

Research Article

Predictive Value of Platelet Dynamics for Clinical Outcomes in Patients with Dengue Fever: A Retrospective Observational Study

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ABSTRACT

Background: Dengue fever presents with evolving haematological alterations, notably progressive thrombocytopenia during the critical phase followed by recovery. While absolute platelet counts are routinely monitored, longitudinal platelet dynamics may offer additional insight into disease progression and hospitalization outcomes.

Objective: To characterize platelet dynamics and evaluate their clinical association with outcomes in hospitalized adult dengue patients, focusing on platelet nadir, timing of nadir, onset of platelet recovery, severity of thrombocytopenia, transfusion frequency, and length of hospital stay (LOS).

Methods: This retrospective observational study evaluated 110 hospitalized adult patients with confirmed dengue fever at Liaquat National Hospital, Karachi (September 2025-February 2026). Demographic, clinical, diagnostic, serial platelet, treatment, and outcome parameters were extracted. Platelet values documented per day of illness were analyzed for nadir, day of nadir, and onset of recovery. Categorical variables were presented as frequencies (%), and continuous variables as mean $\pm$ standard deviation (SD) or median (range). Spearman rank correlation was used to assess associations between platelet-dynamic variables and LOS.

Results: Among 110 records, age was available for 100 patients (mean 38.97 ± 17.65 years; range 13-79), and sex for 103 (63.1% male). Common clinical features included fever (97.9%, 94/96), vomiting (41.7%, 40/96), fatigue (24.7%, 23/93), and abdominal pain (21.9%, 21/96). At least one platelet count $< 150 \times 10^9/L$ was observed in 83.6% (92/110) of patients, and $< 50 \times 10^9/L$ in 68.2% (75/110). Mean platelet nadir was $35.93 \pm 41.13 \times 10^9/L$ (median 22; $n = 89$), occurring at illness day 5.58 ± 1.34 (median 6; $n = 90$). Platelet recovery began at day 6.98 ± 1.43 (median 7; $n = 83$). Platelet transfusions were administered in 18.9% (17/90) of cases. Mean LOS was 4.08 ± 1.91 days (range 1-15). Of 93 patients with recorded final outcomes, 92.5% ($n = 86$) recovered and 7.5% ($n = 7$) left against medical advice; no deaths occurred. One complication was documented among 92 patients (1.1%). Platelet nadir ($\rho = -0.096$, $P = 0.373$), day of nadir ($\rho = -0.135$, $P = 0.207$), and day of recovery ($\rho = 0.195$, $P = 0.079$) showed no statistically significant correlation with LOS.

Conclusion: Serial platelet monitoring reveals a predictable temporal pattern of decline and recovery during dengue infection. While platelet dynamics serve as meaningful physiological indicators of phase transition, low adverse outcome event rates precluded demonstration of independent predictive value for LOS or complications in this cohort.

Keywords: Dengue Fever, Thrombocytopenia, Platelet Dynamics, Platelet Nadir, Platelet Recovery, Length of Stay, Hospitalization, Prognostic Markers.

INTRODUCTION

Dengue is a major mosquito-borne viral infection posing a substantial public health burden across tropical and subtropical regions [1]. South Asia experiences recurrent seasonal transmission, frequently overwhelming emergency and inpatient medical services [2,

3]. The clinical manifestations range from uncomplicated dengue fever to severe dengue characterized by plasma leakage, severe hemorrhage, fluid accumulation, respiratory distress, organ impairment, and death [4, 5]. Because clinical transition from the febrile phase to the critical phase can occur rapidly,

clinicians rely heavily on bedside parameters to anticipate disease progression [6, 7]. In high-volume tertiary care settings, serial complete blood count (CBC) monitoring is low-cost, widely accessible, and rapidly repeatable [8, 9].

Thrombocytopenia is a hallmark laboratory abnormality in dengue [10]. Its pathogenesis involves megakaryocyte suppression, transient bone marrow inhibition, immune-mediated peripheral destruction, endothelial interaction, and platelet consumption [10, 11]. However, a static platelet measurement provides limited prognostic utility: severe thrombocytopenia can occur in patients who recover without complications, whereas critical plasma leakage may precede the absolute lowest platelet count [12, 13].

Evaluating longitudinal platelet dynamics—specifically the rate of decline, the timing and magnitude of the platelet nadir, and the onset of platelet recovery—presents a more biologically coherent framework for tracking disease phase transitions [14]. Delayed platelet recovery may signal persistent pathophysiological activity requiring extended inpatient observation, whereas sustained recovery typically coincides with clinical resolution [14, 15].

While previous studies have linked thrombocytopenia to disease severity, hemorrhage, and transfusion requirements [12, 16, 17], regional data examining serial daily platelet trajectories in relation to hospitalization duration remain limited. This study characterizes serial platelet trajectories in hospitalized adult patients with dengue fever and evaluates the clinical relationship between platelet-dynamic markers, length of stay, and documented inpatient outcomes.

MATERIALS AND METHODS

Study Design and Setting

This retrospective observational study was conducted in the Department of Medicine at Liaquat National Hospital, Karachi, Pakistan. Clinical records of hospitalized patients admitted between September 2025 and February 2026 were evaluated.

Ethical Considerations

The study protocol was approved by the Institutional Ethical Review Committee of Liaquat National Hospital (Ref: 1255-2025-LNH-ERC; dated August 27, 2025). Informed consent was obtained in accordance with

institutional policy. Patient data were fully anonymized prior to statistical analysis.

Eligibility Criteria

- **Inclusion Criteria:** Hospitalized patients aged ≥ 13 years admitted with a confirmed diagnosis of acute dengue fever based on positive non-structural protein 1 (NS1) antigen and/or dengue virus immunoglobulin M (IgM) serology.

- **Exclusion Criteria:** Patients with co-existing confirmed acute febrile illnesses, pre-existing hematological disorders, chronic liver disease, active malignancy, bone marrow failure states, immune thrombocytopenic purpura (ITP), ongoing chemotherapy, or concurrent administration of medications known to significantly alter platelet kinetics.

Data Collection and Variable Definitions

Data were extracted from standardized clinical records, including demographics, clinical presentation, comorbidity status, serial laboratory findings, daily platelet counts (days 1–10 of illness), transfusion status, length of hospital stay (LOS), complications, and discharge outcomes.

- **Platelet Nadir:** The lowest recorded platelet count ($\times 10^9/L$) during the hospital stay.
- **Day of Nadir:** The day of illness on which the lowest platelet count was documented.
- **Onset of Platelet Recovery:** The day of illness marking the initial sustained rise in platelet count following the nadir.
- **Thrombocytopenia:** Defined as any recorded platelet count $< 150 \times 10^9/L$.
- **Severe Thrombocytopenia:** Defined as any recorded platelet count $< 50 \times 10^9/L$.

Statistical Analysis

Statistical analysis was conducted using SPSS version 26.0 or R software. Continuous variables were expressed as mean $\pm$ SD or median (interquartile range [IQR] / min–max range) based on distribution normality. Categorical data were presented as raw counts and percentages (n, %). Because variable completeness varied across retrospective records, available-case denominators were explicitly reported for all analyses. Spearman rank correlation coefficient (ρ) was used to evaluate non-parametric relationships between platelet-dynamic parameters (nadir, day of nadir, day of recovery) and hospital LOS.

Statistical significance was defined as a two-tailed P-value < 0.05.

RESULTS

Patient Demographics and Baseline Characteristics

A total of 110 hospitalized patient records were evaluated. Age was recorded for 100 patients, with a mean of 38.97 ± 17.65 years

(median 35; range 13–79). Males accounted for 63.1% (65/103) of patients with recorded sex. Mean day of illness at presentation was 5.00 ± 1.58 days (median 5; range 1–10). Comorbidities included diabetes mellitus in 17.7% (17/96) and hypertension in 15.6% (15/96). Prior history of dengue was negative across all documented cases (0/96).

Table 1. Demographic and Baseline Clinical Characteristics of the Cohort

Characteristic	Available Records (n)	Summary / n (%)
Total Analyzed Cohort	110	110 (100.0%)
Age (years), Mean $\pm$ SD [Median, Range]	100	38.97 ± 17.65 [35, 13–79]
Age 18–45 years	100	58 (58.0%)
Age > 45 years	100	35 (35.0%)
Sex: Male	103	65 (63.1%)
Sex: Female	103	38 (36.9%)
Day of Illness at Presentation, Mean $\pm$ SD	96	5.00 ± 1.58 [Median: 5]
Diabetes Mellitus	96	17 (17.7%)
Hypertension	96	15 (15.6%)
Chronic Kidney Disease	96	1 (1.0%)
Asthma / COPD	96	0 (0.0%)

Clinical Presentation and Diagnostic Profile

Fever was present in 97.9% (94/96) of patients. Other common symptoms included vomiting (41.7%), fatigue (24.7%), abdominal pain (21.9%), and myalgia (19.8%). Overt bleeding manifestations were recorded in 9.5% (9/95) of patients. Serological testing confirmed NS1 antigen positivity in 53.1% (51/96), IgM positivity in 26.3% (25/95), and IgG positivity in 38.9% (37/95).

Table 2. Presenting Symptoms and Diagnostic Serology Profile

Feature / Marker	Available Records (n)	Positive / Present n (%)
Fever	96	94 (97.9%)
Vomiting	96	40 (41.7%)
Fatigue	93	23 (24.7%)
Abdominal Pain	96	21 (21.9%)
Myalgia	96	19 (19.8%)
Bleeding Manifestations	95	9 (9.5%)
Cutaneous Rash	95	8 (8.4%)
Headache	96	6 (6.3%)
NS1 Antigen Positive	96	51 (53.1%)
Dengue IgM Positive	95	25 (26.3%)
Dengue IgG Positive	95	37 (38.9%)

Longitudinal Platelet Trajectory and Dynamics

Daily mean platelet counts followed a characteristic biphasic pattern: declining to a nadir on days 5–6 of illness before reversing trajectory on day 7. Overall, 83.6% (92/110) of patients experienced thrombocytopenia ($< 150 \times 10^9/L$), and 68.2% (75/110) developed severe thrombocytopenia ($< 50 \times 10^9/L$).

Table 3. Daily Platelet Parameters by Illness Day

Illness Day	Observations (n)	Mean Platelet ($\times 10^9/L$)	Median ($\times 10^9/L$)	Range ($\times 10^9/L$)
Day 1	2	201.5	201.5	143–260
Day 2	7	141.0	95.0	17–406

Day 3	16	86.0	44.5	13–406
Day 4	36	72.8	40.0	9–406
Day 5	59	53.4	33.0	4–329
Day 6	78	52.5	39.0	7–314
Day 7	82	60.7	43.5	11–335
Day 8	56	76.6	59.5	18–451
Day 9	33	86.2	64.0	10–352
Day 10	9	126.6	101.0	65–352

Mean platelet nadir was $35.93 \pm 41.13 \times 10^9/L$ (median 22; range 4–314; $n = 89$), occurring at day 5.58 ± 1.34 of illness. Platelet recovery commenced at day 6.98 ± 1.43 (median 7; range 3–10; $n = 83$).

Table 4. Key Platelet Dynamic Parameters in the Study Population

Parameter	Available n	Mean $\pm$ SD	Median	Range
Platelet Nadir ($\times 10^9/L$)	89	35.93 ± 41.13	22.0	4–314
Day of Platelet Nadir (Illness Day)	90	5.58 ± 1.34	6.0	2–9
Day Platelet Recovery Began (Illness Day)	83	6.98 ± 1.43	7.0	3–10

Inpatient Outcomes and Correlation Analyses

Platelet transfusions were administered to 18.9% (17/90) of patients. Transfused patients had a mean LOS of 3.71 days compared to 4.22 days in non-transfused patients. Mean LOS for the overall cohort was 4.08 ± 1.91 days (median 4; range 1–15; $n = 110$). Among 93 patients with recorded final disposition, 92.5% ($n = 86$) recovered and were discharged home, while 7.5% ($n = 7$)

left against medical advice. No inpatient deaths were documented. A clinical complication was recorded in 1.1% (1/92) of cases.

Spearman rank correlation analyses revealed no statistically significant correlation between hospital LOS and platelet nadir ($\rho = -0.096$, $P = 0.373$), day of nadir ($\rho = -0.135$, $P = 0.207$), or day of recovery onset ($\rho = 0.195$, $P = 0.079$).

Table 5. Spearman Rank Correlation Between Platelet Dynamics and Hospital Stay

Variable Evaluated with LOS	Available n	Spearman ρ	P-value	Statistical Significance
Platelet Nadir ($\times 10^9/L$)	88	-0.096	0.373	Not Statistically Significant
Day of Platelet Nadir	89	-0.135	0.207	Not Statistically Significant
Day Platelet Recovery Began	82	0.195	0.079	Not Statistically Significant

DISCUSSION

This study evaluated serial platelet kinetics in adult patients hospitalized with dengue fever. The findings demonstrate a typical clinical trajectory: platelet counts decline progressively during the acute state, reaching a nadir around day 5 to 6 of illness, followed by recovery starting around day 7 [14]. This trajectory mirrors the classical pathophysiological progression through the critical phase into the convalescent phase [1, 10].

Over 80% of patients developed thrombocytopenia ($< 150 \times 10^9/L$), and over two-thirds exhibited severe thrombocytopenia

($< 50 \times 10^9/L$). Despite these pronounced hematological changes, overall clinical outcomes were favorable, with low complication rates and zero mortality. These observation patterns underscore that isolated low platelet counts do not necessarily correlate with severe adverse clinical events or mortality in a managed inpatient setting [15, 16].

Exploratory analyses showed no statistically significant correlation between length of stay and platelet nadir, day of nadir, or day of recovery onset. While a minor trend suggested that delayed platelet recovery might align with longer hospital stays, the correlation did not

achieve statistical significance. Length of stay in acute dengue care is multifactorial, influenced by hemodynamic stability, resolution of warning signs, clinician discharge thresholds, social factors, and comorbidities [8, 22].

Platelet transfusions were administered in 18.9% of patients. Interestingly, transfused patients exhibited a slightly lower mean LOS than non-transfused patients. Rather than indicating a therapeutic benefit of transfusion, this descriptive variance likely reflects clinical decision-making, where transfusions are administered during acute severe drops near planned discharge or during clinical recovery phases [17, 18]. Current international guidelines discourage prophylactic platelet transfusions in stable dengue patients due to a lack of evidence demonstrating reduced bleeding risks or improved clinical outcomes [1, 7].

Our findings align with cohort studies demonstrating that platelet counts typically bottom out between illness days 4 and 6 [14]. However, unlike prospective risk-modeling studies that establish platelet dynamics as predictors of severe dengue or fluid leakage [9, 21], our single-center retrospective dataset lacked sufficient severe adverse event rates to construct predictive multivariable models. Advanced markers such as immature platelet fraction (IPF) have shown promise in predicting early bone marrow recovery; integrating IPF with serial trajectories represents a key direction for future research [19].

Key strengths of this study include detailed longitudinal data mapping continuous platelet counts across days 1–10 of illness, a realistic clinical representation from a high-volume tertiary hospital in Pakistan, and transparent reporting of missing data denominators. Conversely, several limitations must be noted: the retrospective design led to variable laboratory test timing and varying denominator sizes across illness days. Missing hematocrit/packed-cell-volume data prevented assessment of plasma leakage/hemoconcentration [21], and extremely low complication event rates ($n = 1$) limited the statistical power required for multivariable prediction modeling.

CONCLUSION

Hospitalized adult dengue patients exhibit a distinct longitudinal platelet pattern characterized by a nadir around illness days 5–

6 and onset of recovery by day 7. While serial platelet tracking provides critical bedside utility for monitoring disease phases, platelet dynamic parameters alone were not significantly correlated with hospital length of stay or inpatient complications. Comprehensive clinical assessment—incorporating hemodynamic parameters, warning signs, and broader laboratory profiles—remains essential for guiding inpatient dengue management and discharge decisions.

Statements and Declarations

Ethics Approval and Consent to Participate: Approved by The Institutional Ethical Review Committee of Liaquat National Hospital, Karachi, Pakistan (Ref: 1255-2025-LNH-ERC; dated August 27, 2025). Informed consent was obtained in accordance with institutional guidelines.

Data Availability Statement: The anonymized datasets analyzed during the current study are available from the corresponding author upon reasonable institutional request.

Competing Interests: The authors declare that they have no competing interests.

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Author Contributions: Samar Abbas Jaffri and Syeda Rida E Zehra contributed to study conceptualization, data extraction, statistical analysis, and drafting or critical revision of the manuscript.

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