Section: Pathology

Original Research Article

COMPARISON OF CBC PARAMETERS IN PREDICTING THE SHORT TERM INTRA-HOSPITAL COMPLICATIONS OF ACUTE MYOCARDIAL INFARCTION IN A TERTIARY CARE HOSPITAL

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Received *: 27/01/2026*
Received in revised form *: 12/03/2026*
Accepted *: 01/04/2026*

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DOI: 10.70034/ijmedph.2026.2.260

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2026; 16 (2); 1556-1563

ABSTRACT

Background: Acute myocardial infarction (AMI) remains a leading cause of intrahospital morbidity and mortality, particularly in resource-constrained tertiary care settings. Identification of simple, low-cost prognostic markers is essential to optimize monitoring and timely intervention. **Objectives:** To compare the prognostic utility of nine complete blood count (CBC)–derived parameters in predicting acute in-hospital complications and mortality among patients with AMI in a tertiary care hospital.

Materials and Methods: This cross-sectional study included 124 consecutive patients admitted with acute MI. Demographic and clinical data, cardiovascular risk factors and baseline CBC parameters (haemoglobin, packed cell volume, platelet count, total leucocyte count, neutrophil and lymphocyte percentages, neutrophil-to-lymphocyte ratio [NLR], mean corpuscular volume [MCV] and platelet-to-lymphocyte ratio [PLR]) were recorded at admission. These indices were analysed in relation to a composite of acute complications including cardiogenic shock, heart failure, arrhythmias, thromboembolic and mechanical events, and death.

Results: The mean age was 57.2 ± 12.2 years, and 81.5% were male, with ST-elevation MI in most patients. Arrhythmias, death and left ventricular failure were the most frequent complications. Neutrophils, lymphocytes, platelets, MCV, NLR and PLR showed significant association with the occurrence of acute complications and adverse outcomes.

Conclusions: Routine CBC parameters, particularly differential counts and composite indices such as NLR and PLR, provide valuable incremental prognostic information in AMI. Incorporating these readily available markers into early risk stratification may support intensified surveillance and rational resource utilization in tertiary care hospitals.

Keywords: Myocardial Infarction; Blood Cell Count; Neutrophil-Lymphocyte Ratio; Platelet-Lymphocyte Ratio; Risk Assessment.

INTRODUCTION

Background and Clinical Significance

Acute myocardial infarction (AMI) remains one of the leading causes of death and morbidity worldwide, with substantial variation in intra-hospital mortality rates across different healthcare settings.[1] This variation suggests considerable opportunities for clinical improvement through enhanced risk identification and more effective patient monitoring strategies. The pathophysiology of AMI is fundamentally characterized by a balance between myocardial oxygen supply and demand; however, the inflammatory and hemodynamic consequences of AMI extend well beyond simple ischemic injury to the myocardium. Indeed, myocardial infarction is increasingly recognized as an essentially inflammatory disease in which the intensity of the inflammatory response directly correlates with the severity of hemodynamic repercussion and clinical outcomes.[2]

The Inflammatory Basis of Acute Myocardial Infarction:

The inflammatory nature of AMI has been established through extensive pathological and experimental evidence. Atherosclerosis, the primary etiology of AMI, is fundamentally an inflammatory disease characterized by lipid-driven immune inflammatory processes that involve multiple cellular and molecular mediators.[3,9] Upon rupture of an atherosclerotic plaque with superimposed thrombosis, there follows a cascade of inflammatory and hypoxemic processes involving the release of multiple inflammatory mediators and circulating hematopoietic cells. These processes trigger the activation of the bone marrow, leading to increased myeloid activity and the mobilization of hematopoietic stem cells into the peripheral circulation.[1] The resulting systemic inflammatory response manifests in detectable changes in multiple blood cellular parameters and indices, which can be readily identified through standard laboratory testing. The inflammatory and hypoxemic stress experienced by patients hospitalized with AMI induces profound changes in hematopoietic activity within the bone marrow. Studies have demonstrated that severe hypoxemia and ongoing inflammation are responsible for the appearance of immature blood cells in peripheral circulation, alterations in white blood cell differential counts, changes in platelet indices, and variations in red blood cell parameters—all of which reflect the intensity of the underlying inflammatory and hypoxic burden.[2] The clinical implication is that these routinely measured complete blood count (CBC) parameters may serve as objective biomarkers reflecting the degree of systemic inflammation and myocardial injury severity.

Complete Blood Count Parameters and Prognostic Significance:

The complete blood count represents one of the most basic, universally available, and cost-effective laboratory tests performed in medical practice. Yet emerging evidence suggests that multiple components of this routine test possess independent prognostic value in patients with acute coronary syndromes and myocardial infarction. The principal haematological indices investigated in the present study include: Haemoglobin (g/dL), Packed Cell Volume/PCV (%), Platelets (lakhs/mm³), Total Count (/mm³), Neutrophil (%), Lymphocyte (%), Neutrophil-to-Lymphocyte Ratio (NLR), Mean Corpuscular Volume (MCV, fL), and Platelet-to-Lymphocyte Ratio (PLR).[3,4]

Each of these parameters reflects distinct aspects of the pathophysiology of myocardial injury. Haemoglobin, the oxygen-carrying protein in red blood cells, plays a critical role in delivering oxygen to myocardial tissue, and anemia resulting from reduced haemoglobin levels has been associated with increased morbidity and mortality in AMI patients.[5] Packed Cell Volume (PCV) represents the percentage of blood composed of red blood cells and serves as a marker of the oxygen-carrying capacity of blood; abnormalities in PCV can reflect the severity of inflammatory response and tissue hypoxia.[3]

Platelet count, reflecting the number of platelets in peripheral circulation, is an important indicator of platelet availability for thrombus formation and propagation. Elevated platelet counts have been associated with prothrombotic states, while reduced counts may indicate increased consumption in the setting of acute coronary events.[4] Total Count (white blood cell count) represents the total number of circulating leukocytes and reflects the systemic inflammatory burden; elevated white blood cell counts have consistently predicted adverse cardiovascular outcomes in patients with acute myocardial infarction.[5]

Neutrophil percentage, representing the proportion of neutrophils among circulating white blood cells, is an important marker of acute inflammation. Neutrophils play a central role in the inflammatory cascade following myocardial infarction, contributing to tissue damage through the release of proteolytic enzymes and reactive oxygen species.[3] Lymphocyte percentage, reflecting the proportion of lymphocytes in the differential white blood cell count, serves as a marker of anti-inflammatory immune response, relative lymphopenia in the setting of AMI has been shown to predict worse outcomes.[3]

The neutrophil-to-lymphocyte ratio (NLR) represents a composite marker that integrates information about both pro-inflammatory neutrophil populations and anti-inflammatory lymphocyte populations. Numerous studies have demonstrated that NLR is a strong and independent predictor of both short- and long-term mortality in patients with ST-segment elevation myocardial infarction (STEMI) and non-STEMI (NSTEMI).[3] This parameter can be easily

calculated from the differential white blood cell count obtained during routine haematological analysis, making it widely accessible for clinical use without additional cost or laboratory procedures.

Mean Corpuscular Volume (MCV), reflecting the average size of circulating erythrocytes, has been associated with the prognosis of multiple vascular and systemic disorders including acute coronary syndrome, cerebral ischemic stroke, coronary artery disease, and peripheral artery disease.[4] Abnormalities in MCV, particularly macrocytosis, have been linked to inflammatory states and oxidative stress, both of which play central roles in the pathogenesis of acute myocardial infarction.[4]

Platelet-to-Lymphocyte Ratio (PLR), another composite haematological marker, integrates information about both platelet activation and systemic inflammation as reflected in lymphocyte counts. Recent studies have demonstrated that elevated PLR at hospital admission is an independent predictor of adverse outcomes and intrahospital complications in patients with acute myocardial infarction.[6] These findings underscore the critical importance of comprehensive CBC parameter assessment in identifying high-risk patients requiring intensive monitoring and aggressive intervention during hospitalization.[6]

Rationale for Comprehensive CBC Analysis in Tertiary Care

In tertiary care hospitals managing complex acute myocardial infarction cases, early and accurate identification of patients at highest risk for intrahospital complications remains a critical clinical challenge. While traditional cardiac risk scores (GRACE, TIMI, Killip) and troponin-based stratification provide valuable prognostic information, these tools are typically applied at single time points and may not capture the dynamic inflammatory and hematological changes occurring throughout hospitalization.[2,4] Furthermore, in resource-limited settings or in cases where advanced biomarkers are unavailable or delayed, readily available CBC parameters could provide additional stratification capability.[7]

The advantage of CBC-derived parameters lies in their universal availability, low cost, lack of additional patient burden beyond routine phlebotomy, reproducibility, and the possibility of serial monitoring during hospitalization. These parameters, collectively reflecting systemic inflammation, hypoxemic stress, myocardial damage severity, and platelet dysfunction, may provide complementary and independent prognostic information beyond that provided by troponin levels or clinical scoring systems alone.[8] Given that approximately 75-90% of AMI patients hospitalized in tertiary care centres experience one or more acute complications during their hospital stay—ranging from contractile dysfunction and cardiogenic shock to arrhythmias, mechanical rupture, and death—improved early identification of highest-risk patients through multiple objective biomarkers could facilitate more aggressive monitoring, earlier therapeutic escalation, and more judicious resource allocation.[5] Studies have shown that integrated assessment of multiple CBC parameters provides superior risk stratification compared to individual markers alone.[3]

Study Objective and Significance

Previous studies investigating CBC parameters and AMI prognosis have generally focused on either isolated parameters or on single complications such as mortality. Few studies have systematically compared the relative discriminative ability of multiple CBC indices in predicting a comprehensive spectrum of acute in-hospital complications—including but not limited to mortality, cardiogenic shock, heart failure, arrhythmias, and mechanical complications—within a single tertiary care hospital cohort.[1,8] Therefore, the present cross-sectional study aims to compare the prognostic utility and discriminative ability of the nine key CBC-derived indices—Haemoglobin, PCV, Platelets, Total Count, Neutrophil percentage, Lymphocyte percentage, NLR, MCV, and PLR—in predicting acute in-hospital complications and mortality among patients with acute myocardial infarction admitted to a tertiary care hospital. The findings may inform the development of evidence-based strategies for early risk stratification and clinical surveillance in this high-risk population, particularly in the Indian tertiary care setting where resource optimization is essential.

MATERIALS AND METHODS

This is a retrospective cross sectional on acute MI patients admitted to Sapthagiri Super Speciality Hospital from Oct 2024 to Sept 2025. All patients admitted to the Cardiology department with a diagnosis of Acute Myocardial Infarction based on Clinical presentation, Electrocardiography and Cardiac Troponin-I (cTnI) results were included in the study.

Exclusion Criteria include

1. Patients under the age of 18 years.
2. Readmissions following discharge.
3. Patients with pre-existing medical conditions such as, Chronic liver disease, Autoimmune or systemic inflammatory diseases.
4. Patients on immunosuppressive therapy.
5. Patients with cancer or any hematological disorders.

Sample Collection Method

- Clinical history and demographic data of patients diagnosed as MI were taken.
- Other investigations supporting the diagnosis such as electrocardiography and cardiac troponin I were recorded.
- Risk factors like hypertension, diabetes mellitus, dyslipidemia, smoking, kidney failure, family history of coronary artery disease and depression if present in these patients were noted.

- Data of Complete blood count was collected which was measured using a hematology autoanalyzer Sysmex within 24 hours of admission.

Hematological parameters include

1. Hemoglobin (Hb),
2. Red Cell Distribution Width (RDW),
3. Total Leukocyte count,
4. Differential Leukocyte count- Eosinophils, Basophils, Neutrophils, Lymphocytes, Monocytes,
5. Neutrophil–Lymphocyte ratio (NLR),
6. Platelets, Platelet Distribution Width (PDW), Mean Platelet Volume (MPV), and Platelet–Lymphocyte Ratio (PLR).

- cTnI examination using the CLIA autoanalyser.
- High MPV cut off value was found to be >/= 10.4 fl.
- Neutrophils to lymphocytes ratio was calculated by dividing the absolute neutrophil count with the absolute lymphocyte count and the high NLR cut off value was found to be >/= 3.7.
- The complications of Acute MI we considered were cardiogenic shock, emboli, reinfarction, pericarditis, gastrointestinal (GI) bleeding, cardiac arrhythmias and even death.
- Records of these patients were followed up to 3 days after admission and complications or death if any was retrieved and recorded.
- Further, these patients were classified as AMI with complications and AMI without complications.

Statistical Analysis: Data was analysed using IBM SPSS version 26. Continuous variables were summarized as mean ± SD or median (IQR), and categorical variables as frequencies and percentages. Comparisons between patients with and without complications were done using the Chi-square/Fisher's Exact test for categorical variables and the Mann–Whitney U test for haematological parameters. Correlation between CBC parameters and number of complications was assessed using Spearman's correlation. ROC curve analysis was performed to identify the predictive ability and optimal cut-off values of CBC indices. For each parameter, the optimal cut-off value was determined with the highest Youden's index. A p-value <0.05 was considered as statistically significant.

Correlation was used to check whether changes in haematological parameters were related to the number of acute complications in MI patients.

RESULTS

Baseline characteristics

A total of 124 patients with acute myocardial infarction (AMI) were included, with a mean age of 57.2 ± 12.2 years; 101 (81.5%) were male and 23 (18.5%) were female. Hypertension and type 2 diabetes mellitus were present in 58 (46.8%) and 60 (48.4%) patients, respectively, while 20 (16.12%) reported smoking or alcohol use. ST elevation MI (STEMI) was the predominant presentation (107 patients, 86.3%), followed by NSTEMI in 12 (9.7%) and unstable angina in 5 (4.0%). The mean high-sensitivity troponin I level was 3357 ± 8448 ng/L

Acute in-hospital complications

Arrhythmias were the most frequent acute complication, occurring in 20 patients (16.1%), followed by death in 14 (11.3%), left ventricular failure in 8 (6.5%) and cardiac arrest in 7 (5.6%). Cardiogenic shock (2.4%), emboli (0.8%) and reinfarction (1.6%) were less common, while no cases of gastrointestinal bleeding or pericarditis were recorded

Comparison by complication status

Compared with patients without complications, those with complications had similar prevalences of hypertension (45.3% vs 46.5%, p = 0.048) and diabetes (50.9% vs 46.5%, p = 0.057), but a higher proportion of smoker's/alcohol users (5.7% vs 1.4%, p = 0.032). Median haemoglobin was lower in the complication group (13.00 [11.60–14.60] vs 13.60 [11.85–14.75] g/dL, p = 0.048), while median platelet count was higher (2.59 [2.18–3.19] vs 2.45 [1.99–2.96] lakhs/mm³, p = 0.050). Although total leucocyte count did not differ significantly (p = 0.971), patients with complications had higher neutrophil percentages (75.0 [69.0–79.0] vs 74.0 [68.25–78.75], p = 0.029) and lower lymphocyte percentages (15.0 [10.0–21.0] vs 17.0 [13.0–22.50], p = 0.035). PLR and NLR were significantly elevated in the complication group (PLR 146.07 [121.76–213.39] vs 124.97 [95.20–165.84], p = 0.003; NLR 5.07 [3.32–7.80] vs 4.29 [3.14–5.77], p = 0.019), whereas MCV showed a trend towards lower values (85.94 [82.51–90.17] vs 88.79 [82.81–91.08] fL, p = 0.053)

Dichotomized indices

On dichotomous analysis, haemoglobin <12 g/dL was significantly associated with complications (15 patients [12.1%] vs 18 [14.5%], p = 0.038). Elevated neutrophil percentage >80% (14 [11.3%] vs 12 [9.7%], p = 0.025), lymphocyte percentage <10% (9 [7.3%] vs 4 [3.2%], p = 0.013) and NLR >10 (7 [5.8%] vs 4 [3.2%], p = 0.023) were also significantly associated with the presence of acute complications.

Correlation and ROC analyses

Neutrophil percentage (Spearman ρ = 0.118, p = 0.004) and PLR (ρ = 0.26, p = 0.004) showed positive correlations with the total number of acute complications, while lymphocyte percentage demonstrated a negative correlation (ρ = −0.42, p = 0.021). Other CBC parameters, including haemoglobin, PCV, platelet count, total count, NLR and MCV, did not show statistically significant correlations with complication burden (all p > 0.05).

In ROC analysis, PLR showed the highest discriminative ability for predicting complications (AUC 0.656; 95% CI 0.556–0.756), with an optimal cutoff of 134.46 yielding 67.9% sensitivity and 57.1% specificity. NLR (AUC 0.582; cutoff 7.18; sensitivity 48.2%, specificity 70.0%) and neutrophil percentage (AUC 0.575; cutoff 83.00%; sensitivity

42.6%, specificity 74.3%) demonstrated modest predictive performance, whereas other CBC parameters had lower AUC values.

Table 1: Baseline demographic and clinical characteristics of patients with Acute MI (n = 124)

Variable	Category	n (%)
Age (years)	Mean ± SD	57.2 ± 12.2
Gender	Male	101 (81.5%)
	Female	23 (18.5%)
History of Hypertension	Yes	58 (46.8%)
	No	66 (53.2%)
Type 2 Diabetes Mellitus	Yes	60 (48.4%)
	No	64 (51.6%)
Smoking / Alcohol use	Yes	20 (16.12%)
	No	100 (80.6%)
Type of MI	STEMI	107 (86.3%)
	NSTEMI	12 (9.7%)
	Unstable angina	5 (4.0%)
ECG findings	ST elevation / depression	11 (8.9%)
	Normal sinus rhythm / others	113 (91.1%)
High sensitive Trop I	Mean ± SD	3357±8448

The study included 124 acute MI patients with a mean age of 57.2 ± 12.2 years, predominantly male (81.5%), with nearly half having hypertension (46.8%) and Type 2 diabetes mellitus (48.4%). STEMI was the most common MI presentation (86.3%), while smoking and alcohol use were present in 16.12% of patients. The High sensitive Troponin I levels were significantly elevated at 3357 ± 8448 ng/L, indicating high sensitivity.

Table 2: Distribution of acute complications among patients with Acute MI

Complication	Yes (n)	No (n)	Prevalence (%)
Cardiogenic shock	3	121	2.4
Emboli	1	123	0.8
Reinfarction	2	122	1.6
G I bleeding	0	124	0.0
Arrhythmias	20	104	16.1
LVF	8	116	6.5
Cardiac arrest	7	117	5.6
Pericarditis	0	124	0.0
Death	14	110	11.3

Arrhythmias were the most common acute complication occurring in 16.1% of MI patients, followed by death (11.3%) and left ventricular failure (6.5%). Life-threatening complications like cardiogenic shock, emboli, and reinfarction were relatively rare, occurring in less than 3% of cases.

Table 3: Comparison of risk factors and hematological parameters between patients with and without complications

Parameter	With Complications	Without Complications	p-value
Hypertension (%)	45.3%	46.5%	0.048
Diabetes (%)	50.9%	46.5%	0.057
Smoker/Alcohol (%)	5.7%	1.4%	0.032
Hemoglobin (g/dL)	13.00 (11.60–14.60)	13.60 (11.85–14.75)	0.048
RBC count (×10⁶/µL)	4.51 (4.17–4.89)	4.76 (4.24–5.28)	0.177
PCV (%)	39.50 (36.80–44.10)	41.20 (36.08–45.20)	0.180
Platelets (lakhs/mm³)	2.59 (2.18–3.19)	2.45 (1.99–2.96)	0.050
Total count (/mm³)	11080 (9830–13190)	11430 (9280–13905)	0.971
Neutrophils (%)	75.0 (69.0–79.0)	74.0 (68.25–78.75)	0.029
Lymphocytes (%)	15.0 (10.0–21.0)	17.0 (13.0–22.50)	0.035
Monocytes (%)	7.0 (6.0–9.0)	8.0 (7.0–10.0)	0.219
Eosinophils (%)	1.0 (0.0–2.0)	1.0 (0.0–1.0)	0.868
Basophils (%)	0.0 (0.0–0.0)	0.0 (0.0–0.0)	0.411
MCV (fL)	85.94 (82.51–90.17)	88.79 (82.81–91.08)	0.053
PLR	146.07 (121.76–213.39)	124.97 (95.20–165.84)	0.003
NLR	5.07 (3.32–7.80)	4.29 (3.14–5.77)	0.019

Patients with acute MI complications demonstrated significantly lower hemoglobin and lymphocyte levels, lower MCV values with higher neutrophil percentages, higher PLR values and elevated platelet and NLR values compared to those without complications. Smoking/alcohol use, neutrophils, lymphocytes, PLR, MCV, neutrophil-lymphocyte ratio and platelets emerged as significant predictors of adverse outcomes in MI patients.

Table 4: Association of dichotomized hematological indices with acute complications (Fisher's Exact Test)

Parameter	Cut-off	Complication Yes (n, %)	Complication No (n, %)	p-value (Fisher's Exact)
Hemoglobin <12 g/dL	<12 g/dL	15 (12.1%)	18 (14.5%)	0.038
Neutrophil >80%	>80%	14 (11.3%)	12 (9.7%)	0.025
Lymphocyte <10%	<10%	9(7.3%)	4 (3.2%)	0.013
NLR >10	>10	7 (5.8%)	4 (3.2%)	0.023

Low hemoglobin (<12 g/dL), elevated neutrophils (>80%), low lymphocytes (<10%), and high NLR (>10) were independently associated with acute MI complications with statistical significance. These cutoff values can serve as simple risk stratification tools for identifying high-risk MI patients.

Table 5: Correlation between hematological parameters and total number of acute complications

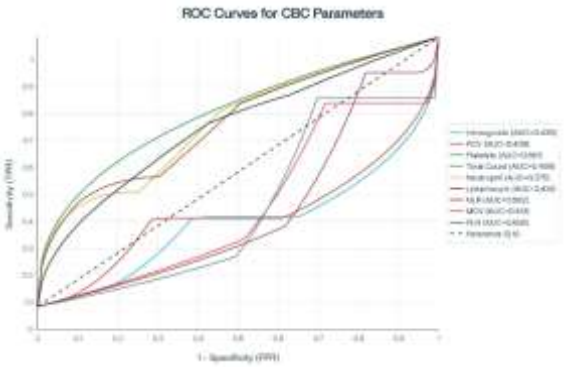
Parameter	Spearman ρ	p-value
CBC - Hb (g/dL)	-0.95	0.187
PCV	-0.12	0.182
PLT	0.16	0.084
TC	-0.19	0.923
N	0.118	0.004
L	-0.42	0.021
NLR	0.09	0.302
MCV	0.6	0.057
PLR	0.26	0.004

Neutrophil percentage and PLR showed positive correlations with the total number of acute complications (p=0.004), while lymphocyte percentage demonstrated negative correlation. These findings suggest that inflammatory markers derived from CBC reflect disease severity and complication burden.

Table 6: ROC Analysis of Complete Blood Count Parameters for Predicting Acute Complications in Acute MI Patients

CBC Parameter	AUC	Std Error	95% CI Lower	95% CI Upper	Optimal Cutoff	Sensitivity (%)	Specificity (%)
Hemoglobin (g/dL)	0.439	0.052	0.336	0.542	15.10	32.6	61.4
PCV (%)	0.429	0.052	0.327	0.531	36.80	75.5	28.6
Platelets (lakhs/mm³)	0.561	0.052	0.459	0.663	2.13	86.8	31.0
Total Count (/mm³)	0.498	0.053	0.394	0.602	9690	77.4	30.0
Neutrophil (%)	0.575	0.053	0.471	0.678	83.00	42.6	74.3
Lymphocyte (%)	0.414	0.052	0.312	0.517	21.00	32.1	71.4
NLR	0.582	0.053	0.480	0.684	7.18	48.2	70.0
MCV (fL)	0.451	0.053	0.347	0.555	81.53	86.8	18.6
PLR	0.656	0.051	0.556	0.756	134.46	67.9	57.1

PLR demonstrated superior diagnostic performance (AUC 0.656) for predicting acute complications, followed by neutrophil percentage (AUC 0.575) and NLR (AUC 0.582). With a cutoff of 134.46, PLR achieved 67.9% sensitivity, positioning it as the most reliable CBC parameter for risk assessment in acute MI.



DISCUSSION

Risk stratification in acute MI patients remain a daily clinical challenge, particularly in busy, resource-limited settings where rapid decisions must often be made before advanced investigations are available. Simple tests, when interpreted thoughtfully, can be as powerful as sophisticated technology. The present study strengthens the above statement by demonstrating that routinely available complete blood count (CBC) parameters can serve as low cost and effective predictors of acute intra hospital complications following MI. This research study is first of its kind which compares the CBC parameters in patients of MI who developed acute intra hospital complications with those who did not.

The current study population reflects the typical demographic profile seen in real world Indian cardiology practice- predominantly middle aged men, with a high burden of hypertension, diabetes and STEMI as the most common presentation. This lends practical relevance to the findings as they

mirror patients encountered in most coronary care units. Acute complications, particularly arrhythmias, left ventricular failure, cardiac arrest and death, were commonly prevalent, underscoring the need for early identification of high risk individuals.

Patients who developed complications demonstrated a distinct haematological profile characterised by lower haemoglobin, relative lymphopenia, higher neutrophil percentages and elevated platelet to lymphocyte ratio (PLR) and neutrophil to lymphocyte (NLR) and all of these parameters were statistically significant. Lower haemoglobin was observed in the study conducted by Adam AM et al,[10] but their study was based on outcome after 30 days of follow up unlike ours. In the study conducted by Babes et al,[11] and Firani et al,[6] neutrophil percentages were high, in line with our study but they also showed higher leucocyte percentages in patients associated with mortality which was contradictory to our study. Acute MI is not merely an ischemic event but a profound inflammatory state. Neutrophilia reflects increased inflammatory and stress response, on the other hand, it may also represent a defective adaptation process in AMI because of the circulating leukocyte–platelet aggregates which may contribute to vascular occlusion and expansion of the infarcted area.[12] Increased neutrophil count may also be explained by a successful reperfusion or impaired microvascular perfusion which carries a lower probability.[13] Although studies have shown the role of neutrophils as a predictor of mortality and complications in long-term AMI patients,14 there is literature which proves the role of neutrophils as a predictor of mortality in short-term AMI patients. Lymphocytes have a protective role in inflammation and MI while lymphopenia represents pathophysiological stress and cortisol mediated immune suppression, which is known to be associated with adverse outcomes.[15] These parameters when combined into ratios such as NLR and PLR amplify subtle shifts and provide a more stable reflection of systemic inflammation. We found a significant elevation of platelet count in patients with complications following acute MI similar to the study conducted by Arsalan Adam et al,[10] and Samuel et al,[4] Studies by Sahin DY et al,[16] and Elbasan Z et al,[17] have shown that high NLR and high PLR are effective in predicting morbidity and mortality in patients with acute myocardial infarction but in a different study design and even in cases of long term follow up.

Studies by Firani et al,[6] and Sabatine et al,[18] showed higher ranges of leukocyte count in patients with complications but this parameter was not statistically significant in the present study. Cheng L et al. conducted a research on the long-term outcomes of acute coronary syndrome patients in which it indicated a higher MCV at admission is a significant and reliable predictor of major adverse cardiovascular events in acute coronary syndrome patients.[19] This was not in line with the current study and the study conducted by Samuel et al.[4]

Among all CBC derived indices studied, PLR emerged as the most reliable predictor of acute complications, with the highest area under the ROC curve. A PLR cut off of approximately 134 provided a reasonable balance between sensitivity and specificity. From a clinician's perspective this is particularly valuable. This has a supportive evidence in literature which tells that a high PLR predicts poor intra hospital and long term mortality in patients of acute coronary syndrome undergoing percutaneous coronary intervention.[20] Platelets play a central role in coronary thrombosis and microvascular obstruction, while lymphocyte count reflects the host inflammatory milieu.[15] Therefore an elevated PLR captures both thrombotic and inflammatory risk, making it a meaningful biological marker.

The study also demonstrated that the dichotomized cut offs such as haemoglobin <12g/dl, neutrophils >80%, lymphocytes <10% and NLR >10 were significantly associated with AMI patients having complications. These thresholds are easy to remember and can be applied whenever complications are suspected in case of MI without delaying with calculations or complex algorithms so that early intervention can be made.

In our study there was correlation between neutrophil percentage and PLR with the total number of complications, while lymphocyte percentage showed an inverse relationship. This suggests that CBC parameters which are statistically significant not only predict the presence of complications but may also reflect the overall disease severity. While no single marker should be viewed in isolation, trends across multiple CBC parameters can alert clinicians to a patient who may appear clinically stable but is biologically high risk, thus making a path for early intervention.

Complete blood count analysis is already a part of the standard care, requires no additional financial burden, and is accessible even in small hospitals. It is also universally performed at admission, inexpensive, rapidly available results and often underutilized beyond identifying anaemia or infection. In healthcare systems especially where resources are restricted, utilising such existing data is necessary. These markers are not intended to replace established risk scores or imaging but to complement them, particularly in the early hours of presentation when time sensitive decisions regarding monitoring intensely, transfer or intervention can be made.

CONCLUSION

In conclusion, this study affirms that the CBC test often taken for granted, contains valuable predictive information in patients who may develop complications following acute MI during the hospital stay. In our study CBC parameters like neutrophils, lymphocytes, MCV and platelets along with PLR and neutrophil-lymphocyte ratio emerged as significant predictors of adverse outcomes in MI patients. This

study highlights how much prognostic information is embedded in these basic parameters. With thoughtful interpretation, these simple and cost effective tools can meaningfully influence clinical decision making especially in resource constrained environments. Rather than overlooking what is already in front of us, sometimes the most effective answers are found in the simplest tests.

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