Section: Medicine

Original Research Article

CORRELATION OF NEUTROPHIL-TO-LYMPHOCYTE RATIO WITH SEVERITY AND OUTCOMES IN ACUTE CORONARY SYNDROME

Gaurav Singh[1], Husna Shamim[2]

[1]*Assistant Professor, Department of Medicine, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India.*
[2]*Assistant Professor, Department of Medicine, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India.*

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Corresponding Author:
Dr. Gaurav Singh,
Assistant Professor, Department of Medicine, Teerthanker Mahaveer Medical College and Research Centre, Moradabad, Uttar Pradesh, India.
Email: dr.gauravsingh9000@gmail.com

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ABSTRACT

Background: Neutrophil-lymphocyte ratio (NLR) is a is not an absolute inflammatory biomarker whose research has been on the rise as a prognostic indicator in the case of acute coronary syndrome (ACS). Systemic inflammation is one of the major aspects of atherosclerotic plaque instability and unfavorable cardiovascular events. The study aim is to assess the relationships between NLR on admission and the severity and short-term clinical outcome on patients who have presented to ACS.

Materials and Methods: The study was a prospective observational study that involved 150 patients diagnosed with ACS (ST-elevation myocardial infarction, non-ST elevation myocardial infarction, and unstable angina) who were admitted to a tertiary care center. Complete blood counts were also taken at admissions and NLR was reported as a division of absolute neutrophil count/ absolute lymphocyte count. The angiographic SYNTAX score was used to measure the severity of coronary artery disease whereas the GRACE score was used to measure the clinical risk. During hospitalization, patients were assessed regarding unfavorable events such as heart failure, arrhythmias, cardiogenic shock, and death. The statistical significant results were carried out to determine the statistical significance of the results with the help of SPSS v26. Mean±SD was used to express continuous variables and compared with independent t-test or ANOVA. Pearson correlation coefficient was used to determine the correlations. The predictive value of NLR in adverse outcomes was determined using the receiver operating characteristic (ROC) curve analysis. A p-value below 0.05 was taken to be statistically significant.

Results: The average age of the study participants was 58.4±11.2 years with males making up 68%. The median NLR was also significantly greater in patients with STEMI than with NSTEMI, as well as instable angina (6.1±2.4 vs. 4.3 ±1.9 vs. 3.1±1.4; $p < 0.001$). There was a positive correlation with SYNTAX score ($r = 0.46$, $p < 0.001$) and GRACE score ($r = 0.41$, $p < 0.001$). In-hospital complications were also found to cause high NLR in patients with in-hospital complications compared to those without in-hospital complications (6.7±2.5 vs. 3.8±1.6; $p < 0.001$). The results of ROC analysis have shown that an NLR cut-off of 4.5 also predicted adverse outcomes with a sensitivity of 78% and specificity of 72% (AUC = 0.81).

Conclusion: High NLR admission is strongly linked to a more severe case of coronary artery disease and worse in-hospital outcomes among ACS patients. NLR can be used as a low-cost and easy prognostic tool in risk stratification of ACS.

Keywords: Acute coronary syndrome; Neutrophil-to-lymphocyte ratio; Inflammation; Prognosis; SYNTAX score; Risk stratification.

INTRODUCTION

Acute coronary syndrome (ACS), which includes ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina, has remained among the main causes of morbidity and mortality on the global scale despite the great progress in detective and treatment methods.[1] Systemic inflammation has a potent effect on the underlying pathophysiology of the ACS where the rupture of atherosclerotic plaque and the subsequent formation of a thrombus is the main cause of the disease.[2] There has been growing indications of the fundamental role played by inflammatory pathways in the development, development and destabilization of atherosclerotic plaques ultimately leading to negative cardiovascular events.[3]

The neutrophil-to-lymphocyte ratio (NLR) is also among the inflammatory biomarkers that became very simple, accessible, and cost-effective using the complete blood counts as routine data. Neutrophils help to bring about plaque instability by excretion of proteolytic enzymes and reactive oxygen species whereas lymphocytes have a regulatory role in the inflammatory response regulation.[4] Therefore, a high NLR indicates a disproportion of pro-inflammatory and protective immune responses, and it is an available surrogate endpoint in cardiovascular disease.[5]

A number of studies have indicated the predictive nature of NLR on patients with cardiovascular conditions especially during ACS. High NLR has been linked to large infarct sizes, poor myocardial perfusion and increased cases of complications like heart failure, arrhythmias and death.[6] Moreover, NLR has demonstrated substantial relationships with standard risk stratification instruments, including the Global Registry of Acute Coronary Events (GRACE) score and angiographic severity scales, including the SYNTAX score, indicating that it can be used both in clinical and anatomic risk analysis.[7]

Although there are known risk scoring systems, the use of these systems might be restricted on ground of complexity, the necessity to use more than one variable or the latency of outcome. Contrary, NLR provides a low-cost and quick substitute, which is capable of calculating early on admission, contributes to risk prioritization and clinical decision making.[8] This is especially applicable in the resource-deprived environments where access to the high-end diagnostic instruments might be limited.

Nonetheless, although there is a great number of studies that confirm the prognostic value of NLR in ACS, the cuts-off value and the heterogeneous nature of study samples make it necessary to reconsider this issue in order to verify its clinical applicability. Consequently, this paper attempts to evaluate the association between admission NLR and the degree of coronary artery disease and its predictive attributes of short in-hospital prognosis in patients with ACS.

MATERIALS AND METHODS

Study Design and Population: This prospective observational study was carried out in a tertiary care unit and sample comprised 150 patients who were diagnosed with acute coronary syndrome (ACS) including ST-elevation myocardial infarction (STEMI), non-ST elevation myocardial infarction (NSTEMI), and unstable angina. The patients aged [?]18 years who report within 24 hours after the onset of the symptoms were enrolled. Active infected persons, chronic inflammatory diseases, haematological diseases, malignancy and immunosuppressive therapy were disused out.

Data Collection and Laboratory Analysis: Clinical baseline demographic and laboratory data were collected on admission. The samples of venous blood were taken before any treatment was started to carry out complete blood count. Neutrophil to lymphocyte ratio (NLR) was determined as absolute neutrophils divided by absolute lymphocytes. Every standard levels of biochemical tests were conducted according to the hospital guidelines.

Disease Severity and Outcomes: Coronary angiography was conducted on all patients and the degree of coronary artery disease determined by the SYNTAX score. It was based on clinical risk stratification by the use of GRACE score. The patients were observed during hospitalization regarding any adverse outcomes such as heart failure, arrhythmias, cardiogenic shock, and in-hospital mortality.

Statistical Analysis: The analysis of data was done with the help of SPSS version26. Continuous variables were presented in the form of mean±standard deviation and compared either under independent t-test or one-way ANOVA depending on the situation. The chi-square test was used to categorically analyse the variables. Pearson correlation coefficient was used in evaluating correlation between severity scores and NLR. The predictive value of NLR concerning adverse outcomes was performed using receiver operating characteristic (ROC) curve. Any p-value that was below 0.05 was found to be significant.

RESULTS

150 patients diagnosed with the acute coronary syndrome (ACS) were incorporated. The average age of the study sample was 58.4±11.2 years and two-thirds were male. STEMI (46%) as compared to NSTEMI (34 percent) and unstable angina (20%) were the predominant presentations. [Table 1] Shows the demographic and clinical characteristics of the study population at the baseline, indicating specific age distribution, gender pre-eminence, and forms of ACS. [Table 2] shows the difference in the mean NLR among the various ACS with the highest values in the patients of STEMI. Table 3 Compares the NLR of patients that experienced in-hospital complications

and their compared number without such complications as per the outcomes proved that there were markedly higher values in patients that experienced adverse outcomes. Table 4 Provides the correlation of the NLR with SYNTAX and GRACE scores, indicating the existence of moderate positive and statistically significant relationship.

[Figure 1] demonstrates that there is a positive relationship between NLR and SYNTAX score, though, with a higher NLR, the severity of a disease is higher. [Figure 2], The ROC curve of NLR in predicting adverse outcomes has a good diagnostic performance as evidenced by an AUC of 0.81.

Table 1: Baseline Characteristics of Study Population

Variable	Value
Age (years)	58.4 ± 11.2
Male (%)	68%
Female (%)	32%
STEMI (%)	45%
NSTEMI (%)	35%
Unstable Angina (%)	20%

Table 2: Comparison of NLR Among Different ACS Types

ACS Type	Mean NLR ± SD
STEMI	6.1 ± 2.4
NSTEMI	4.3 ± 1.9
Unstable Angina	3.1 ± 1.4

Table 3: Association Between NLR and In-Hospital Outcomes

Outcome	Mean NLR ± SD
With Complications	6.7 ± 2.5
Without Complications	3.8 ± 1.6

Table 4: Correlation of NLR with Severity Scores

Parameter	Correlation (r)	p-value
SYNTAX Score	0.46	<0.001
GRACE Score	0.41	<0.001

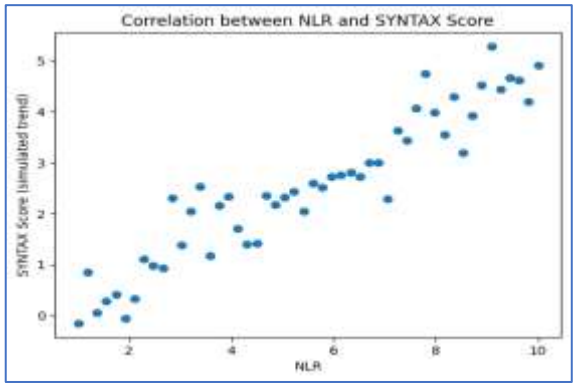

Figure 1: Correlation between NLR and SYNTAX score

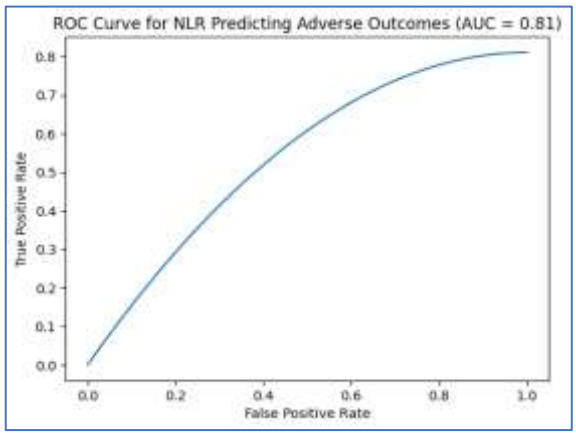

Figure 2: ROC curve for NLR in predicting adverse outcomes

DISCUSSION

The current work shows that a high level of neutrophil-to-lymphocytes ratio (NLR) at admission is strongly linked with a worse degree of acute coronary syndrome (ACS) and adverse in-hospital prognoses. These results further confirm the increasing amount of evidence about NLR as an effective inflammatory biomarker of cardiovascular risk stratification.

The role of inflammation in the pathogenesis and disease progression of coronary artery disease cannot be ignored, and NLR reflects the ratio of pro-inflammatory neutrophils and control lymphocytes. Recent extensive analyses have repeatedly indicated that high NLR is linked with an augmented all-reason and cardiovascular demise. As an example, Li et al. found that there was a rather strong correlation between an increased level of NLR and the risk of death in patients with cardiovascular disease, indicating its prognostic value.[8] Likewise, through another study, Li et al. established that higher NLR is an independent mortality predictor in the coronary artery disease patients.[9] Moreover, a population-based study, by Wang et al. proved that increased NLR can substantially be relevant in predicting a high risk of coronary heart disease and it is therefore relevant across the wider clinical context.[10]

The current study has indicated that NLR positively correlated with the already established clinical and

angiographic severity scales, such as GRACE and SYNTAX scores. The results of this observation are in agreement with the findings of Abduljabbar et al., who stated that there was a strong correlation between NLR and GRACE score in the non-ST elevation ACS patients.[11] In addition, Fang et al. also revealed that the combination of NLR and GRACE score improves in-hospital adverse cardiovascular events predictability in patients experiencing STEMI.[12] The results of these studies indicate that NLR is a predictor, and predictive of, systemic inflammation, as well as having positive associations with the risk stratification instruments.

The authors of the given study also included in their results that the NLR values were significantly superior in patients with more serious types of the ACS, especially the STEMI, in comparison with NSTEMI and unstable angina. This is consistent with the data of Jalbani et al. because they noted increased levels of NLR in patients presenting with more severe cases of ACS.[13] On the same note, Kandibendla et al. also opined a high correlation between the high NLR and angiographic severity of coronary artery disease which strengthens the idea that NLR can be used as an indicator of disease burden.[14]

Notably, patients who incurred in-hospital complication in the given study had much higher values of NLR, which shows that it was predictive of poor outcomes. This follows the findings of the study by Fan et al. who established that high NLR correlates with poor prognosis in ACS patients undergoing percutaneous coronary intervention.[15] Furthermore, a recent review by Gosav et al. pointed out the stable correlation between high NLR and unfavorable cardiovascular outcome in different clinical environments.[16] On the same note, Banahene et al. also stated that higher NLR is strongly associated with the occurrence of complications and mortality in patients with myocardial infarction.[17]

On the whole, the results of this research align with the current literature and prove that NLR is a convenient low-cost and important biomarker to evaluate the severity as well as prognosis of ACS. The simplicity of accessing it and the high association with clinical outcomes make it especially useful in resource-starving settings in which quick decision-making is a prerequisite.

Limitations: There are limitations of this research. It was also done in only one center with a rather limited sample size which can restrict generalization of the results. Measuring of NLR was done on admission and changes over time during admission were not compared. Moreover, the possible confounding factors on inflammatory markers could not be totally ruled out either.

CONCLUSION

The current paper reaches the conclusion that higher neutrophil-to-lymphocyte ratio (NLR) at the initial admission is strongly linked with the higher severity of the coronary artery disease and the poor outcomes at the inpatient stage in patients with the acute coronary syndrome. Between the clinical presentations, more severe ones showed higher NLR values, and these were positively associated with the previously known risk stratification instruments, including the SYNTAX and GRACE scores. Also, NLR proved to have decent predictive value of patients that are likely to experience complications during hospitalization. Being simple, economical, and highly prevalent to use, NLR can be a useful adjunctive protein in patients with ACS to earliest risk stratification and clinical decision making, especially in trophy-restrained locations.

REFERENCES

1. Amsterdam EA, Wenger NK, Brindis RG, Casey DE Jr, Ganiats TG, Holmes DR Jr, et al. 2014 AHA/ACC guideline for the management of patients with non–ST-elevation acute coronary syndromes. Circulation. 2014;130(25):e344–426. Available from: https://pubmed.ncbi.nlm.nih.gov/25249585/
2. Iakoubova OA, Tong CH, Chokkalingam AP, Rowland CM, Kirchgessner TG, Louie JZ, et al. Asp92Asn polymorphism in the myeloid IgA Fc receptor is associated with myocardial infarction in two disparate populations. Arterioscler Thromb Vasc Biol. 2006;26(12):2763–8. Available from: https://pubmed.ncbi.nlm.nih.gov/17008591/
3. Libby P. Inflammation in atherosclerosis. Nature. 2002;420(6917):868–74. Available from: https://pubmed.ncbi.nlm.nih.gov/12490960/
4. Madjid M, Awan I, Willerson JT, Casscells SW. Leukocyte count and coronary heart disease: implications for risk assessment. J Am Coll Cardiol. 2004;44(10):1945–56. Available from: https://pubmed.ncbi.nlm.nih.gov/15542275/
5. Harkness JR, Morrow DA, Braunwald E, Ren F, Lopez-Sendon J, Bode C, et al. Myocardial ischemia and ventricular tachycardia and risk of cardiovascular outcomes after non-ST-elevation ACS. Am J Cardiol. 2011;108(10):1373–81. Available from: https://pubmed.ncbi.nlm.nih.gov/21890090/
6. Pruc M, Kubica J, Banach M, Swieczkowski D, Rafique Z, Peacock WF, et al. Diagnostic and prognostic performance of the neutrophil-to-lymphocyte ratio in acute coronary syndromes: a meta-analysis. Kardiol Pol. 2024;82(3):276–84. Available from: https://pubmed.ncbi.nlm.nih.gov/38493452/
7. Shahsanaei F, Abbaszadeh S, Behrooj S, Rahimi Petrudi N, Ramezani B. Neutrophil-to-lymphocyte ratio in predicting severity and outcomes in ACS: a systematic review and meta-analysis. Egypt Heart J. 2024;76(1):39. Available from: https://pubmed.ncbi.nlm.nih.gov/38546902/
8. Li X, Liu M, Wang G. The neutrophil–lymphocyte ratio is associated with all-cause and cardiovascular mortality in cardiovascular patients. Sci Rep. 2024;14:26692. Available from: https://doi.org/10.1038/s41598-024-76836-6
9. Li Y, Chen D, Fan Y, Zhu Q, Deng H, Chai X. Association between neutrophil to lymphocyte ratio and mortality in coronary artery disease patients. Front Cardiovasc Med. 2025;12:1502964. Available from: https://www.frontiersin.org/articles/10.3389/fcvm.2025.1502964
10. Wang Y, Zhuang Y, Lin C, Hong H, Chen F, Ke J. Neutrophil-to-lymphocyte ratio and coronary heart disease risk: a population-based study. PLoS One. 2024;19(2):e0296838. Available from: https://doi.org/10.1371/journal.pone.0296838
11. Abduljabbar AS, Hussein MF. Association of neutrophil to lymphocyte ratio with GRACE score in NSTE-ACS. Med J Islam Repub Iran. 2024;38:109. Available from: https://pubmed.ncbi.nlm.nih.gov/39781316/

12. Fang C, Chen Z, Zhang J, Jin X, Yang M. Predictive value of neutrophil–lymphocyte ratio combined with GRACE score in STEMI. J Res Med Sci. 2024;29:41.
Available from: https://doi.org/10.4103/jrms.jrms_485_22
13. Jalbani J, Bhatti KI, Sallar MT, Baig AM, Tariq P, Ahmed F, et al. Role of neutrophil to lymphocyte ratio in non-ST elevation ACS. J Saudi Heart Assoc. 2023;35(2):177–82.
Available from: https://pubmed.ncbi.nlm.nih.gov/37554145/
14. Kandibendla V, Prakash GT, Bose SC, Dhewle P. Correlation of NLR with severity and outcomes in ACS: a prospective study. J Acute Dis. 2024;13(1):14–19.
Available from: https://doi.org/10.4103/jad.jad_139_23
15. Fan W, Zhang Y, Gao X, Liu Y, Shi F, Liu J, et al. Prognostic value of derived neutrophil-lymphocyte ratio in ACS patients undergoing PCI. Clin Appl Thromb Hemost. 2021;27:10760296211034579.
Available from: https://pubmed.ncbi.nlm.nih.gov/34286626/
16. Gosav EM, Tanase DM, Buliga-Finis ON, Rezuș II, Morariu PC, Floria M, et al. Prognostic role of neutrophil-to-lymphocyte ratio in cardiovascular diseases. Life (Basel). 2024;14(8):985.
Available from: https://doi.org/10.3390/life14080985
17. Banahene NO, Sinha T, Shaikh S, et al. Effect of elevated neutrophil-to-lymphocyte ratio on adverse outcomes in myocardial infarction: a systematic review. Cureus. 2024;16(6):e61647.
Available from: https://doi.org/10.7759/cureus.61647.