reactive oxygen species that facilitate microvascular obstruction and reperfusion injury. At the same time, lymphopenia shows that the adaptive immune system isn't working as well and that stress levels are higher because of cortisol. This imbalance between neutrophil-driven inflammation and lymphocyte-mediated regulation results in an enlarged infarct size, detrimental ventricular remodelling, and elevated complication rates. Research by Kurtul et al. and Gibson et al. has confirmed these mechanisms, demonstrating the prognostic significance of systemic inflammatory indices in STEMI.Our findings are also in line with data from the region. (9,10) Sadashiva et al. found that NLR was a strong predictor of what would happen to Indian STEMI patients in the hospital.(11) It was related to Killip class and TIMI risk scores. More recently, Sharma et al. found that high NLR values were linked to a higher risk of heart failure and death in STEMI patients. This shows how important the marker is in Indian tertiary care settings.(12)

The results of our study, corroborated by substantial global evidence, affirm that an elevated admission NLR indicates an exacerbated inflammatory state linked to heightened in-hospital complications and mortality in AMI. Because it is easy to get NLR from a routine complete blood count, it is a quick, cheap, and reliable biomarker for early risk stratification, especially in emergency situations where resources are limited.

Conclusion

The present study demonstrated that an elevated admission neutrophil–lymphocyte ratio (NLR) is significantly associated with adverse in-hospital outcomes among patients with acute myocardial infarction. Patients with higher NLR values had increased risks of cardiogenic shock, heart failure, arrhythmias, and mortality, reflecting the strong influence of systemic inflammation on clinical prognosis. As a simple, inexpensive, and readily available marker derived from a routine blood count, NLR can serve as a valuable adjunct for early risk stratification in emergency settings, particularly in resource-limited healthcare environments. Incorporating NLR into existing prognostic models may enhance the prediction of short-term outcomes and guide timely therapeutic interventions in AMI patients.

Limitations:

Due to its retrospective nature, potential confounding factors, such as undiagnosed infections or chronic inflammatory diseases, may affect leukocyte counts. The single-center design might also make it hard to apply the findings to other places. It is advised that future prospective, multicentric studies with larger cohorts be conducted to determine standardised NLR cutoffs and assess its incorporation into established risk models such as the GRACE and TIMI scores for enhanced prognostic accuracy.

References:

1. Tamhane UU, Aneja S, Montgomery D, Rogers EK, Eagle KA, Gurm HS. Association between

admission neutrophil to lymphocyte ratio and outcomes in patients with acute coronary syndrome. Am J Cardiol. 2008;102(6):653–7.
2. Arbel Y, Shacham Y, Ziv-Baran T, Laufer Perl M, Finkelstein A, Halkin A, et al. Higher neutrophil/lymphocyte ratio is related to lower ejection fraction and higher long-term all-cause mortality in ST-elevation myocardial infarction patients. Can J Cardiol. 2014;30(10):1177–82.
3. Zhang S, Diao J, Qi C, Jin J, Li L, Gao X, et al. Predictive value of neutrophil to lymphocyte ratio in patients with acute ST-segment elevation myocardial infarction after percutaneous coronary intervention: a meta-analysis. BMC Cardiovasc Disord. 2018;18:75.
4. Dong C, Wang Z, Chen S. Neutrophil to lymphocyte ratio predict mortality and major adverse cardiac events in acute coronary syndrome: a systematic review and meta-analysis. Clin Biochem. 2018;52:131–6.
5. Sawant AC, Blazon L, Williams KA, Jasmin G, Schreiber T, Afonso L. Neutrophil to lymphocyte ratio predicts short- and long-term mortality following revascularization in patients with ST elevation myocardial infarction. Cardiol J. 2014;21(5):500–8.
6. Soylu K, Gedikli O, Aksu U, Tapan S, Ozturk D, Ozcan F, et al. Neutrophil to lymphocyte ratio predicts in-hospital mortality in acute myocardial infarction. Korean Circ J. 2015;45(3):186–93.
7. Kurtul A, Murat SN. The relationship between neutrophil-to-lymphocyte ratio and in-hospital mortality in patients with ST-elevation myocardial infarction undergoing primary percutaneous coronary intervention. Angiology. 2017;68(8):707–16.
8. Dentali F, Nigro O, Squizzato A, Gianni M, Zuretti F, Grandi AM. Prognostic role of neutrophil to lymphocyte ratio in patients with acute coronary syndromes: A systematic review and meta-analysis. Int J Cardiol. 2018;259:76–81.
9. Kurtul A, Yarlioglues M, Duran M, Murat SN, Koseoglu C. The relationship between neutrophil to lymphocyte ratio and no-reflow phenomenon in patients with acute myocardial infarction. Eur J Clin Invest. 2016;46(6):555–62.
10. Gibson PH, Croal BL, Cuthbertson BH. The prognostic value of neutrophil-to-lymphocyte ratio in patients with acute myocardial infarction: A systematic review and meta-analysis. J Am Heart Assoc. 2019;8(7):e011585.
11. Sadashiva SB, Pradeep R, Kumar AS. Study of neutrophil to lymphocyte ratio as a predictor of adverse in-hospital outcomes in patients with acute myocardial infarction. Int J Adv Med. 2021;8(4):1485–90.
12. Sharma D, Kalita D, Bhuyan D, Talukdar P. Neutrophil to lymphocyte ratio: Useful as a cost-effective preliminary prognostic marker in ST-elevation myocardial infarction (STEMI): An observational study from a tertiary care hospital in Northeast India. Cureus. 2023;15(4):e36885.