

Neutrophil-To-Lymphocyte Ratio: Is There Value in Assessing the Severity and Complications of Liver Cirrhosis?

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Abstract

Original Research Article

Background: The neutrophil-to-lymphocyte ratio (NLR) is a simple, inexpensive, and readily available inflammatory marker. It has been studied as a prognostic factor in several chronic diseases, particularly liver diseases. The objective of this study was to evaluate the utility of NLR in assessing the severity of liver cirrhosis and its complications. [1-3] **Patients and Methods:** This was a single-center cross-sectional study including 50 patients with liver cirrhosis. NLR was calculated from the complete blood count. Cirrhosis severity was evaluated using the Child-Pugh classification, MELD score, and ALBI score. Associations between NLR and complications of cirrhosis—ascites, hepatic encephalopathy, digestive hemorrhage, ascitic fluid infection, and jaundice—were analyzed using Spearman's correlation coefficient, Mann-Whitney test, and Chi-square test. **Results:** Fifty patients were included. The median NLR was 2.75 (range: 0.87–15.42). Median NLR values were 3.00 in Child-Pugh class A, 2.62 in Child-Pugh class B, and 2.00 in Child-Pugh class C, with no significant difference ($p = 0.332$). No significant correlation was observed between NLR and MELD ($\rho = -0.196$; $p = 0.177$), ALBI ($\rho = 0.024$; $p = 0.869$), bilirubin, albumin, INR, or platelet count. Similarly, NLR was not significantly associated with ascites, hepatic encephalopathy, digestive hemorrhage, ascitic fluid infection, or jaundice. A non-significant trend toward a higher NLR was observed in patients with ascitic fluid infection (7.58 vs. 2.72; $p = 0.138$). **Conclusion:** In this cohort of cirrhotic patients, NLR was not significantly associated with cirrhosis severity evaluated by Child-Pugh, MELD, or ALBI, nor with the main complications of the disease. These results suggest that NLR alone does not allow stratification of cirrhosis severity in this population. Larger studies are needed to clarify its interest, particularly in ascitic fluid infection.

Keywords: Liver cirrhosis; Neutrophil-to-lymphocyte ratio; Inflammation; Child-Pugh; MELD; Complications.

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1. INTRODUCTION

Liver cirrhosis is a chronic disease that progresses toward liver failure and its major complications, including ascites, digestive hemorrhage, hepatic encephalopathy, bacterial infections, and renal failure. Assessment of disease severity relies primarily on the Child-Pugh classification, the Model for End-Stage Liver Disease (MELD) score, and, more recently, the Albumin-Bilirubin (ALBI) score. [1-3]

Systemic inflammation plays a pivotal role in the progression of cirrhosis and the occurrence of its complications. The neutrophil-to-lymphocyte ratio (NLR), calculated from the routine complete blood count, is a simple, inexpensive, and highly reproducible inflammatory marker. It has been associated with prognosis across several pathological conditions, notably cardiovascular diseases, malignancies, and specific liver disorders. [1,4,6]

In liver cirrhosis, an elevated NLR could reflect systemic inflammation, underlying bacterial infection, or disease exacerbation. However, its precise utility in evaluating cirrhosis severity remains debated in current clinical literature. [7,8]

The objective of this study was to evaluate the relationship between NLR and the severity of liver cirrhosis—assessed via Child-Pugh, MELD, and ALBI scores—as well as its association with the principal complications of the disease.

2. PATIENTS AND METHODS

2.1. Study Design and Population

This was a single-center cross-sectional study conducted among patients treated for liver cirrhosis at the Gastroenterology Department of the Military Hospital of Rabat. All patients who had a complete blood count including absolute neutrophil and lymphocyte counts

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were included in the analysis. A total of 50 patients met the eligibility criteria and were analyzed.

2.2. Calculation of NLR

The neutrophil-to-lymphocyte ratio (NLR) was calculated by dividing the absolute neutrophil count by the absolute lymphocyte count:

$$\text{NLR} = \text{Absolute Neutrophil Count} / \text{Absolute Lymphocyte Count}$$

2.3. Study Variables

The following clinical and biological parameters were systematically collected:

- **Demographic characteristics:** Age and sex.
- **Etiology of cirrhosis:** Hepatitis B virus (HBV), hepatitis C virus (HCV), undetermined etiology, or other causes.
- **Severity classifications and scores:** Child-Pugh class (A, B, or C), MELD score, and ALBI score.
- **Laboratory parameters:** Serum bilirubin, serum albumin, International Normalized Ratio (INR), and platelet count.
- **Complications:** Presence of ascites, hepatic encephalopathy, jaundice, digestive hemorrhage, and ascitic fluid infection.

Table 1: Median NLR values according to Child-Pugh classification (p = 0.332).

Child-Pugh Class	Median NLR
Class A	3.00
Class B	2.62
Class C	2.00

Furthermore, no significant correlation was observed between NLR and MELD score ($\rho = -0.196$; $p = 0.177$) or ALBI score ($\rho = 0.024$; $p = 0.869$). Likewise, NLR did not correlate significantly with individual laboratory markers, including serum bilirubin, serum albumin, INR, or platelet count.

2.4. Statistical Analysis

Qualitative variables were expressed as frequencies and percentages. Quantitative variables were presented as medians and ranges (minimum–maximum). Correlations between NLR and continuous severity scores (MELD, ALBI) were evaluated using Spearman's correlation coefficient (ρ). Comparison of NLR levels according to the presence or absence of complications was performed using the Mann-Whitney U test. Statistical significance was defined as a p -value < 0.05 .

3. RESULTS

3.1. Population Characteristics

Fifty patients were included in the study. The distribution according to Child-Pugh classification was as follows: 17 patients in class A (34%), 18 in class B (36%), and 15 in class C (30%). The overall median NLR was 2.75, with values ranging from 0.87 to 15.42.

3.2. NLR and Cirrhosis Severity

The median NLR values according to Child-Pugh severity class were 3.00 in class A, 2.62 in class B, and 2.00 in class C. No statistically significant difference was observed across Child-Pugh classes ($p = 0.332$).

3.3. NLR and Complications of Cirrhosis

Regarding cirrhosis complications, ascites was present in 29 patients (58%), hepatic encephalopathy in 12 patients (24%), digestive hemorrhage in 11 patients (22%), ascitic fluid infection in 4 patients (8%), and jaundice in 3 patients (6%). NLR was not significantly associated with the presence of any of these individual complications (Table 2).

Table 2: Relationship between NLR and major complications of liver cirrhosis

Complication	Median NLR (With Complication)	Median NLR (Without Complication)	p-value
Ascites	2.75	2.74	0.701
Hepatic Encephalopathy	2.11	2.80	0.323
Digestive Hemorrhage	3.25	2.74	0.556
Ascitic Fluid Infection	7.58	2.72	0.138
Jaundice	2.75	2.74	0.595
Hemorrhagic Decompensation	2.75	2.48	0.330

A non-significant numerical trend toward a higher median NLR was noted among patients with ascitic fluid infection (7.58 vs. 2.72 in patients without infection; $p = 0.138$).

4. DISCUSSION

This study found no statistically significant association between NLR and the severity of liver cirrhosis as evaluated by Child-Pugh classification, MELD score, or ALBI score. These findings suggest that, in this patient population, NLR alone does not serve

as a effective biomarker for stratifying overall cirrhosis severity.

Several pathophysiological hypotheses may explain this absence of correlation. First, chronic liver cirrhosis is characterized by persistent low-grade systemic inflammation, which may not consistently produce marked elevations in circulating neutrophil-to-lymphocyte ratios. Second, acute events such as bacterial superinfections, acute gastrointestinal bleeding, or acute-on-chronic liver decompensation can cause transient surges in NLR, rendering single cross-sectional measurements difficult to interpret. [9,10]

The observed trend toward elevated NLR in patients presenting with ascitic fluid infection is biologically plausible, given that bacterial infections trigger a pronounced systemic inflammatory response accompanied by neutrophilia. However, this association did not reach statistical significance, likely due to the small sample size of patients with confirmed ascitic fluid infection in this cohort (n = 4).

5. CONCLUSION

In this cross-sectional cohort of patients with liver cirrhosis, the neutrophil-to-lymphocyte ratio (NLR) was not significantly associated with disease severity evaluated by Child-Pugh, MELD, or ALBI scores, nor with the main clinical complications of cirrhosis. A non-significant trend toward higher NLR values was observed in patients with ascitic fluid infection. Larger prospective studies with longitudinal follow-up are warranted to clarify the prognostic value of NLR, particularly in the early detection of infectious complications such as spontaneous bacterial peritonitis.

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