e-ISSN: 0976-822X

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

International Journal of Current Pharmaceutical Review and Research 2023; 15(1); 276-282

Original Research Article

Clinicohematological Profile with Absolute Neutrophil Count and Platelets Trends in Children with Dengue During an Epidemic in Central India: A Prospective Observational (Cohort-Type) Study

Nisha R. Aglave[1], Snehal Korade[2]

[1]Assistant Professor, Department of Pediatrics, NKP Salve Institute of Medical Sciences & Lata Mangeshkar Hospital, Nagpur, Maharashtra, India

[2]Assistant Professor, Department of Pediatrics, NKP Salve Institute of Medical Sciences & Lata Mangeshkar Hospital, Nagpur, Maharashtra, India

Received: 28-11-2022 / Revised: 27-12-2022 / Accepted: 26-01-2023

Corresponding Author: Dr. Nisha R. Aglave

Conflict of interest: Nil

Abstract:

Background: The burden of dengue virus infection in central India during rainy season is high. Dengue infection affects every age group from infants to adults. Severe dengue affects most Asian and Latin American countries and is a leading cause of hospitalization and death in this region. It has been found that low neutrophil count during the initial phase of illness predicts the disease severity. Various studies are conducted to see the platelet trends and clinical outcome, but very few studies are there on ANC trend and its correlation with severity of thrombocytopenia. Present study was done to study the clinicohematological profile with ANC and platelet trends in children with dengue.

Objective: The study was conducted to correlate clinicohematological profile with absolute neutrophil count and platelets trends in children with dengue during an epidemic in central India.

Method: A hospital-based cross-sectional study was conducted among 100 serologically confirmed dengue patients aged 6 months to 18 years during the 2021 epidemic in Central India. Clinical features and serial complete blood counts, including platelet and absolute neutrophil counts (ANC), were recorded on day 0, day 1 and day 2 of admission and at the time of discharge. Patients were classified according to WHO 2009 dengue criteria. Statistical analysis was performed using SPSS version 21.

Results: Out of 100 children with dengue, 66% had dengue fever (DF), 22% had DF with warning signs (DFW), and 12% had severe dengue (SD). Thrombocytopenia was significantly associated with disease severity ($p < 0.001$), with 91.7% of SD patients showing platelet counts <20,000/mm³. Neutropenia was seen in 69% of patients, though not statistically linked to severity. Platelet and ANC nadirs commonly occurred between days 4–6 of illness. Recovery of platelets was delayed in SD, correlating with longer hospital stay ($p = 0.002$). No mortality was reported.

Conclusion: This study supports the use of serial ANC and platelet count monitoring as valuable tools in dengue management. The strong association between thrombocytopenia and severity, and a potential role of early neutropenia as a warning sign, highlight avenues for further research. Incorporating these parameters into triage and monitoring algorithms could improve outcomes in paediatric dengue.

Keywords: Dengue fever, Severe Dengue, Absolute neutrophil count, Platelet count

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Dengue is the most common arboviral infection transmitted to humans by the bite of mosquito vectors Aedes aegypti and Aedes albopictus affecting more than 100 countries worldwide. The overall risk of dengue in the world is increased due to an early onset and prolonged duration of dengue transmission seasons in endemic areas; alterations in the distribution and increased prevalence of the vectors ; the impact of climate change and periodic weather phenomena (such as El Niño and La Niña events) resulting in heavy precipitation, increased humidity, and rising temperatures that favour vector reproduction and virus transmission. [1] Dengue fever is caused by the Dengue virus (DENV), which is classified under the Flavivirus genus of the Flaviviridae family. This virus is known to have four serotypes (DENV1, DENV2, DENV3, DENV4), each exhibiting different levels of virulence. In October 2013, a fifth serotype (DENV-5) was discovered through isolation and genetic sequencing in Malaysia's Sarawak state. [2]

The clinical spectrum of dengue ranges from mild febrile illness to dengue haemorrhagic fever and dengue shock syndrome. The WHO 2009 Dengue classification categorizes it into dengue without warning signs, dengue with warning signs and severe dengue. Warning signs include abdominal pain, persistent vomiting, clinical fluid accumulation in the form of ascites or pleural effusion, mucosal bleeding and liver enlargement >2cm. Severe dengue is characterised by plasma leakage leading to shock, severe bleeding, or severe organ involvement (e.g., ALT/AST ≥ 1000 U/L, altered consciousness, cardiac or other organ failure. [3]

Dengue is a significant public health concern in India, with the country experiencing a substantial increase in cases over the past few decades with peak incidence during monsoon season. In 2021, the incidence of dengue cases in India was 193245, with 12720 in the state of Maharashtra causing mortality in 346 patients including 42 deaths in Maharashtra. [4]

As of now, there is no approved dengue vaccine to prevent dengue infection. For this reason, timely diagnosis and quality supportive treatment in the form of fluid management and monitoring of complications are essential to patient care. A complete blood count (CBC) is a crucial diagnostic tool in the management of dengue fever. The haematological parameters, particularly platelet count and absolute neutrophil count, are frequently altered during the course of infection. Thrombocytopenia and leukopenia are well-recognized features of dengue and have been closely associated with bleeding manifestations and disease severity. [5] A decrease in absolute neutrophil count (ANC) is often preceded by thrombocytopenia and rise in ANC often indicate initiation of platelet rise. Therefore, it is important to study trends in platelet and ANC values during the illness for estimating the recovery.

Methodology: This prospective observational study was carried out at a tertiary care hospital of central India. All children diagnosed with dengue infection between July 2021 and November 2021 and admitted to the hospital were enrolled in the study. Those patients who had positive dengue serology like non-structural protein 1 (NS1), serology marker immunoglobulin M (IgM), immunoglobulin G (IgG) positive were included in the study, while those with preexisting haematological conditions like ITP, Platelet disorders, malignancy and whose parent did not give consent were excluded from the study.

Ethical Approval: The study was approved by the Institutional Ethics Committee of NKP Salve Institute of Medical Sciences and Research Center and Lata Mangeshkar Hospital, Nagpur. All procedures were conducted in accordance with the Declaration of Helsinki and its later amendments. Written informed consent was obtained from parents or legal guardians of all participating children before enrolment.

The manuscript has been prepared in accordance with the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for cross-sectional studies, and a completed STROBE checklist is submitted along with this manuscript.

Demographic details (name, age, sex, address), presenting complaints (duration of fever, vomiting, headache, abdominal pain, bleeding manifestations, rash and petechia), examination findings (Hess test, pallor, signs of fluid retention, circulatory failure) were collected in a prewritten proforma. CBC was done in all the cases on the day of admission, on day-1, day-2 and day-3 of the admission, and total leukocyte counts, absolute neutrophil count (ANC) and platelet count of all these days were recorded. Lowest ANC of each patient and day of illness on which ANC was lowest were noted, similarly lowest platelet counts and day of illness on which platelets were lowest were recorded. Platelet recovery time was defined as time taken for platelets to rise above 1,00,000 per mm^3 and day of illness on which platelet was recovered was also recorded.

The patients were classified as having Dengue fever without warning signs (DF), Dengue fever with warning signs (DFW) and Severe dengue (SD) as per World health organization (WHO) classification. [6] Neutropenia was defined as ANC count of less than 1500 per mm^3, further they were grouped as having mild, moderate and severe neutropenia with ANC counts being 1001 to 1500, 501 to 1000 and less than 500 respectively. According to platelet counts they were classified as having mild, moderate and severe thrombocytopenia with platelet count of more than 50000, between 20001 to 50000 and less than 20000 per mm^3. All patients were managed as per dengue management protocol and monitored strictly as per guidelines. Platelet recovery time and duration of hospital stay was recorded. There was no mortality during the study duration.

The data was entered meticulously in Microsoft Office Excel 2019. No data were missing for any variable analysed. Chi square test was applied to compare groups with Categorical data. Mean and standard deviation of demographic data were calculated and were compared using student t-test, ANOVA. Statistical analysis was conducted using windows-based SPSS (statistical package for social sciences) version 21.

Results

This is a prospective observational study, which included 100 sequentially admitted and serologically positive dengue children between 6 months and 18 years of age during study duration July 2021 to November 2021. The mean age was approximately 11.02 years and standard deviation of about 4.35, indicating a moderate degree of age variation among the individuals. Out of 100 patients 60 (60 %) were above 10 years of age and remaining 40 below 10 years. There was no sex preponderance: 51 of 100 patients were male and 49 were female.

Fever was present in all patients admitted with dengue infection. Vomiting was the most frequent associated symptom with fever which occurred in 45 (45%) of patients, rash was present in 19 (19%), ascites was present in 16 (16%) of patients. While pain in abdomen, headache and hepatosplenomegaly was present in 9 (9%), 6 (6%) and 9 (9%) patients respectively (Table 1).

Dengue non-structural protein 1 antigen (NS1 Ag) was positive in 97 (97%) of patients enrolled in the study while dengue immunoglobulin M (IgM) and dengue immunoglobulin G (IgG) were positive in 10 (10%) and 3 (3%) patients respectively. The enrolled dengue patients were classified as having dengue fever without warning signs (DF), Dengue fever with warning signs (DFW) and Severe Dengue (SD) as per World health organization (WHO) dengue classification. Out of 100 patients 66 (66%) were classified as DF, 22 (22%) as DFW and 12 (12%) as SD.

Most of the patients, 72 (72%) were admitted within first 5 days of symptom onset, while 26 (26%) were admitted between day 6 and day 8, and two (2%) were admitted after day 8 of illness.

Neutropenia was seen in 69 (69%) patients in this study and 12 (12%) had severe neutropenia. Out of total 66 patients diagnosed as Dengue fever, 24 (36.4%) had absolute neutrophil count (ANC) more than 1500 and neutropenia was seen in 42 (63.63%), with severe neutropenia in 6 (9.1%). In patients with DFW out of 22, 16 (72.7%) had ANC below 1500 and 1 (4.5%) had severe neutropenia. While in severe dengue patients, 11(91.66%) out of 12 had ANC count less than 1500 per mm3, with 5 patients (41.7%) having severe neutropenia. Chi square test showed $X^2 = 0.06$ and p value was 0.78 which was not statistically significant (Table 2).

Out of 100 patients, 60 (60%) had platelet counts less than 50000 per mm3. Mild, Moderate and sever thrombocytopenia was seen in 33 (50%), 22(33.33%) and 11 (16.7%) of DF respectively. Mild, Moderate and severe thrombocytopenia was seen in 6(27.3%), 8 (36.4%), 8 (36.4%) respectively in patients with DFW, while 11 (91.7%) of SD patients had severe thrombocytopenia and 1 (8.3%) had mild thrombocytopenia. Chi square test showed $X^2 = 16.43$ and p value was less than 0.001 which was statistically significant ($p < 0.05$) (Table 3).

The key clinical parameters among three subgroups of dengue patients: Dengue Fever (DF, n=66), Dengue Fever with Warning Signs (DFW, n=22), and Severe Dengue (SD, n=12). The mean age was comparable across all groups (DF: 10.86 ± 4.67 years, DFW: 11.09 ± 3.61 years, SD: 11.67 ± 4.76 years), with no statistically significant difference ($p = 0.845$). The mean day of illness on which the platelet recovered in DF, DFW and SD were 8.00 ± 2.335, 8.71 ± 1.829 and 9.59 ± 1.652 respectively, which was statistically significant (p value= 0.046). Similarly, the duration of hospital stay was significantly longer in more severe cases, with SD patients staying an average of 7.25 ± 2.01 days, compared to 6.45 ± 1.85 in DFW, and 5.55 ± 1.50 in DF ($p = 0.002$). This trend aligns with the clinical expectation that more severe disease requires prolonged hospitalization and supportive care (Table 4).

The haematological trends among 100 patients with confirmed dengue fever was plotted across the days of illness. 48 (48%) of patients experienced their nadir in ANC and platelet count on day 5 and 6 of illness. The peak in lowest ANC is slightly prior to the lowest platelets counts. These findings highlight the critical window between days 4 to 6, where both neutrophil and platelet nadirs are most common. The recovery of the platelets started on day 5 of the illness, with 84 (84%) of the recovered between day 6 to day 11 of illness, 5 (5%) showed late recovery of platelets after day 12 of illness (Figure 1).

Out of 100 patients, 45(45%) showed neutropenia on day 1 after admission and 42 (42%) showed neutropenia on day 2 of admission. 19 (19%) showed netropenia on day 3 of admssion. The percentage of patients in the lowest ANC range (0–500) declines sharply from 45% to 10%, while those with ANC >1500 increase from 10% to 40% (Figure 2).

Out of 100 patients, 38 (38%) showed thrombocytopenia on the day of admission and 48 (48 %) showed thrombocytopenia on day 1 of admission. On day 2 of admission again 38 (38%) showed thrombocytopenia while most of the patients recovered by day 3 of admssion with only 4 (4%) having thrombocytopenia and late recovery (Figure 3).

All 100 patients admitted were discharged and there was no mortality noted in this study. Antibiotics were used in 4 % of patients; all of them showed late platelet recovery and a hospital stay exceeding 8 days.

Table 1: Clinical Characteristics of dengue patients

Symptom	No. of Children (n =100)
Fever	100
Vomiting	45
Rash	19
Ascites	16
Pain in Abdomen	9
Headache	6
Hepatosplenomegaly	9

Table 2: Lowest Absolute neutrophil count (ANC) and its association with severity of dengue.

Lowest ANC (per mm3)	DF (n= 66)	DFW (n=22)	SD (n= 12)	Total (n=100)
<500	6 (9.1%)	1 (4.5%)	5 (41.7%)	12
500-1000	17 (25.8%)	7(31.8%)	3 (25%)	27
1000-1500	19 (28.8%)	8 (36.4%)	3 (25 %)	30
>1500	24 (36.4%)	6 (27.3%)	1 (8.3 %)	31

n- number of patients, ANC- Absolute Neutrophil count, DF- Dengue fever, DFW- Dengue fever with warning signs, SD- Severe Dengue

Table 3: Lowest platelet counts and its association with severity of dengue

Lowest Platelet count (per mm3)	DF (n= 66)	DFW (n=22)	SD (n= 12)	Total (n=100)
<20000	11(16.7%)	8(36.4%)	11 (91.7%)	30
20000-50000	22 (33.3%)	8 (36.4%)	0 (0%)	30
>50000	33 (50%)	6(27.3%)	1(8.3%)	40

n- number of patients, ANC- Absolute Neutrophil count, DF- Dengue fever, DFW- Dengue fever with warning signs, SD- Severe Dengue

Table 4: Mean ± Standard Deviation of various parameter

Parameter	DF (n= 66)	DFW (n=22)	SD (n= 12)	p value
Age	10.86 ± 4.670	11.09 ± 3.611	11.67 ± 4.755	0.845
Day of platelet recovery	8.00 ± 2.335	8.71 ± 1.829	9.59 ± 1.652	0.046
Duration of hospital stay	5.55 ± 1.501	6.45 ± 1.845	7.25 ± 2.006	0.002

n- number of patients, p value < 0.05- Statistically significant

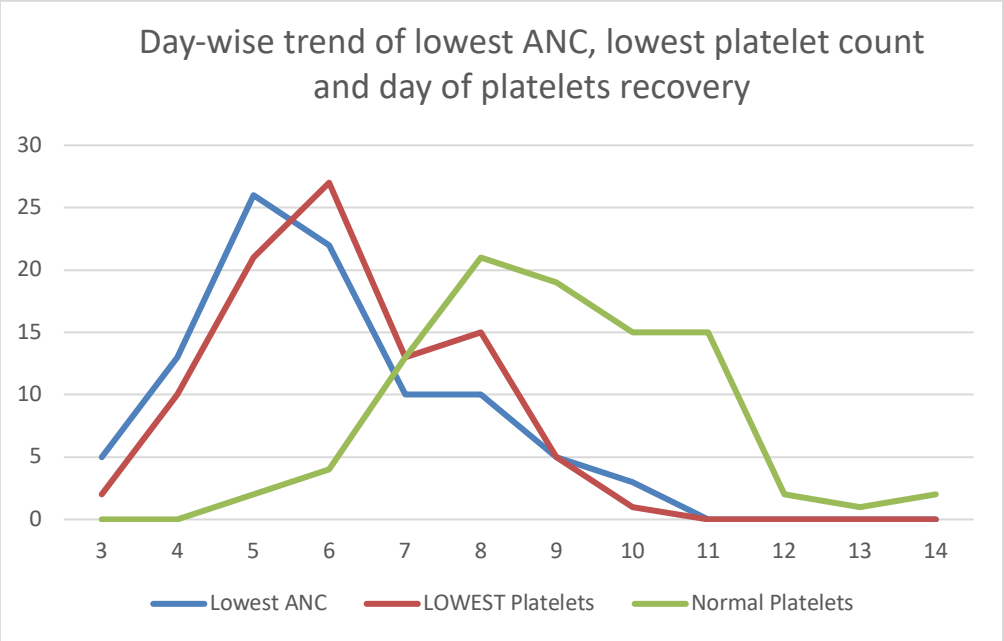


Figure 1: Day-wise trend of lowest ANC, lowest platelet counts and day of platelets recovery

Legends:

X axis: Day of illness, Y axis: number of patients

Blue line: lowest ANC, Orange line: Lowest platelet counts, Grey line: Normal Platelet counts

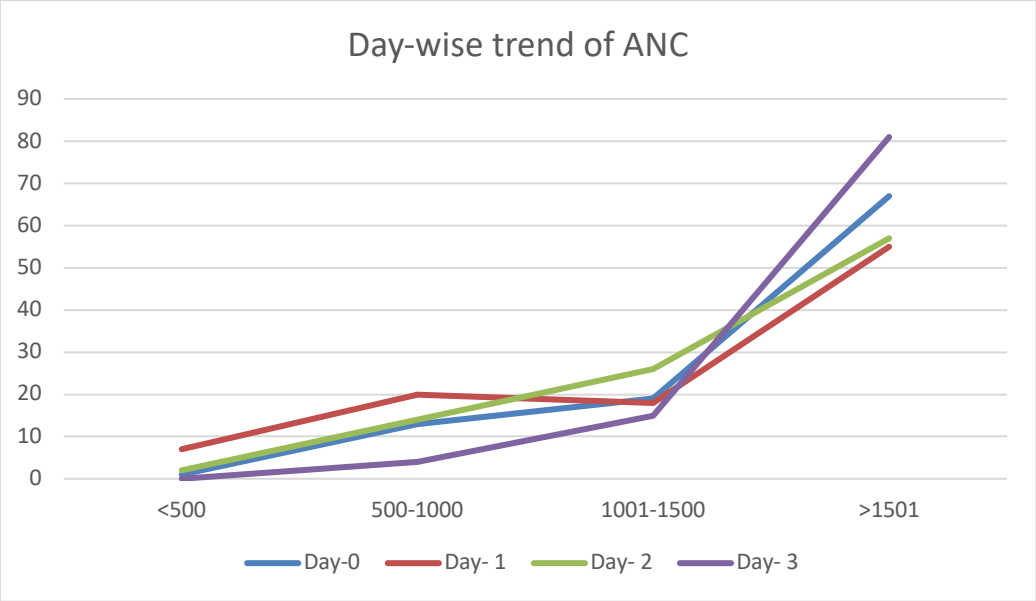


Figure 2: Day-wise trend of Absolute neutrophil count

Legends:

X axis: Absolute neutrophil counts, Y axis: number of patients.

Blue line: Day-0, Orange line: Day-1, Grey line: Day-2, Yellow line: Day-3.

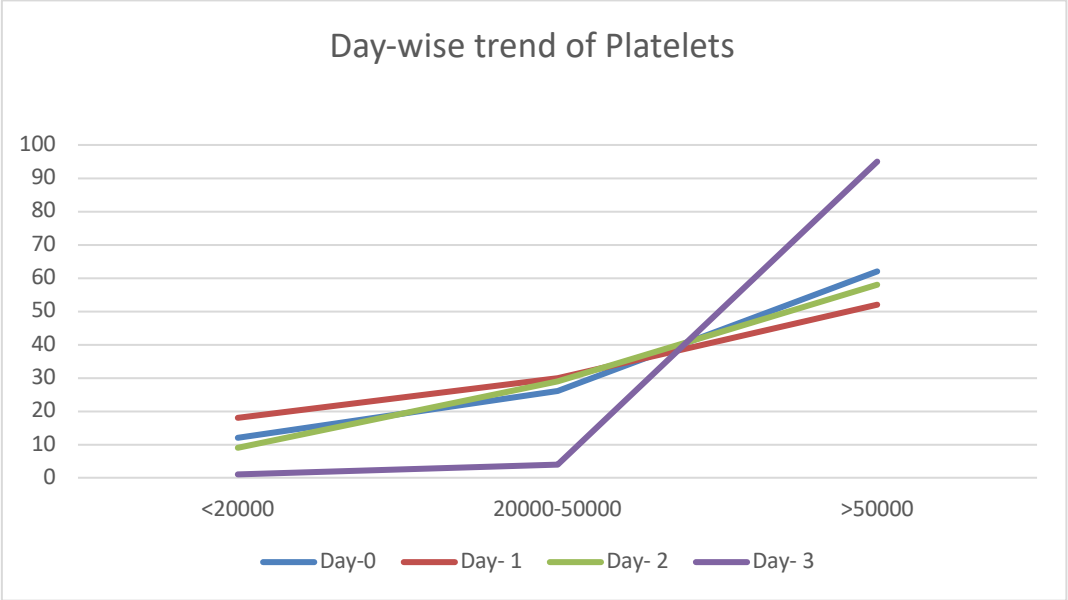


Figure 3: Day-wise trend of Platelet counts

Legends:

X axis: Platelets count, Y axis: Number of patients.

Blue line: Day-0, Orange line: Day-1, Grey line: Day-2, Yellow line: Day-3.

Discussion

This prospective cross-sectional study evaluates the clinicohematological profile, with a particular focus on absolute neutrophil count (ANC) and platelet trends, in paediatric patients with serologically confirmed dengue during the 2021 epidemic in Central India. Our findings provide novel insights into the temporal evolution of hematologic parameters in dengue and highlight their relevance

in predicting disease severity and recovery trajectory.

Dengue virus affects the bone marrow, leading to suppression of megakaryopoiesis and granulopoiesis, resulting in thrombocytopenia and neutropenia, respectively. In addition to direct marrow suppression, immune-mediated destruction and increased peripheral consumption of platelets during the capillary leak phase contribute to the drop in counts. [7]

In this study NS1 antigen positivity was 97% , which is consistent with a study from Maharashtra by Barde et al. (2018), reporting NS1 sensitivity of >90% in paediatric cases during the early febrile phase. [8]

Thrombocytopenia is a well-established marker in dengue fever, and our findings confirm its strong association with clinical severity. In the present study, 91.7% of patients with severe dengue (SD) had platelet counts <20,000/mm³, which was statistically significant ($p < 0.001$). This is consistent with studies by Mittal et al., who reported that severe thrombocytopenia was significantly more common in patients with severe or complicated dengue presentations.[9] Similarly, a study by Kumar et al. in North India reported that patients with platelet counts <50,000/mm³ were at significantly higher risk of complications such as bleeding and hypotension. [10]

Neutropenia was observed in 69% of our patients, with severe neutropenia (<500/mm³) noted in 41.7% of SD cases. Although the statistical association between neutropenia and severity was not significant ($p = 0.78$), the trend is noteworthy. This aligns with findings by Kalayanarooj et al., who reported early-onset neutropenia in many pediatric dengue cases, particularly in the critical phase. [11] A similar report was documented by Ralapanawa et al., who found neutropenia on day 5 of illness in 64.6 % of dengue patient. [12] Vogt MB et al. also observed neutropenia as a common finding, often preceding the drop in platelet counts, which may indicate early bone marrow suppression due to viral replication. [13] Neutropenia during the dengue infection does not warrant antibiotic use. [14]

Interestingly, our study shows that the nadir of ANC often preceded the lowest platelet count, particularly around days 4 to 6 of illness. This is similar to findings who observed that neutropenia typically peaked before thrombocytopenia, and proposed that rising ANC could be a harbinger of impending platelet recovery. [15]

Another key finding in our study was the delayed platelet recovery in severe dengue cases. The average day of platelet normalization was 8.00 days in DF, 8.71 in DFW, and 9.59 days in SD, which was statistically significant ($p = 0.046$). These findings are comparable to reports from southern India and Thailand, where delayed recovery of hematological parameters was correlated with more severe clinical manifestations. [11]

The prolonged hospital stay in severe dengue patients (mean stay: 7.25 ± 2.0 days) were statistically significant ($p = 0.002$), similar to findings by Jayanthi HK et al., who reported longer hospital stays with increasing disease severity. [16] These observations highlight the importance of supportive care and close monitoring, especially during the critical window.

Our study had zero mortality, possibly due to early diagnosis and adherence to national dengue treatment protocols. Similarly, a study in Kerala by Goudar et al. reported 1.9 % case fatality when timely interventions and standardized monitoring were in place. [17]

Understanding hematological trends offers prognostic value. Early neutropenia followed by thrombocytopenia between days 4 to 6 indicates the critical phase of dengue, when plasma leakage, bleeding, and shock are most likely to occur. Timely identification of this window allows for intensive monitoring, appropriate fluid management, and prevention of complications. The finding that 84% of patients began platelet recovery between days 6–11 emphasizes the importance of extending vigilance into the convalescent phase.

A strength of this study is its prospective design with serial monitoring of hematologic parameters during admission. Moreover, strict application of WHO 2009 classification improves the reliability of clinical severity grading.

However, it has limitations. Being single-center, the results may not be generalizable to all regions or to adult populations. The study also lacked evaluation of other biomarkers like CRP, ferritin, or liver enzymes, which could have provided a more comprehensive severity index. Lastly, follow-up beyond discharge was not conducted, limiting insight into late complications or relapses.

Conclusion

This study highlights the prognostic significance of serial monitoring of platelet counts and absolute neutrophil count (ANC) in paediatric dengue. Severe thrombocytopenia showed a strong association with clinical severity, while early neutropenia, though not statistically significant, emerged as a potential early marker of disease progression. The temporal trends observed—ANC nadirs preceding platelet decline and delayed platelet recovery in severe cases—underscore the critical need for close monitoring during days 4–6 of illness and continued vigilance into the recovery phase. The absence of mortality in our cohort

emphasizes the benefits of timely diagnosis and adherence to standardized treatment protocols. These findings contribute valuable evidence to existing literature and suggest that incorporating ANC and platelet dynamics into clinical algorithms could improve risk stratification and optimize management of paediatric dengue.

Funding statement: No external funding was received for this study

References

1. Ryan SJ, Carlson CJ, Mordecai EA, Johnson LR. Global expansion and redistribution of Aedes-borne virus transmission risk with climate change. PLoS Negl Trop Dis. 2019;13(3):e0007213. doi:10.1371/journal.pntd.0007213
2. Mustafa MS, Rasotgi V, Jain S, Gupta V. Discovery of fifth serotype of dengue virus (DENV-5): A new public health dilemma in dengue control. Med J Armed Forces India. 2015;71(1):67-70. doi:10.1016/j.mjafi.2014.09.011
3. Dengue: Guidelines for Diagnosis, Treatment, Prevention and Control: New Edition. World Health Organization; 2009.http://www.ncbi.nlm.nih.gov/books/NBK143157/
4. DENGUE SITUATION IN INDIA :: National Center for Vector Borne Diseases Control (NCVBDC). https://ncvbdc.mohfw.gov.in/index4.php?font=Increase&lang=1&level=0&lid=3715&linkid=431&utm_source=chatgpt.com
5. Ananda Rao A, U RR, Gosavi S, Menon S. Dengue Fever: Prognostic Insights from a Complete Blood Count. Cureus. Published online November 20, 2020. doi:10.7759/cureus.11594
6. Ajlan BA, Alafif MM, Alawi MM, Akbar NA, Aldigs EK, Madani TA. Assessment of the new World Health Organization's dengue classification for predicting severity of illness and level of healthcare required. PLoS Negl Trop Dis. 2019;13(8):e0007144. doi:10.1371/journal.pntd.0007144
7. Guzman MG, Harris E. Dengue. Lancet. 2015;385(9966):453-465. doi:10.1016/S0140-6736(14)60572-9
8. Anand AM, Sistla S, Dhodapkar R, Hamide A, Biswal N, Srinivasan B. Evaluation of NS1 Antigen Detection for Early Diagnosis of Dengue in a Tertiary Hospital in Southern India. J Clin Diagn Res. 2016;10(4):DC01-DC04. doi:10.7860/JCDR/2016/15758.7562
9. Mittal H, Faridi MMA, Arora SK, Patil R. Clinicohematological profile and platelet trends in children with dengue during 2010 epidemic in north India. Indian J Pediatr. 2012;79(4):467-471. doi:10.1007/s12098-011-0586-7
10. Kumar R, Tripathi P, Tripathi S, Kanodia A, Venkatesh V. Prevalence of dengue infection in north Indian children with acute hepatic failure. Ann Hepatol. 2008;7(1):59-62.
11. Kalayanarooj S, Vaughn DW, Nimmannitya S, et al. Early clinical and laboratory indicators of acute dengue illness. J Infect Dis. 1997;176(2):313-321. doi:10.1086/514047
12. Ralapanawa U, Alawattegama ATM, Gunrathne M, Tennakoon S, Kularatne SAM, Jayalath T. Value of peripheral blood count for dengue severity prediction. BMC Res Notes. 2018;11:400. doi:10.1186/s13104-018-3505-4
13. Vogt MB, Lahon A, Arya RP, Spencer Clinton JL, Rico-Hesse R. Dengue viruses infect human megakaryocytes, with probable clinical consequences. PLoS Negl Trop Dis. 2019;13(11):e0007837. doi:10.1371/journal.pntd.0007837
14. Khandelwal DR, Khandelwal DLM. Effect of dengue fever on the total leucocyte count and neutrophil count in children in early febrile period. Pediatric Review: International Journal of Pediatric Research. 2017;4(10):10. doi:10.17511/ijpr.2017.i10.06
15. Thein TL, Lye DC, Leo YS, Wong JGX, Hao Y, Wilder-Smith A. Severe Neutropenia in Dengue Patients: Prevalence and Significance. Am J Trop Med Hyg. 2014;90(6):984-987. doi:10.4269/ajtmh.14-0004
16. Jayanthi HK, Tulasi SK. Correlation study between platelet count, leukocyte count, nonhemorrhagic complications, and duration of hospital stay in dengue fever with thrombocytopenia. J Family Med Prim Care. 2016;5(1):120-123. doi:10.4103/2249-4863.184635
17. Goudar SR, D HR, Mathew J, Agarwal V, George R. Clinical profile and outcomes of dengue fever during monsoon season at a tertiary care hospital in South India. International Journal of Advances in Medicine. 2021;8(11):1674-1678. doi:10.18203/2349-3933.ijam20214068