Original Research

PROGNOSTIC VALUE OF THE NEUTROPHIL-TO-LYMPHOCYTE COUNT IN PATIENTS WITH LIVER CIRRHOSIS

A. Ramanathan[1], B. Manikandan[2]
[1]Junior Resident, Department of General medicine, Government Sivagangai Medical College, India.
[2]Assistant Professor Department of General Medicine, Government Sivagangai Medical College, India.

Abstract

Background: Liver cirrhosis is a gradual and irreversible chronic hepatic condition marked by fibrosis and regenerating nodules. Identifying dependable, cost-effective, and accessible prognostic indicators is essential for informing therapeutic decisions and enhancing patient outcomes. Recently, the neutrophil-to-lymphocyte ratio (NLR), a measure of systemic inflammation, has surfaced as a potential prognostic marker in numerous diseases, including cancers, cardiovascular disorders, and chronic liver diseases.

Aims: To evaluate the NLR in patients with liver cirrhosis and to determine the correlation between NLR and the severity of liver cirrhosis using Child-Pugh and MELD scoring systems.

Methods: A cross-sectional observational study was carried out at a tertiary care hospital from January to June 2025. Seventy patients identified with liver cirrhosis validated through clinical, biochemical, and radiological assessments—were included. Individuals with simultaneous infections, cancers, or autoimmune diseases were excluded. Complete blood counts were acquired upon admission, and the neutrophil-to-lymphocyte ratio (NLR) was determined by dividing the absolute neutrophil count by the absolute lymphocyte count. Patients were categorized based on Child-Pugh and MELD scores to evaluate illness severity. The correlation between NLR and clinical outcomes, such as hepatic decompensation, length of hospitalization, and mortality, was examined utilizing suitable statistical techniques.

Results: The mean NLR value was considerably higher in individuals with decompensated cirrhosis relative to those with compensated illness (6.2 vs. 2.8, $p < 0.01$). Patients classified as Child-Pugh class C exhibited significantly higher NLR levels than those in classes A and B. A positive association was identified between NLR and MELD scores ($r = 0.49$, $p < 0.01$), signifying deteriorating liver function with heightened inflammatory response. Moreover, those exhibiting elevated NLR values (>5.0) experienced prolonged hospitalizations and an increased in-hospital mortality rate.

Conclusion: The NLR is a simple, cost-effective and easily available biomarker that has a substantial correlation with the severity of liver cirrhosis and clinical outcomes. Increased NLR correlates with heightened illness severity scores, augmented risk of comorbidities, and elevated mortality rates.

Keywords: Child-Pugh Score, Inflammation, Liver Cirrhosis, MELD Score, Neutrophil-To-Lymphocyte Ratio, Prognostic Marker.

INTRODUCTION

Liver cirrhosis is the most advanced phase of chronic liver illnesses, marked by advancing hepatic fibrosis, structural distortion, and regenerating nodules that compromise liver function.[1] Cirrhosis is a predominant source of morbidity and mortality worldwide, especially in areas with elevated incidences of hepatitis B, hepatitis C, and alcohol-related liver disease. In recent decades, non-alcoholic fatty liver disease (NAFLD) has become a notable factor in the development of cirrhosis in both industrialized and developing nations.[2]

The clinical progression of liver cirrhosis exhibits significant variability, spanning from an asymptomatic compensated phase to a

www.ajmrhs.com
eISSN: 2583-7761

Date of Received: 24-01-2026
Date Acceptance: 05-02-2026
Date of Publication: 09-02-2026

decompensated stage characterized by severe consequences, including ascites, variceal hemorrhage, hepatic encephalopathy, and hepatorenal syndrome.[3]

Precise evaluation of disease severity and prognosis is essential for informing therapy choices, prioritizing liver transplantation, and enhancing outcomes. Historically, scoring methods like the Child-Pugh classification and the Model for End-stage Liver Disease (MELD) have been extensively utilized for prognostic assessment. Although these methods are beneficial, they necessitate various laboratory markers and may not completely represent the ongoing systemic inflammatory response in individuals with cirrhosis.[4,5]

In recent years, there has been heightened focus on the role of systemic inflammation in the advancement and consequences of liver cirrhosis. The liver is pivotal in immune control, and its impairment can result in substantial changes in inflammatory responses.[6] The neutrophil-to-lymphocyte ratio (NLR) has emerged as a straightforward, economical, and readily available indication of systemic inflammation among numerous inflammatory markers. The neutrophil-to-lymphocyte ratio (NLR), obtained from standard complete blood count assays, indicates the equilibrium between inflammation driven by neutrophils and immunological control mediated by lymphocytes.[7]

Numerous investigations in oncology, cardiology, and critical care medicine have shown NLR as a significant prognostic indicator. In individuals with cirrhosis, concomitant infections such spontaneous bacterial peritonitis (SBP) or pneumonia frequently occur and can substantially affect NLR readings, thereby complicating its interpretation as an indicator of liver disease progression.[8] In hepatic disorders, a higher neutrophil-to-lymphocyte ratio (NLR) has been correlated with adverse outcomes in illnesses such as hepatocellular carcinoma and acute-on-chronic liver failure. There is an increasing interest in assessing its prognostic value specifically in patients with liver cirrhosis.[9]

The justification for examining NLR in cirrhosis is its capacity to indirectly indicate the severity of systemic inflammation, immunological dysfunction, and disease advancement. Neutrophilia in cirrhosis frequently associates with bacterial translocation, portal hypertension, and endotoxemia, but lymphopenia may indicate immunological depletion or suppression. Consequently, an elevated NLR may indicate more advanced disease and a poorer prognosis. This research aims to clarify the role of NLR in cirrhosis care, perhaps enhancing risk categorization and tailored interventions for this high-risk patient demographic.

AIMS AND OBJECTIVES

- To evaluate the neutrophil-to-lymphocyte ratio (NLR) in patients with liver cirrhosis.
- To determine the correlation between NLR and the severity of liver cirrhosis using Child-Pugh and MELD scoring systems.

MATERIALS AND METHODS

This cross-sectional observational study was performed at the Department of General Medicine, encompassing the Outpatient Department (OPD) and Medical Intensive Care Unit (MICU), at Govt. Sivagangai Medical College, Sivagangai. for a six-month duration, from January to June 2025. The study comprised 70 patients diagnosed with liver cirrhosis using a synthesis of clinical, biochemical, and radiographic assessments.

Clinical manifestations indicative of cirrhosis encompassed ascites, jaundice, hepatic encephalopathy, spider angiomata, and a history of decompensation episodes. Biochemical criteria included abnormal liver function tests characterized by high bilirubin and transaminases, extended prothrombin time, and decreased serum albumin levels. Radiological evidence corroborating the diagnosis comprised ultrasonographic or CT observations of a nodular liver surface, coarse echotexture, splenomegaly, and indications of portal hypertension.

Patients were eligible for inclusion if they were above 18 years of age, had a confirmed diagnosis of liver cirrhosis based on the aforementioned criteria, and were willing to participate in the study.

Individuals with ongoing infections, malignancies, autoimmune liver illnesses, hematological disorders, or those undergoing immunosuppressive or corticosteroid treatment were excluded. Recent surgery or gastrointestinal hemorrhage within two weeks, along with persistent inflammatory disorders such as rheumatoid arthritis or lupus, were also excluded.

Subsequent to acquiring informed consent, all patients had a comprehensive clinical assessment and laboratory examinations. Venous blood samples were obtained upon admission, and complete blood counts were assessed by an automated hematology analyzer. The NLR was determined by dividing the absolute neutrophil count by the absolute lymphocyte count. Supplementary laboratory assessments comprised liver function tests, renal function tests, and coagulation profile (INR), and serum electrolytes.

The severity of liver disease was evaluated using the Child-Pugh score, which includes blood bilirubin, serum albumin, INR, presence of ascites, and the degree of hepatic encephalopathy. Patients were categorized into Child-Pugh class A, B, or C

according to their total score. The MELD (Model for End-Stage Liver Disease) score was computed utilizing serum bilirubin, creatinine, and INR data. All patients were observed during their hospitalization for the emergence of problems including hepatic encephalopathy, variceal hemorrhage, or spontaneous bacterial peritonitis. The length of hospitalization and in-hospital mortality were also documented.

Statistical analysis was conducted utilizing suitable software. Continuous variables were represented as mean ± standard deviation, whilst categorical variables were displayed as frequencies and percentages. The relationship between NLR and MELD score was assessed using Pearson's correlation coefficient, while comparisons among Child-Pugh classes were conducted via analysis of variance (ANOVA). A p-value < 0.05 was regarded as statistically significant.

OBSERVATION AND RESULTS

Out of 70 patients, 48 (68.6%) were male and 22 (31.4%) were female, with a mean age of 52.4 ± 11.8 years. The most common etiology of liver cirrhosis was alcohol-related liver disease, followed by viral hepatitis and cryptogenic cirrhosis. The mean NLR across the cohort was 4.9 ± 2.6, indicating an overall elevated inflammatory response. (Table 1)

Table 1: Baseline Characteristics of Study Population

Parameter	
Mean Age (years)	52.4 ± 11.8
Gender (M:F)	48:22
Alcoholic Cirrhosis	45 (64.3%)
Viral Hepatitis	18 (25.7%)
Cryptogenic Cirrhosis	7 (10%)
Mean NLR (overall)	4.9 ± 2.6

Patients were classified into Child-Pugh classes A, B, and C. The NLR values were compared across these groups. There was a statistically significant increase in the mean NLR as the severity of liver disease increased from Child-Pugh class A to C ($p < 0.01$). This trend suggests that NLR correlates with the degree of hepatic dysfunction and clinical decompensation. (Table 2)

Table 2: NLR across Child-Pugh Classes

Child-Pugh Class	**Number of Patients**	**Mean NLR ± SD**
A	16 (22.9%)	2.1 ± 0.9
B	28 (40.0%)	4.7 ± 1.3
C	26 (37.1%)	7.9 ± 2.2
p-value	—	< 0.01

To further evaluate the association between NLR and liver disease severity, patients were grouped based on MELD score ranges. There was a moderate positive correlation between NLR and MELD score ($r = 0.49$, $p < 0.01$), indicating that as the MELD score increases, so does the systemic inflammatory response. This reinforces the potential of NLR as a marker of liver disease progression. (Table 3)

Table 3: NLR and MELD Score Correlation

MELD Score Range	**Number of Patients**	**Mean NLR ± SD**
<10	14 (20.0%)	2.3 ± 0.8
10–19	29 (41.4%)	4.8 ± 1.5
≥20	27 (38.6%)	7.4 ± 2.0
Correlation Coefficient (r)	—	0.49
p-value	—	< 0.01

The mean NLR was significantly elevated in patients with decompensated cirrhosis (6.2 ± 2.3) compared to those with compensated cirrhosis (2.8 ± 1.1). The difference was statistically significant ($p < 0.01$). (Table 4).

Table 4: NLR in Compensated vs. Decompensated Cirrhosis

Disease Status	Number of Patients	Mean NLR ± SD	p-value
Compensated Cirrhosis	24 (34.3%)	2.8 ± 1.1	**< 0.01**
Decompensated Cirrhosis	46 (65.7%)	6.2 ± 2.3	

Patients were stratified into two groups based on their NLR values: NLR < 5 and NLR ≥ 5, and their clinical outcomes were compared. Patients with NLR ≥ 5 had a significantly longer hospital stay and higher in-hospital mortality compared to those with NLR < 5. This highlights the prognostic value of elevated NLR in predicting adverse clinical outcomes in cirrhotic patients. (Table 5)

Table 5: NLR and Clinical Outcomes

NLR Group	No. of Patients	Mean Hospital Stay (days)	Mortality
NLR < 5	39 (55.7%)	5.2 ± 1.7	2 (5.1%)
NLR ≥ 5	31 (44.3%)	9.4 ± 2.8	8 (25.8%)
p-value	—	< 0.01	< 0.01

DISCUSSION

The current study comprised 70 patients diagnosed with liver cirrhosis, predominantly male (68.6%), with a mean age of 52.4 ± 11.8 years. This demographic trend aligned with global patterns, especially in alcohol-related liver disease, which constituted the predominant etiology in the current study (64.3%), followed by viral hepatitis (25.7%) and cryptogenic cirrhosis (10%).

Bhadra A et al.[10] found that the predominant age group for cirrhosis was middle-aged males, specifically those in their fourth to fifth decade of life. Alcohol is the predominant cause of chronic liver disease (66%), followed by non-alcoholic fatty liver disease (18%) and viral etiologies such as Hepatitis B and C (10% combined). The primary causes of liver cirrhosis identified in the study by Al Kaabi H et al.[11] were alcohol (29.5%), hepatitis C (27.75%), and hepatitis B (26.74%). Unlike the current study, Duah A et al.[12] identified HBV as the primary cause of liver cirrhosis (38.7%), closely followed by alcohol intake (38.3%).

The mean NLR in the study population was 4.9 ± 2.6, suggesting a generally elevated systemic inflammatory response in cirrhotic patients. When categorized by the Child-Pugh classification, the NLR exhibited a distinct rising trajectory corresponding to escalating disease severity. Patients classified as Child-Pugh class A displayed a mean NLR of 2.1 ± 0.9, whereas class B patients demonstrated a mean of 4.7 ± 1.3, and class C patients presented the greatest mean NLR of 7.9 ± 2.2.

The disparity in NLR across these groups was statistically significant ($p < 0.01$), indicating a robust correlation between NLR and deteriorating liver function as well as progressing hepatic decompensation. The study by T Kumar B et al.[13] indicated that a lower sensitivity level of NLR was effective in predicting infections in patients with chronic liver disease.

The study conducted by Tandale A et al.[14] observed a statistically significant positive connection between NLR and CTP ($p=0.0001$). Patients exhibiting elevated NLR were associated with CTP class B and C, indicating a favorable correlation with illness severity.

To further evaluate the correlation between NLR and the severity of liver disease, patients were classified according to their MELD scores. A steady rise in mean NLR was noted across the MELD categories, with a statistically significant positive correlation between NLR and MELD score ($p < 0.01$), underscoring the association between systemic inflammation and the advancement of liver disease. The research by Rice J et al.[15] indicated that the NLR retained statistical significance in multivariable models, accounting for age, MELD score, hepatocellular cancer, and ACLF severity.

Subsequent analysis revealed that patients with decompensated cirrhosis exhibited a markedly elevated mean NLR (6.2 ± 2.3) in contrast to those with compensated cirrhosis (2.8 ± 1.1), yielding a p-value of < 0.01. This discovery corroborates the concept that inflammatory activity, indicated by NLR, escalates with the emergence of clinical problems in cirrhosis, including ascites, variceal hemorrhage, and hepatic encephalopathy. This was analogous to the research conducted by Song F et al.[16]

Upon categorizing patients into two groups according to their NLR values—those with NLR < 5 and those with NLR ≥ 5—a considerable disparity in clinical outcomes was observed. Patients with an NLR of 5 or greater experienced a substantially prolonged mean hospital stay (9.4 ± 2.8 days) in contrast to those with an NLR of less than 5 (5.2 ± 1.7 days).

Furthermore, in-hospital mortality was significantly elevated in the high-NLR group, with a rate of 25.8% compared to merely 5.1% in the low-NLR group. Both differences were statistically significant ($p < 0.01$). The results highlight the prognostic significance of NLR in forecasting unfavorable clinical outcomes in patients with liver cirrhosis, indicating its potential as a straightforward and economical biomarker for early risk assessment and management strategy formulation. The study conducted by Mahassadi AK et al.[17] found that the Neutrophil-to-Lymphocyte Ratio (NLR) demonstrates superior and consistent accuracy in forecasting in-hospital mortality at 30 days (AUC=0.618), 60 days (AUC=0.680), and 90 days (AUC=0.613) of follow-up.

CONCLUSION

The degree of liver cirrhosis has a strong association with the NLR, a simple, affordable, and easily accessible biomarker. Increased NLR levels correlated with elevated Child-Pugh and MELD scores, signifying more severe liver impairment. Moreover, elevated NLR was associated with prolonged hospitalizations and heightened in-hospital mortality rates. Consequently, NLR may function as a valuable prognostic indicator to inform clinical decision-making and risk stratification in individuals with liver cirrhosis.

FINANCIAL SUPPORT AND SPONSORSHIP:

Nil.

CONFLICTS OF INTEREST:

There are no conflicts of interest

REFERENCES

1. Campana L, Iredale JP. Regression of liver fibrosis. InSeminars in liver disease 2017 Mar (Vol. 58, No. 01, pp. 001-010). Thieme Medical Publishers.
2. Huang DQ, Mathurin P, Cortez-Pinto H, Loomba R. Global epidemiology of alcohol-associated cirrhosis and HCC: trends, projections and risk factors. Nature reviews Gastroenterology & hepatology. 2023 Jan;20(1):37-49.
3. Battle A, Mudd J, Ahlenstiel G, Kalo E. Liver Cirrhosis: Evolving Definitions, and Recent Advances in Diagnosis, Prevention and Management. Livers. 2025 Jun 25;5(3):28.
4. Mylavarapu M, Kalpeshbhai PN, Hien VT, Patel P, Assefi M. Comparison of the Prognostic Value of the Child Pugh and MELD Scoring Systems in Cirrhosis-A Systematic Review. Journal of Critical Care & Emergency Medicine. 2022;115:2-7.
5. Kotak PS, Kumar J, Kumar S, Varma A, Acharya S, Kumar Jr MJ. Navigating cirrhosis: a comprehensive review of liver scoring systems for diagnosis and prognosis. Cureus. 2024;16(3).
6. Gong J, Tu W, Liu J, Tian D. Hepatocytes: A key role in liver inflammation. Frontiers in immunology. 2023 Jan 18;13:1083780.
7. Obeagu EI. The diagnostic significance of neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio in malaria: insights and implications–a narrative review. Annals of Medicine and Surgery. 2025 Jun 1;87(6):3393-402.
8. Seyedi SA, Nabipoorashrafi SA, Hernandez J, Nguyen A, Lucke-Wold B, Nourigheimasi S et al. Neutrophil to lymphocyte ratio and spontaneous bacterial peritonitis among cirrhotic patients: a systematic review and meta-analysis. Canadian Journal of Gastroenterology and Hepatology. 2022;2022(1):8604060.
9. Wang N, He S, Zheng Y, Wang L. The value of NLR versus MLR in the short-term prognostic assessment of HBV-related acute-on-chronic liver failure. International Immunopharmacology. 2023;121:110489.
10. Bhadra A, Mandal SK, Mukhopadhyay A. Etiological and Demographic Profile of Chronic Liver Diseases in Adults in a Tertiary Care Center of Eastern India. Bengal Physician Journal. 2025;12(3):119-22.
11. Al Kaabi H, Al Alawi AM, Al Falahi Z, Al-Naamani Z, Al Busafi SA. Clinical characteristics, etiology, and prognostic scores in patients with acute decompensated liver cirrhosis. Journal of Clinical Medicine. 2023 Sep 4;12(17):5756.
12. Duah A, Agyei-Nkansah A, Osei-Poku F, Duah F, Addo BP. Sociodemographic characteristics, complications requiring hospital admission and causes of in-hospital death in patients with liver cirrhosis admitted at a district hospital in Ghana. PloS one. 2021 Jun 24;16(6):e0253759.
13. Kumar B, Kumari B, Kumari P. Inflammatory markers (esr, crp, nlr and ferritin) and their correlation to child pugh scoring in chronic liver disease (cld). Int. J. Acad. Med. Pharm.. 2024;6(1):1196-202.
14. Tandale A, Kalburgi MM, Itagi NR, Khanapur R, Pattar S. A study of NLR and it's correlation with severity and complications of liver cirrhosis on the basis of child turcotte pugh score in a tertiary care hospital, Vijayapur. Al Am een J Med Sci 2023; 16(4): 373-378

15. Rice J, Dodge JL, Bambha KM, Bajaj JS, Reddy KR, Gralla J et al. Neutrophil-to-lymphocyte ratio associates independently with mortality in hospitalized patients with cirrhosis. Clinical Gastroenterology and Hepatology. 2018 Nov 1;16(11):1786-91.
16. Song F, Wu XL, Wei BH. Prognostic value of neutrophil-to-lymphocyte ratio in septic patients with liver cirrhosis: a cohort study. BMC gastroenterology. 2025 Aug 1;25 (1):549.
17. Mahassadi AK, Anzouan-Kacou Kissi H, Attia AK. The prognostic values of neutrophil-to-lymphocyte ratio and platelet-to-lymphocyte ratio at baseline in predicting the in-hospital mortality in black african patients with advanced hepatocellular carcinoma in palliative treatment: A comparative cohort study. Hepatic Medicine: Evidence and Research. 2021 Dec 8:123-34.

How to cite this article: A. Ramanathan[1], B. Manikandan[2], PROGNOSTIC VALUE OF THE NEUTROPHIL-TO-LYMPHOCYTE COUNT IN PATIENTS WITH LIVER CIRRHOSIS, Asian J. Med. Res. Health Sci., 2026; 4 (1):67-72.
Source of Support: Nil, Conflicts of Interest: None declared.

