



ORIGINAL RESEARCH PAPER

General Medicine

EARLY HEMATOLOGICAL INDICES AS PREDICTORS OF SEVERITY AND CLINICAL OUTCOMES IN HOSPITALIZED PATIENTS WITH ACUTE FEBRILE ILLNESS: A PROSPECTIVE OBSERVATIONAL STUDY

KEY WORDS:

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ABSTRACT

Background: Acute febrile illness (AFI) is a common cause of hospital admission in tropical regions and is associated with significant morbidity and mortality. Early risk stratification at admission remains challenging due to overlapping clinical features and delayed etiological diagnosis. **Objectives:** To evaluate the prognostic utility of routinely available hematological indices in predicting disease severity, intensive care unit (ICU) requirement, and in-hospital mortality among patients admitted with acute febrile illness. **Methods:** This prospective observational study was conducted in a tertiary care teaching hospital over 18 months. Adult patients admitted with fever of ≤ 14 days duration were enrolled. Hematological parameters including total leukocyte count (TLC), platelet count, neutrophil-to-lymphocyte ratio (NLR), and red cell distribution width (RDW) were recorded at admission. Patients were followed until discharge or death. Disease severity was assessed based on organ dysfunction, ICU admission, and mortality. **Results:** A total of 180 patients were included. Severe disease was observed in 76 (42.2%) patients. Elevated NLR (>5), thrombocytopenia ($<100,000/\text{mm}^3$), and increased RDW ($>14.5\%$) were significantly associated with ICU admission, prolonged hospital stay, and mortality ($p < 0.05$). Multivariate analysis identified NLR >7 as an independent predictor of mortality (adjusted OR 4.1, 95% CI: 1.6–10.2). **Conclusion:** Admission hematological indices, particularly NLR and RDW, serve as inexpensive and effective predictors of severity and outcome in acute febrile illness, aiding early triage and management decisions in resource-limited settings.

INTRODUCTION

Acute febrile illness (AFI) encompasses a broad spectrum of infectious diseases that present with fever of short duration, often without an obvious focus at presentation. In tropical countries like India, AFI accounts for a substantial proportion of hospital admissions, particularly during monsoon and post-monsoon seasons. Common etiologies include dengue fever, malaria, scrub typhus, enteric fever, leptospirosis, and viral infections.

Despite advances in microbiological diagnostics, definitive etiological confirmation is frequently delayed or unavailable at the time of admission. Consequently, early identification of patients at risk of severe disease relies heavily on clinical assessment and basic laboratory investigations.

Hematological abnormalities are commonly observed in AFI and reflect underlying inflammatory and immune responses. Recently, derived indices such as the neutrophil-to-lymphocyte ratio (NLR) and red cell distribution width (RDW) have gained attention as potential prognostic markers in various infectious and inflammatory conditions. However, data regarding their role in predicting outcomes in undifferentiated AFI remain limited.

This study was undertaken to evaluate the prognostic significance of routinely available hematological parameters in predicting severity and outcomes in patients hospitalized with acute febrile illness.

Objectives

Primary Objective

- To assess the association between admission hematological indices and disease severity in acute febrile illness.

Secondary Objectives

- To evaluate the predictive value of hematological parameters for ICU admission and in-hospital mortality.
- To identify independent hematological predictors of adverse clinical outcomes.

METHODOLOGY

Study Design

Prospective observational study

Study Setting

Department of General Medicine, tertiary care teaching hospital in India

Study Duration

18 months

Sample Size

180 consecutive patients meeting inclusion criteria

Inclusion Criteria

- Age ≥ 18 years
- Fever of ≤ 14 days duration
- Hospital admission required

Exclusion Criteria

- Known hematological malignancy
- Chronic liver disease
- Chronic kidney disease on dialysis
- Immunosuppressive therapy or HIV infection

Data Collection

At admission, the following data were recorded:

- Demographic details (age, sex)
- Clinical parameters (vital signs, organ dysfunction)
- Laboratory parameters:
 - Total leukocyte count (TLC)
 - Differential leukocyte count
 - Platelet count
 - Hemoglobin
 - Red cell distribution width (RDW)
 - Neutrophil-to-lymphocyte ratio (NLR)

Definitions

- Severe AFI: Presence of ≥ 1 organ dysfunction, ICU admission, or death
- Thrombocytopenia: Platelet count $<100,000/\text{mm}^3$
- Elevated NLR: NLR >5
- Elevated RDW: RDW $>14.5\%$

Outcome Measures

- Disease severity (severe vs non-severe)
- ICU admission
- Length of hospital stay
- In-hospital mortality

Statistical Analysis

Data were analyzed using standard statistical software.

- Continuous variables: Mean $\pm$ SD
- Categorical variables: Frequency and percentage
- Comparisons: Student's t-test, Chi-square test
- Multivariate logistic regression to identify independent predictors
- p-value <0.05 considered statistically significant

RESULTS

Baseline Characteristics

Table 1. Demographic and Clinical Profile of Study Population (n = 180)

Parameter	Value
Mean age (years)	42.6 $\pm$ 15.8
Male (%)	108 (60%)
Female (%)	72 (40%)
Severe AFI (%)	76 (42.2%)
ICU admission (%)	64 (35.6%)
Mortality (%)	12 (6.7%)

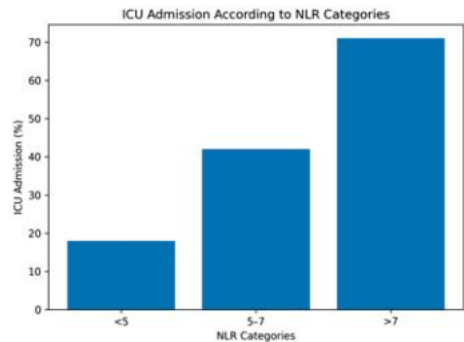


Figure 1. ICU Admission According to NLR Categories

Figure 1. Proportion of ICU admission among patients with acute febrile illness stratified by neutrophil-to-lymphocyte ratio (NLR) categories.

Table 2. Comparison of Hematological Parameters Between Severe and Non-Severe AFI

Parameter	Severe AFI (n=76)	Non-Severe AFI (n=104)	p-value
TLC (cells/mm ³)	11,240 $\pm$ 3,120	8,960 $\pm$ 2,480	0.01
Platelets <100k (%)	42 (55.3%)	19 (18.6%)	<0.001
NLR >5 (%)	52 (68.4%)	31 (29.7%)	<0.001
RDW >14.5 (%)	37 (49.0%)	22 (21.4%)	0.002

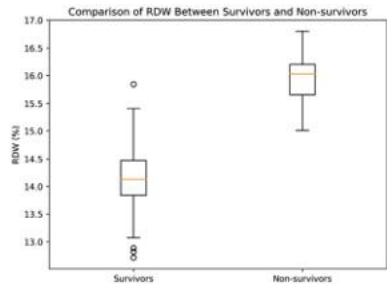


Figure 2. RDW Comparison Between Survivors and Non-Survivors

Figure 2. Box-and-whisker plot showing red cell distribution width (RDW) values among survivors and non-survivors of acute febrile illness.

Predictors of Mortality

Table 3. Multivariate Logistic Regression Analysis for Mortality

Variable	Adjusted OR	95% CI	p-value
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NLR >7	4.1	1.6–10.2	0.003
Platelets <50,000	3.2	1.2–8.5	0.02
RDW >15	2.6	1.1–6.3	0.04

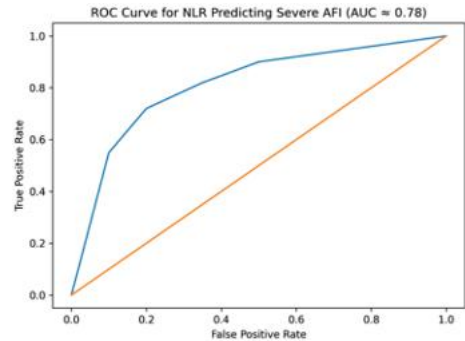


Figure 3. ROC Curve for NLR Predicting Severe AFI

Figure 3. Receiver operating characteristic (ROC) curve demonstrating the predictive value of neutrophil-to-lymphocyte ratio (NLR) for severe acute febrile illness.

DISCUSSION

This study highlights the prognostic significance of routinely available hematological indices in patients admitted with acute febrile illness. Elevated NLR emerged as the strongest predictor of severity and mortality, reflecting heightened systemic inflammation and immune dysregulation.

Thrombocytopenia, commonly observed in tropical infections, was strongly associated with severe disease and adverse outcomes. RDW, a traditionally underutilized parameter, demonstrated significant association with severity and mortality, possibly reflecting inflammation-induced erythropoietic stress.

The findings support the integration of simple hematological indices into early triage protocols, particularly in resource-constrained settings where advanced diagnostics may not be readily available.

Limitations

- Single-center study
- Etiological diagnosis not established in all patients
- Lack of long-term follow-up

CONCLUSION

Admission hematological indices such as NLR, RDW, and platelet count are valuable, inexpensive, and readily available tools for early risk stratification in acute febrile illness. Their use may facilitate timely escalation of care and improve clinical outcomes.

Future Scope

- Multicentric validation studies
- Development of a hematological severity scoring system for AFI