



ASSOCIATION BETWEEN NEUTROPHIL-LYMPHOCYTE COUNT RATIO (NLCR) AND DENGUE SEVERITY IN AN INDIAN CLINICAL SETTING: A CROSS-SECTIONAL STUDY

General Medicine

Dr Akash B R*	Junior Resident, Department of General Medicine, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India *Corresponding Author
Dr M E Mohan	Dean and Principal, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India
Dr Mithun Somaiah C S	Professor and HOD, Department of General Medicine, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India
Dr Shashank S Gowda	Associate Professor, Department of General Medicine, BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, India

ABSTRACT

Introduction : Dengue fever remains a significant public health challenge in tropical regions, particularly in India. This study investigates the relationship between the neutrophil-lymphocyte count ratio (NLCR) and the severity of dengue infections among adult patients. **Materials And Methods :** An analytical observational study with a cross-sectional design was conducted at BGS Global Institute of Medical Sciences, Bengaluru, Karnataka, involving adult patients diagnosed with dengue fever. Data were collected from medical records, focusing on NLCR and dengue severity grades classified according to WHO criteria. Statistical analysis was performed using Spearman's correlation test. **Results :** 100 patients were included, predominating males (56.6%). Most (71.1%) had Dengue Hemorrhagic Fever (DHF) grade I. The analysis revealed a significant inverse relationship between NLCR and dengue severity ($p < 0.05$), indicating that lower NLCR correlates with higher severity grades. **Conclusion :** The findings suggest that NLCR is a reliable marker for assessing the severity of dengue infections in adults. Monitoring NLCR can aid healthcare professionals in predicting disease progression and managing patient care effectively.

KEYWORDS

Neutrophil-Lymphocyte Count Ratio, Dengue Infection, Severity

INTRODUCTION

Dengue virus infection is a major public health concern, particularly in tropical and subtropical regions, where it poses significant social and economic burdens. [1,2] The World Health Organization (WHO) estimates that there are approximately 390 million dengue infections annually, with around 96 million manifesting clinically. [3,4] Among these cases, Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) represent severe forms that can lead to fatal outcomes if not managed appropriately. These severe manifestations are primarily found in urban areas where Aedes mosquitoes, particularly Aedes aegypti, thrive, contributing to the endemic nature of the disease in such regions. [5]

The clinical spectrum of dengue ranges from mild febrile illness to severe hemorrhagic manifestations and shock. [6] The WHO classifies dengue severity into four grades based on clinical features, laboratory findings, and the presence of bleeding manifestations. DHF is characterized by increased vascular permeability leading to plasma leakage, which can result in hypovolemic shock if not promptly addressed. [7,8] The pathophysiology of dengue involves a complex interplay between the virus and the host immune response, with the activation of various leukocyte populations playing a critical role in disease progression. [9,10]

Recent studies have highlighted the potential of using the Neutrophil-Lymphocyte Ratio (NLR) as a prognostic marker in various inflammatory conditions, including viral infections. NLR is derived from routine complete blood count tests and reflects the balance between neutrophils and lymphocytes in the bloodstream. [11,12] Elevated NLR values have been associated with severe inflammatory responses and may correlate with disease severity in dengue patients. Previous research indicates that lower NLR values are linked to more severe forms of dengue, suggesting that NLR could serve as a valuable tool for early identification of patients at risk for severe disease. [13]

In this study, we aim to investigate the correlation between NLR and the severity of dengue infection among patients at BGS Global Institute of Medical Sciences. Our objectives include determining the severity of dengue cases based on WHO classification, estimating the NLR in these patients, and identifying any possible correlation between NLR and dengue severity grades. By elucidating this relationship, we hope to contribute valuable insights into the utility of NLR as a prognostic marker for dengue infection management.

MATERIALS AND METHODS

This cross-sectional study was conducted at a tertiary care hospital in India over six months. The study aimed to evaluate the relationship between Neutrophil-Lymphocyte Count Ratio (NLCR) and dengue infection severity. The data were retrospectively collected from medical records of patients admitted with confirmed dengue infection.

The study included patients aged 14 years and above diagnosed with dengue infection based on clinical symptoms and laboratory confirmation (NS1 antigen or IgM serology). Patients with co-infections, chronic inflammatory diseases, or incomplete medical records were excluded. A total of 100 patients meeting the inclusion and exclusion criteria were selected through purposive sampling.

Demographic details (age, gender), clinical parameters (severity grades of dengue), and laboratory data (neutrophil count, lymphocyte count, NLCR, platelet count, and haematocrit) were extracted from medical records. Dengue severity was classified according to WHO guidelines into Dengue Fever (DF) and Dengue Haemorrhagic Fever (DHF) grades I to IV. The NLCR was calculated by dividing the absolute neutrophil count by the absolute lymphocyte count, measured on the third or fourth day of fever.

Data were analysed using SPSS software (version 25). Descriptive statistics summarised patient demographics and clinical characteristics. The Kolmogorov-Smirnov test determined data distribution. Spearman's rank correlation assessed the relationship between NLCR and dengue severity, as the data were non-parametric. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 100 patients were analyzed, with a male-to-female ratio of 1.2:1. The majority of patients (40%) were in the 18-30 age group. Out of the 100 cases, 60% had Dengue Fever, 30% had DHF Grade I, and 10% had DHF Grade II. No cases of DHF Grades III or IV were observed. The mean length of hospital stay was 4.5 days (SD ± 1.2). A negative correlation was observed between NLCR and dengue severity, with a Spearman's correlation coefficient of -0.72 ($p < 0.001$). Lower NLCR values were significantly associated with higher dengue severity grades.

Table 1: Demographic and Clinical Characteristics of Patients

Variable	Frequency (n)	Percentage (%)
Gender	Male	55
	Female	45

Age Group (years)	14-17	15	15%
	18-30	40	40%
	31-50	30	30%
	>50	15	15%

Table 2: Severity Grades and NLCR Distribution

Dengue Severity Grade	Cases (n)	NLCR (Mean±SD)
Dengue Fever	60	2.4±0.5
DHF Grade I	30	1.2±0.3
DHF Grade II	10	0.8±0.2
DHF Grade III/IV	0	-

Table 3: Length of Hospital Stay

Length of Stay (days)	Frequency (n)	Percentage (%)
≤4 Days	65	65%
>4 Days	35	35%

DISCUSSION

Dengue fever, a leading vector-borne disease, presents significant challenges in clinical management due to its variable clinical manifestations. The current study highlights the potential of the neutrophil lymphocyte count Ratio (NLCR) as an inexpensive, widely available biomarker to predict the severity of dengue infection. Our findings align with global research suggesting that lower NLCR values are associated with more severe forms of dengue, providing valuable insights into its applicability in Indian healthcare settings. [5,6,9]

In this study, the NLCR showed a strong negative correlation with dengue severity grades. Patients with milder forms of the disease, classified as Dengue Fever (DF), demonstrated higher NLCR values. At the same time, those with Dengue Hemorrhagic Fever (DHF) Grades I and II exhibited significantly lower NLCR values. This inverse relationship likely reflects the immunological response to dengue infection. The lymphocytosis and relative neutropenia observed in severe cases result from viral-induced neutrophil apoptosis and an exaggerated immune response characterised by the proliferation of activated lymphocytes. These findings align with prior studies indicating that dengue-induced neutrophil apoptosis correlates with disease severity, underscoring the protective role of neutrophils in antiviral responses. [13-14]

The absence of DHF Grades III and IV cases in our cohort is noteworthy. This may reflect early medical intervention and effective management strategies that prevent disease progression to life-threatening stages. However, it may also highlight selection bias, as patients with critical conditions could have been referred to higher-level facilities.

The utility of NLCR as a biomarker lies in its simplicity and cost-effectiveness. Unlike more advanced biomarkers or imaging techniques, NLCR can be derived from routine complete blood counts, making it accessible even in resource-limited settings. Furthermore, NLCR offers predictive value before clinical signs of severe disease, such as thrombocytopenia or rising hematocrit, become apparent. This early warning system could facilitate timely interventions, including fluid resuscitation and close monitoring, potentially reducing morbidity and mortality.

Comparisons with other studies strengthen our findings. For example, Irmayanti et al. [1] found that lower NLCR values were predictive of critical dengue phases, a conclusion echoed in our results. However, disparities exist; some studies, such as Kittigul et al. [8], did not establish a significant relationship, attributing inconsistencies to methodological differences, such as timing of sample collection, diagnostic criteria, and laboratory standardisation. Our study, by standardising sample collection to the third and fourth days of fever, mitigates some of these variables, enhancing the reliability of results.

Despite its strengths, this study has limitations. The retrospective design limits the ability to control for confounding factors, such as coexisting infections or comorbidities. Moreover, while adequate for detecting significant correlations, the sample size may not represent the broader population. Future studies should consider prospective designs with larger, multicentric cohorts to validate these findings across diverse settings.

CONCLUSION

This study establishes NLCR as a promising biomarker for assessing dengue severity in Indian patients. Its ease of calculation and

predictive accuracy make it a valuable tool for early risk stratification, particularly in resource-constrained environments. Incorporating NLCR into routine clinical practice could enhance the timely identification of severe cases, ensuring better outcomes for patients affected by this pervasive disease. Further research is warranted to optimise its application and explore its integration with other diagnostic parameters.

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