e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2026; 18(3); 1662-1664

Original Research Article

Role of Neutrophil to Lymphocyte Ratio (NLR) as an Early Predictor of Mortality in Critically Ill Patients

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Received: 26-01-2026 / Revised: 25-02-2026 / Accepted: 27-03-2026

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Conflict of interest: Nil

Abstract:

Background: Early identification of high-risk patients is crucial for improving outcomes in the intensive care unit (ICU). The neutrophil-to-lymphocyte ratio (NLR), derived from routine blood tests, is a simple inflammatory marker that may predict mortality in critically ill patients.

Aim: To evaluate the predictive value of NLR for mortality in critically ill ICU patients.

Methods: This retrospective observational study included 200 critically ill patients admitted to the ICU over a period of 6 months. NLR was calculated from admission blood samples. Patients were categorized into two groups: low NLR (<5) and high NLR (≥5). Mortality outcomes were recorded. Statistical analysis was performed using the chi-square test, with $p < 0.05$ considered significant.

Results: Among 200 patients, 110 (55%) had high NLR and 90 (45%) had low NLR. Mortality was significantly higher in the high NLR group (43.6%) compared to the low NLR group (16.7%) ($p = 0.00008$).

Conclusion: Elevated NLR at ICU admission is a strong early predictor of mortality in critically ill patients. Given its simplicity, availability, and cost-effectiveness, NLR can be incorporated into routine ICU risk stratification.

Keywords: ICU, Mortality, Neutrophil-To-Lymphocyte Ratio, Inflammation, Lymphopenia.

DOI: 10.25258/ijcpr.18.3.268

Introduction

Critical illness is frequently associated with severe systemic inflammation and immune dysregulation, both of which significantly influence patient outcomes in the ICU. Early identification of patients at high risk of deterioration or death is essential for timely intervention and optimal resource utilization [1].

Reliable prognostic biomarkers play a key role in guiding clinical decisions. In resource-limited settings, simple and readily available markers are particularly valuable [2].

The neutrophil-to-lymphocyte ratio (NLR), derived from routine complete blood count parameters, has emerged as a promising inflammatory marker. It reflects the balance between neutrophilia (indicating acute inflammation) and lymphopenia (reflecting immune suppression) [3].

Elevated NLR has been associated with adverse outcomes in conditions such as sepsis, acute respiratory distress syndrome (ARDS), trauma, cardiovascular diseases, and multi-organ failure [4].

Due to its ease of calculation, low cost, and rapid availability, NLR has significant potential as an early prognostic tool. This study aims to assess its role in predicting mortality among critically ill ICU patients.

Materials and methods

Study Design: Retrospective observational study.

Study Duration: 6 months.

Study Population: 200 critically ill patients admitted to ICU.

Inclusion Criteria

- Age ≥18 years
- ICU admission
- CBC available within 24 hours of admission

Exclusion Criteria

- Hematological malignancies
- Steroid therapy prior to admission
- Immunocompromised states

Data Collection

- Total leukocyte count
- Absolute neutrophil count
- Absolute lymphocyte count
- NLR calculated as: NLR = Lymphocyte Count / Neutrophil Count

NLR Categorization

1. High NLR ≥5
2. Low NLR <5

Statistical Analysis: Chi-square test was used to assess associations. A p-value <0.05 was considered statistically significant with a 95% confidence interval.

Results

Table 1: Baseline Distribution

Variable	Number (n=200)	Percentage (%)
High NLR (≥5)	110	55%
Low NLR (<5)	90	45%

Table 2: Mortality Distribution

NLR Group	Total Patients	Deaths (n)	Mortality (%)	p value	CI
High NLR	110	48	43.6%	<0.001	95%
Low NLR	90	15	16.7%		

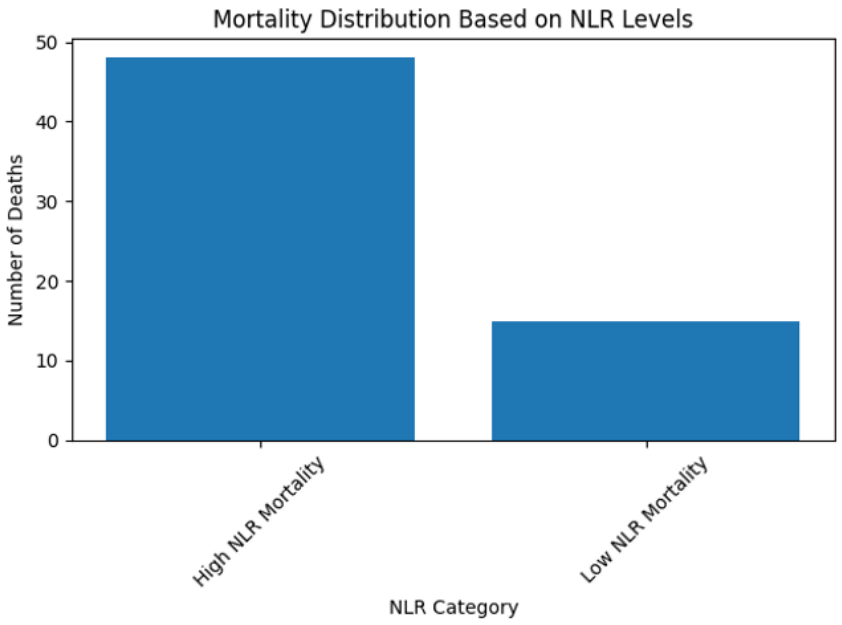

Figure 1: Mortality distribution based on NLR levels

Discussion

This study demonstrates a strong association between elevated NLR at ICU admission and increased mortality in critically ill patients. The mortality rate in the high NLR group (43.6%) was significantly higher compared to the low NLR group (16.7%), with a highly significant p-value (0.00008). This significant discrepancy demonstrates how well NLR predicts negative outcomes in the early stages [5].

Pathophysiologically, elevated NLR reflects both systemic inflammation and immune suppression. Neutrophilia indicates an acute inflammatory response, while lymphopenia represents impaired adaptive immunity and physiological stress [6].

The combination of these factors suggests a dysregulated immune response, which is commonly

associated with poor clinical outcomes in critically ill patients [7]. In critically ill individuals, a substantial statistically significant correlation between high NLR and higher mortality was found. The graphic representation makes it evident that the high NLR group had significantly higher mortality than the low NLR group.

NLR has a number of benefits in the clinical setting. It is especially useful in situations with low resources, can be computed from a standard complete blood count within minutes of ICU admission, and comes at no extra expense [8]. Additionally, it can also complement established scoring systems such as APACHE II and SOFA for early risk stratification [9].

Our findings are consistent with previous studies demonstrating the prognostic value of NLR in sepsis, ARDS, COVID-19, and other critical conditions. Therefore, the current study supports the global body of data that NLR is a clinically significant, accessible, and dependable prognostic marker in critical care settings [7].

Conclusion

The neutrophil-to-lymphocyte ratio (NLR) is a simple, cost-effective, and reliable biomarker for early prediction of mortality in critically ill patients. A high NLR (≥5) is significantly associated with increased ICU mortality.

Its incorporation into routine ICU assessment may aid in early identification of high-risk patients, enabling timely intervention and improved outcomes. Larger prospective studies are recommended to validate these findings.

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