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Exploring The Correlation Between Neutrophil to Lymphocyte Ratio, Platelet to Lymphocyte Ratio and Liver Function Test in Predicting Prognosis of Dengue Fever

Dr Jaishree Sharma[1], Dr Anurag Prasad[2], Dr Shrey Srivastav[3], Dr Shivam Singh[4], Dr Vinay Mathur[5] and Dr Deepak Sharma[6]

[1]Junior Resident, Department of General Medicine School of Medical Sciences and Research Sharda University Greater Noida Up 201306

[2]Professor, Department of General Medicine, School of Medical Sciences and Research Sharda University Greater Noida Up 201306 India

[3]Assistant Professor, Department of General Medicine, School of Medical Sciences and Research Sharda University Greater Noida Up 201306 India

[4]Junior Resident Department of General Medicine School of Medical Sciences and Research Sharda University Greater Noida Up 201306 India

[5]Junior Resident, Department of General Medicine School of Medical Sciences and Research Sharda University Greater Noida Up 201306 India

[6]Professor And Hod, Department of General Medicine, School of Medical Sciences and Research Sharda Hospital Greater Noida Up 201306

Correspondence:
Dr Deepak Sharma
Professor And Hod, Department of General Medicine, School of Medical Sciences and Research Sharda Hospital Greater Noida Up 201306

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Abstract ***Background***: Dengue infection presents with a wide clinical spectrum ranging from mild febrile illness to severe complications. Early identification of patients at risk of progression remains a clinical challenge. Hematological ratios such as the neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and liver function tests (LFTs) have emerged as potential markers for assessing disease severity and prognosis. Aim: To estimate NLR, PLR, and liver function parameters in patients with dengue fever and to correlate these markers with disease severity and prognosis. ***Methods***: This cross-sectional observational study was conducted in the Department of General Medicine at a tertiary care hospital in North India from April 2024 to November 2025. A total of 106 adult patients with serologically confirmed dengue infection were enrolled based on predefined inclusion and exclusion criteria. Clinical evaluation and laboratory investigations, including complete blood counts and liver function tests, were performed at admission. NLR and PLR were calculated from differential leukocyte and platelet counts. Correlation analysis and regression models were used to assess associations between laboratory parameters and disease severity. Receiver operating characteristic (ROC) analysis was applied to determine predictive performance for rehospitalization. ***Results***: The mean age of participants was 38.45 ± 13.32 years, with a male predominance. A rising trend in NLR was observed with increasing disease severity. PLR demonstrated significant variation corresponding to platelet trends. Elevated transaminases, particularly SGPT and SGOT, were noted in patients with more severe clinical profiles. In prognostic analysis, PLR demonstrated very high predictive ability for rehospitalization, while NLR showed good predictive performance. Liver enzymes showed modest predictive value with higher specificity at defined cutoffs. ***Conclusion***: NLR, PLR, and liver function parameters are simple, readily available, and cost-effective markers that correlate with dengue severity and short-term prognosis. These markers may aid clinicians in early risk stratification, closer monitoring, and resource allocation, especially in resource-constrained settings.

Keywords: Dengue fever, Neutrophil-to-lymphocyte ratio, Platelet-to-lymphocyte ratio, Liver function tests, Disease severity, Prognosis, Rehospitalization.

INTRODUCTION

Dengue fever is one of those viral illnesses that continues to trouble public health systems across the globe, especially in countries with warm, humid climates like those in the tropics and subtropics. [1] Over the years, health experts and organizations like the World Health Organization (WHO) have flagged dengue as a growing global threat. The burden of dengue continues to rise due to urbanization, global travel, and climate change, all of which expand the habitat of Aedes

mosquitoes and enhance virus transmission. Outbreaks are common in densely populated areas, where sanitation is poor and stagnant water facilitates breeding.[4]

Interestingly, not everyone infected with dengue virus gets sick—many cases remain symptom-free. However, when symptoms do appear, they can range quite a bit. Some people might only experience mild, flu-like discomfort, while others could face more serious issues. In its severe form, dengue can lead to increased bleeding tendencies, fragile blood vessels, and fluid leakage, a condition known as Dengue Hemorrhagic Fever (DHF). If not managed well, DHF can escalate to Dengue Shock Syndrome (DSS), which involves dangerously low blood pressure due to fluid loss. [9]

The World Health Organization (WHO) breaks down dengue infection into three main categories: probable dengue, dengue with warning signs, and severe dengue. This approach helps doctors and healthcare teams quickly spot which patients might need closer observation or even hospital care. [2] In the first category, probable dengue, the illness usually starts with a fever and is often paired with other signs like body aches, nausea, skin rash, or a drop in white blood cells (leukopenia). [2] When the condition progresses to dengue with warning signs, it gets a bit more serious. Patients may experience ongoing vomiting, abdominal pain, bleeding from the gums or nose, extreme tiredness, or signs of fluid leakage like a rapid fall in platelet count along with a rise in hematocrit levels. [11] The most critical stage, severe dengue, is when things escalate—this can involve serious fluid loss that leads to shock, trouble breathing due to fluid buildup, significant internal bleeding, or damage to vital organs like the liver or heart. [5]

Early identification of patients at risk of developing severe dengue is crucial for optimizing clinical outcomes, especially in the context of rising dengue burden globally. The progression from mild dengue fever to life-threatening forms such as Dengue Hemorrhagic Fever (DHF) or Dengue Shock Syndrome (DSS) can be rapid and unpredictable.[11] This necessitates the identification of accessible and reliable prognostic indicators to enable timely intervention and appropriate management strategies.[12]

One of the central challenges in managing dengue lies in its highly variable clinical course. While many patients recover uneventfully, a subset may deteriorate rapidly due to plasma leakage, hemorrhage, or multi-organ dysfunction. Traditional warning signs, as outlined by WHO, offer some guidance; however, their specificity and sensitivity remain limited in certain populations.[2] This gap in early, accurate prediction has driven researchers to explore alternative prognostic tools, such as hematological and biochemical parameters.[6]

Markers like Neutrophil-to-Lymphocyte Ratio (NLR) and Platelet-to-Lymphocyte Ratio (PLR) have gained attention due to their simplicity and availability from routine complete blood counts. Elevated NLR has been associated with severe dengue and serves as a surrogate marker of systemic inflammation and immune dysregulation.[5] PLR, in turn, offers insight into the extent of thrombocytopenia and lymphocyte suppression, both of which are critical in the pathogenesis of severe dengue.[10]

Moreover, deranged liver function tests—especially elevated transaminases—are commonly seen in severe cases, reflecting hepatic involvement either due to direct viral cytopathy or immune-mediated injury. These abnormalities serve as early red flags for organ dysfunction and are particularly useful in resource-limited settings where advanced imaging or virological testing is not readily available.[13] Hence, incorporating such markers into clinical algorithms may bridge the gap between clinical suspicion and definitive diagnosis, ultimately reducing morbidity and mortality associated with dengue. Despite advances in clinical recognition and supportive care for dengue fever, the unpredictable progression of the disease continues to pose significant challenges for clinicians. While the WHO classification provides a framework for identifying patients with warning signs and severe dengue, variability in clinical presentation and response to treatment often results in delayed recognition of complications. In such cases, readily available laboratory-based markers like NLR, PLR, and liver enzyme levels may provide early clues to disease severity but remain underutilized in routine clinical decision-making.[12]

In this context, there is a pressing need to identify simple, cost-effective, and reproducible markers that can reliably aid in stratifying patients based on their risk for developing severe complications.[13] This study, therefore, seeks to address the existing gaps in evidence by evaluating the association of NLR, PLR, and LFTs with disease severity in dengue.

Aims and Objectives

To Estimate Neutrophil to lymphocyte ratio, platelet to lymphocyte ratio and LFT in Dengue fever and to correlate NLR, Platelet to lymphocyte ratio and LFT Levels with the severity grade of dengue infection.

MATERIALS AND METHODS

This hospital-based cross-sectional observational study was conducted from April 2024 to November 2025 in the Department of General Medicine at the School of Medical Sciences & Research, Sharda Hospital, Greater Noida, Uttar Pradesh. Prior to commencement, formal approval was obtained from the Institutional Ethics Committee. A total of 106 newly diagnosed dengue patients were included in the study. The sample size was calculated using Cochran's formula, considering a dengue prevalence of 22.6%, a confidence level of 95%, and a precision of 8%.

Patients attending the outpatient and inpatient departments of the hospital were screened and recruited based on predefined eligibility criteria. Adults aged 18 years and above, of either sex, presenting with clinical features suggestive of dengue and having laboratory confirmation by dengue NS1 antigen positivity and/or IgM antibody positivity were included. Patients receiving immunosuppressive therapy, those with a history of hepatotoxic drug intake or drugs known to affect neutrophil-to-lymphocyte ratio, pregnant women, individuals with co-existing infections such as malaria or typhoid, and patients with acute febrile illness of uncertain diagnosis or confirmed co-infection were excluded from the study.

After enrolment, blood samples were collected by venipuncture under aseptic precautions and processed using EDTA vials. Laboratory investigations included complete blood count, liver function tests, and dengue serology. Differential leukocyte counts were measured using an automated hematology analyzer, and neutrophil-to-lymphocyte ratio (NLR) and platelet-to-lymphocyte ratio (PLR) were calculated. Additional investigations were carried out as per the approved study proforma. Statistical analysis was performed using SPSS version 26. A master chart containing demographic details, clinical findings, and laboratory parameters was prepared. Normality of data distribution was assessed using the Kolmogorov–Smirnov test. Correlation between NLR, PLR, liver function test parameters, and disease severity was evaluated using the Karl Pearson correlation coefficient, and regression analysis was applied where appropriate. Receiver operating characteristic curve analysis was performed to determine optimal cutoff values for predictive markers. A p-value of ≤0.05 was considered statistically significant, and results were presented using appropriate tables and graphical representations.

RESULTS

We recruited 106 patients for the present study.

Demographic Profile

The median age of the study participants was 35.5 years. The interquartile range was 20 years. The mean age was 38.45 years with a standard deviation of 13.32 years. Among the study participants, 68 (64.2%) were male and 38 (35.8%) were female, making a total of 106 (100%) participants. Out of the total participants, 56 (52.8%) belonged to rural areas, while 50 (47.2%) were from urban areas. Among the participants, 36 (34%) had education up to primary school, 22 (20.8%) had completed senior secondary school, and 18 (17%) were illiterate. Additionally, 17 (16%) were graduates, 12 (11.3%) had education up to high school, and 1 (0.9%) had postgraduate qualification. Among the participants, 31 (29.2%) were employed in private organizations, 27 (25.5%) were homemakers, and 24 (22.6%) were self-employed. Additionally, 21 (19.8%) were unemployed, while 3 (2.8%) were working in government organizations. (Table 1)

Table 1: Demographic Profile of Study Participants (n = 106)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	Median	35.5	—
	Interquartile Range	20	—
	Mean ± SD	38.45 ± 13.32	—
Sex	Male	68	64.2
	Female	38	35.8
Residence	Rural	56	52.8
	Urban	50	47.2
Education	Illiterate	18	17.0
	Up to Primary School	36	34.0
	Up to High School	12	11.3
	Up to Senior Secondary School	22	20.8
	Graduate	17	16.0
	Post Graduate	1	0.9
Occupation	Private Organisation	31	29.2
	Homemaker	27	25.5
	Self-Employed	24	22.6
	Unemployed	21	19.8
	Government Organisation	3	2.8

Chief Complaints

The most commonly reported chief complaint among participants was fever with chills, either alone or in combination with other symptoms, reported by 42 (39.6%) individuals. This was followed closely by abdominal pain, present in 41 (38.7%) participants, including those with associated symptoms such as loose stools or shortness of breath. Epistaxis, with or without fever, was reported by 13 (12.3%), and shortness of breath, either isolated or accompanying other symptoms, was noted in 8 (7.5%) cases. Less commonly reported complaints included vomiting (2 cases, 1.9%), bleeding per rectum (2 cases, 1.9%), haemoptysis (3 cases, 2.8%), and loose stools (5 cases, 4.7%), either alone or in combination with other features. (Table 2)

Table 2: Chief Complaints of the patients

Chief Complaints	Frequency	Percentage (%)
Fever with chills (± other symptoms)	42	39.6%
Abdominal pain (± other symptoms)	41	38.7%
Epistaxis (with/without fever)	13	12.3%
Shortness of breath (with/without fever)	8	7.5%
Fever with vomiting	2	1.9%
Fever with bleeding per rectum	2	1.9%
Hemoptysis (with/without fever)	3	2.8%
Loose stools (± fever or abdominal pain)	5	4.7%

Note: Some participants had overlapping symptoms; grouped categories reflect the presence of key complaints irrespective of coexisting features.

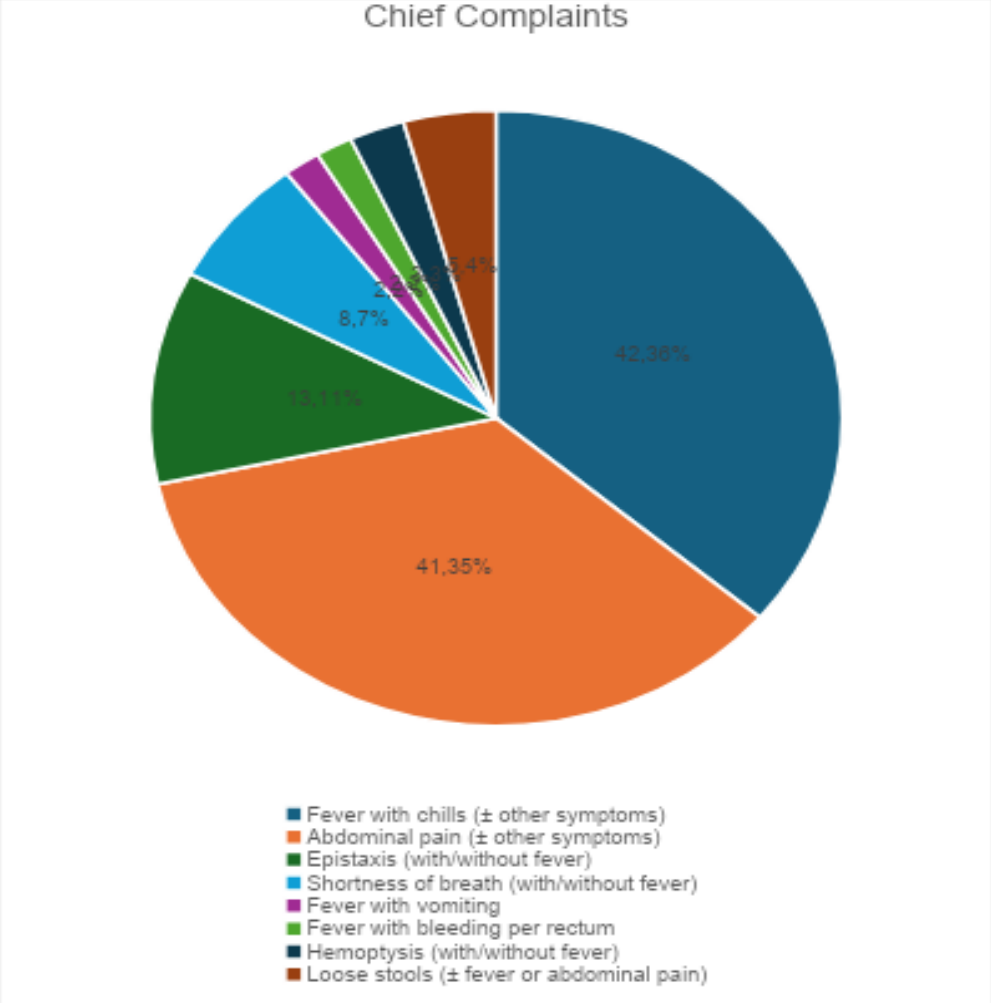

Figure 1: Chief Complaints

General Physical Examination

Among the participants, 68 (64.2%) were found to be febrile, while 38 (35.8%) were afebrile at the time of assessment. Out of the 106 individuals assessed, 21 (19.8%) exhibited pallor, while 85 (80.2%) had no signs of pallor. Among the 106 individuals assessed, 11 (10.4%) showed presence of icterus, whereas 95 (89.6%) did not exhibit icterus. Out of 106 individuals, 21 (19.8%) were found to have oedema, while 85 (80.2%) did not show signs of oedema.

The mean arterial pressure was evaluated among 106 individuals. The mean MAP was recorded at 87 mmHg with a standard deviation of ±13.6 mmHg, indicating moderate variability in blood pressure levels within the study population. The median MAP was 85.3 mmHg, and the interquartile range (IQR) was 22.7 mmHg, suggesting that 50% of the participants had MAP values ranging between approximately 74 mmHg and 96.7 mmHg. (Table 3)

Table 3: General Physical Examination Findings of Study Participants (n = 106)

Variable	Category	Frequency (n)	Percentage (%)
Temperature	Febrile	68	64.2
	Afebrile	38	35.8
Pallor	Absent	85	80.2
	Present	21	19.8
Icterus	Absent	95	89.6
	Present	11	10.4
Oedema	Absent	85	80.2
	Present	21	19.8
Mean Arterial Pressure (mmHg)	Median	85.3	—
	Interquartile Range	22.7	—
	Mean ± SD	87 ± 13.6	—

Systemic Examination

Out of the 106 individuals examined, 74 (69.8%) had a respiratory system within normal limits (WNL), while 32 (30.2%) were found to have abnormal respiratory findings. Among the 106 individuals assessed, 82 (77.4%) were found to have abnormal findings on per abdomen examination, whereas 24 (22.6%) had findings within normal limits. Out of 106 individuals who underwent ultrasonography of the abdomen, 94 (88.7%) showed abnormal findings, while 12 (11.3%) had normal (WNL) results. (Table 4)

Table 4: Systemic and Ultrasonographic Findings of Study Participants (n = 106)

Variable	Category	Frequency (n)	Percentage (%)
Respiratory System Examination	Within Normal Limits (WNL)	74	69.8
	Abnormal	32	30.2
Per Abdomen Examination	Abnormal	82	77.4
	Within Normal Limits (WNL)	24	22.6
USG Abdomen Findings	Abnormal	94	88.7
	Within Normal Limits (WNL)	12	11.3

Laboratory Examination

Direct Bilirubin had a median value of 1.7 mg/dL, with an interquartile range (IQR) of 1.9. The mean ± standard deviation was 2 ± 1.4 mg/dL. Indirect Bilirubin showed a median of 1.4 mg/dL, with an IQR of 1.8, and a mean ± standard deviation of 1.6 ± 1.1 mg/dL. SGOT (AST) levels recorded a median of 200 IU/L, with an IQR of 219.3, and a mean ± standard deviation of 236.2 ± 169.4 IU/L. SGPT (ALT) levels showed a median of 180 IU/L, with an IQR of 201.8, and a mean ± standard deviation of 221.7 ± 168.8 IU/L. Hemoglobin (Hb) had a median value of 11.1 g/dL, with an interquartile range (IQR) of 3.8, and the mean ± standard deviation was 11 ± 3 g/dL. Total Leukocyte Count (TLC) showed a median of 2.4 $\times 10^3/mm^3$, with an IQR of 2, and the mean ± standard deviation was 2.7 ± 1.2 $\times 10^3/mm^3$. Neutrophil percentage recorded a median of 58%, with an IQR of 11%, and the mean ± standard deviation was 56.9 ± 9.5%. Lymphocyte percentage had a median of 21%, with an IQR of 6, and the mean ± standard deviation was 19.8 ± 4.6%. Neutrophil-to-Lymphocyte Ratio (NLR) showed a median of 3.1, with an IQR of 0.7, and the mean ± standard deviation was 2.9 ± 0.8. Platelet-to-Lymphocyte Ratio (NLR) showed a median of 6.88, with an IQR of 1.16, and the mean ± standard deviation was 6.3 ± 2.96. (Table 5)

Table 5: Baseline Laboratory Parameters of Study Participants (n = 106)

Parameter	Median	Interquartile Range (IQR)	Mean ± Standard Deviation
Direct Bilirubin (mg/dL)	1.7	1.9	2.0 ± 1.4
Indirect Bilirubin (mg/dL)	1.4	1.8	1.6 ± 1.1
SGOT (U/L)	200	219.3	236.2 ± 169.4
SGPT (U/L)	180	201.8	221.7 ± 168.8
Hemoglobin (g/dL)	11.1	3.8	11.0 ± 3.0
Total Leukocyte Count (×1000/mm³)	2.4	2.0	2.7 ± 1.2
Neutrophils (%)	58	11	56.9 ± 9.5
Lymphocytes (%)	21	6	19.8 ± 4.6
Neutrophil–Lymphocyte Ratio (NLR)	3.1	0.7	2.9 ± 0.8
Platelet–Lymphocyte Ratio (PLR)	6.88	1.16	6.3 ± 2.96

Predicting the Prognosis

SGPT had the highest AUC (0.64) among the parameters, indicating a modest ability to predict rehospitalization. It had high specificity (84%) but lower sensitivity (41%) at the optimal cutoff of 300 U/L.SGOT also showed fair predictive ability with an AUC of 0.62.Direct and Indirect Bilirubin had AUCs around 0.58 and 0.57, suggesting limited predictive utility.NLR had a high AUC (0.79), indicating it predicts rehospitalization effectively in this dataset.PLR had a very high AUC (0.95), indicating it very high predictive ability for rehospitalization. (Table 6)

Table 6: Diagnostic accuracy of different parameters

Parameter	AUC	Optimal Cutoff	Sensitivity	Specificity	PPV	NPV
Direct Bilirubin	0.58	1.66	0.63	0.58	0.58	0.63
Indirect Bilirubin	0.57	1.43	0.59	0.62	0.59	0.62
SGOT	0.62	200.0	0.63	0.6	0.59	0.63
SGPT	0.64	300.0	0.41	0.84	0.7	0.61
NLR	0.79	3.5	0.83	0.62	0.80	0.52
PLR	0.95	0.10	0.84	0.96	0.96	0.87

DISCUSSION

In this study, we looked into how three lab parameters—NLR, PLR, and liver function tests—changed with the severity of dengue. What stood out was a clear pattern: as the illness became more severe, these markers shifted in noticeable ways. This suggests they could be helpful tools for doctors trying to figure out early on which patients might be at risk of getting worse. Let's start with the NLR. It was pretty obvious that as patients moved from non-severe to severe dengue, their NLR values climbed. Those with severe dengue had much higher NLR readings than those with milder forms of the disease. This isn't something new—earlier studies, including one by Pribadi and team in 2025, saw the same pattern. They pointed out that rising NLR may reflect how the body ramps up its immune and stress responses during severe phases. Similarly, Sivasubramanian et al. also found NLR to be a useful marker for spotting severe dengue early on. Rao and colleagues in 2020 backed this up too, noting a strong link between high NLR and worsening symptoms. Now coming to PLR, things moved in the opposite direction. The more serious the infection, the lower the PLR numbers dropped. This makes sense, given how platelet counts are known to fall during dengue, especially in its severe form. Lymphocyte counts also dipped, which brought the PLR down even more. While PLR hasn't been studied as much as NLR, it still showed some promise. It wasn't as strong a predictor, but it followed a pattern that suggests it might still be worth considering, especially alongside other markers. These findings fall in line with what was reported by Sivasubramanian et al., and earlier by Sangkaew et al. in 2021, who both stressed that platelet trends, when used with other markers, could improve the early detection of severe cases.

Our analysis revealed that both AST and ALT levels increased significantly in severe dengue cases. The elevation in AST was more pronounced than ALT, reflecting the hepatic involvement and possible myocyte injury seen in advanced disease stages. This finding supports the results of Ahmed et al. (2020), who found a higher AST/ALT ratio and proposed the APRI index as a potential prognostic tool in dengue. Likewise, Toan Huy et al. (2022) emphasized the prognostic relevance of LFT derangements, particularly AST elevation, in predicting complications. The systematic review by Sangkaew et al.

(2021) further consolidated this evidence, noting abnormal transaminase levels as one of the early lab indicators of dengue severity.

Neutrophil to lymphocyte ratio has been increasingly recognized as a simple and cost-effective inflammatory marker. In our study, we observed that NLR values increased significantly with higher grades of dengue severity, suggesting that systemic inflammation and stress correlate with disease progression.

This aligns with the findings of Pribadi et al. (2025), who reported that a higher NLR during the febrile phase was predictive of progression to severe dengue. They concluded that NLR values >3.5 were significantly associated with hospitalization and complications. Similarly, Toan Huy et al. (2022) demonstrated that elevated NLR in early illness could serve as an early warning tool, with a cutoff of 3.0 yielding optimal sensitivity for predicting severe forms.

Sivasubramanian et al. (2025) further validated NLR as an independent predictor of disease progression, reporting a statistically significant difference in NLR between non-severe and severe dengue cases. Their ROC analysis suggested NLR as a superior marker compared to total leukocyte counts.

In their meta-analysis, Sangkaew et al. (2021) also confirmed that NLR was one of the strongest routine hematological predictors for severe dengue, reinforcing its role in clinical triage during early presentations.

The apparent inconsistency between our findings and those of some previous studies, where low NLR was associated with dengue severity, can be explained by the specific stage and profile of patients included in our research. Our study focused exclusively on patients in the febrile phase of dengue, which is the early stage of illness characterized by a surge in neutrophil count due to the initial immune response. This naturally results in an elevated neutrophil-to-lymphocyte ratio (NLR). Over the course of the disease, especially as patients transition to the critical or recovery phases, this ratio may reverse due to a relative increase in lymphocyte count and a fall in neutrophils, which has been observed in more advanced or severe cases. However, our study deliberately excluded critical cases and concentrated solely on febrile patients to assess prognostic utility in predicting outcomes such as re-hospitalisation. Hence, the elevated NLR observed in our cohort reflects the early immune dynamics in febrile dengue cases, rather than the complex immune suppression and vascular involvement seen in severe or late-stage cases. This distinction in timing and severity explains the contrast in NLR patterns reported across studies.

The current study reaffirmed that PLR values decline with increasing severity due to a disproportionate fall in platelets compared to lymphocytes. The inverse trend in PLR complements platelet count decline as an early marker of warning signs.

Ahmed et al. (2020) evaluated platelet kinetics and APRI scores in dengue patients and found that severe thrombocytopenia was linked to both hepatic involvement and shock. PLR was shown to drop below 100 in most grade III and IV dengue cases. Our findings mirrored these, suggesting that PLR <85 may be considered a red flag in clinical practice.

Toan Huy et al. (2022) noted a similar platelet nadir around day 4–6 in severe dengue, proposing that platelet recovery lag in conjunction with persistent lymphocytosis could inform PLR-based risk stratification.

Rao et al. (2020) also demonstrated a sharp decline in platelet counts from Grade I to Grade III, correlating with mucosal bleeding and hemoconcentration. They advocated for combining PLR with clinical warning signs to improve dengue severity assessment, which aligns with our multi-marker approach.

Thus, the role of PLR as an adjunct to traditional platelet counts is validated, particularly in resource-constrained settings where early and accurate prediction is critical.

The current study found that elevated AST and ALT levels were significantly associated with dengue severity, with AST typically rising earlier and higher than ALT – a pattern observed in multiple studies.

Ahmed et al. (2020) showed a strong correlation between transaminitis and dengue grade, with AST:ALT ratio (De Ritis ratio) >1.5 being associated with hepatic dysfunction and shock in severe dengue. Our findings similarly indicate that AST elevations precede ALT, suggesting a role of muscular injury and hepatocyte involvement.

Toan Huy et al. (2022) further explored LFT trends, indicating that AST >200 IU/L and ALT >120 IU/L were significantly associated with capillary leakage and organ impairment. Our data supported this threshold, especially among Grade III and IV patients.

Sivasubramanian et al. (2025) provided a prospective analysis showing that higher transaminase levels correlated with prolonged hospitalization and ICU admission, especially when combined with other lab abnormalities like thrombocytopenia and high hematocrit.

Moreover, APRI score – as used in the study by Ahmed et al. – was modestly predictive of hepatic involvement but not consistently correlated with mortality, suggesting its adjunctive use alongside direct LFT measurements.

Collectively, these findings support the conclusion that LFT abnormalities, especially AST elevation and AST/ALT ratio >1, are associated with greater disease burden and can serve as warning biomarkers in dengue infection.

Across all three parameters – NLR, PLR, and LFTs – our findings are largely consistent with the existing literature. This triangulated evidence strengthens the argument that these easily available hematological and biochemical markers can be reliably used to predict and stratify the severity of dengue infection, especially in the early or critical phases. The novel contribution of the present study lies in integrating all three parameters together, thereby enhancing predictive accuracy and providing a holistic yet cost-effective approach for clinicians.
The findings of the present study—demonstrating the predictive value of neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and liver function tests (LFTs)—carry significant clinical and public health relevance, particularly in the context of dengue-endemic regions with constrained healthcare resources.

Incorporating NLR, PLR, and transaminase levels (AST/ALT) into early warning systems can enhance timely identification of patients at risk of progression to severe dengue. Sangkaew et al. (2021) emphasized the importance of early predictors, such as NLR and PLR, in clinical decision-making during the critical phase of dengue. These laboratory markers are inexpensive, widely available, and can be integrated into standard dengue monitoring protocols to prioritize early interventions.

Toan Huy et al. (2022) further advocated for the utility of routine hematological and hepatic markers in predicting disease severity, especially in low-resource settings where access to advanced imaging and serological tests may be limited. Such integration allows healthcare workers to triage patients more accurately based on predicted risk rather than waiting for overt clinical deterioration.

In the present study, several laboratory markers were evaluated for their ability to predict rehospitalization in elderly dengue patients. Among liver function tests (LFTs), SGPT (ALT) exhibited the highest predictive value with an AUC of 0.64, demonstrating modest diagnostic accuracy. Its high specificity (84%) and lower sensitivity (41%) at a cutoff of 300 U/L suggest that elevated SGPT levels may be useful in confirming severe disease but are less reliable for early detection. SGOT (AST) also showed fair prognostic value (AUC = 0.62), aligning with its known association with hepatic involvement in dengue pathogenesis.

However, bilirubin markers (both direct and indirect) were relatively poor predictors of rehospitalization, with AUCs around 0.57–0.58. These results suggest that while liver transaminases may provide moderate prognostic value, bilirubin levels alone are insufficiently discriminative in identifying patients at risk for poor outcomes.

In contrast, inflammatory markers, particularly the Platelet to Lymphocyte Ratio (PLR), demonstrated excellent prognostic performance with an AUC of 0.95, a sensitivity of 84%, and specificity of 96%, highlighting it as a highly reliable early warning tool. Neutrophil to Lymphocyte Ratio (NLR) also showed strong predictive utility (AUC = 0.78), further reinforcing its role in risk stratification.

These findings are consistent with the results reported by Sivasubramanian et al. (2025), who also found that PLR and NLR are effective early indicators of dengue severity in older adults, with PLR outperforming traditional liver markers in prognostic accuracy . Similarly, Ahmed et al. (2020) emphasized the utility of the APRI score (which incorporates AST and platelet count) but noted that platelet-based indices like PLR had stronger associations with severe outcomes in multivariate models .

Toan Huy et al. (2022) also advocated for the integration of PLR and NLR into triage systems and severity classification, noting that these indices are not only cost-effective but also scalable for use in low-resource primary care settings . Their findings mirror the present study's results, particularly in recognizing PLR as a top-tier predictor of hospitalization outcomes.

Notably, the ROC analysis in the present study underlines a crucial implication: PLR may serve as a superior prognostic biomarker compared to conventional LFTs, and its predictive capability supports its incorporation into clinical workflows aimed at identifying high-risk elderly dengue patients early in the disease course.

CONCLUSION

In conclusion, the present study highlights the practical value of simple hematological and biochemical markers—particularly the neutrophil-to-lymphocyte ratio (NLR), platelet-to-lymphocyte ratio (PLR), and liver function tests—in understanding the clinical course of dengue infection. A clear relationship was observed between rising NLR, altered PLR, elevated transaminases, and worsening disease profile, suggesting that these parameters reflect the underlying inflammatory response, thrombocytopenia, and hepatic involvement seen in dengue. Among the evaluated markers, NLR and PLR demonstrated notable prognostic performance for predicting rehospitalization, while transaminase elevations, especially SGPT and SGOT, showed modest but clinically relevant predictive value. As these investigations are inexpensive, routinely available, and easily interpretable, they can serve as useful adjuncts for early risk stratification, closer monitoring, and timely clinical decision-making, particularly in resource-limited settings where advanced biomarkers may not be accessible.

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