

Analysis of Prognostic Indicators in Fever Associated with Thrombocytopenia Among Children Up to 12 Years

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Abstract

Fever associated with thrombocytopenia is a common clinical presentation in paediatric practice, particularly in regions with a high prevalence of infectious diseases. This study aimed to analyse prognostic indicators and clinical outcomes in children up to 12 years presenting with fever and thrombocytopenia. A cross-sectional observational study was conducted on 150 children admitted with fever ($>99.9^{\circ}\text{F}$) and platelet counts below $150,000/\mu\text{L}$ at Pushpagiri Medical College and Hospital Research Institute, Kerala. Detailed clinical evaluation, laboratory investigations, and outcome assessment were performed. Dengue fever emerged as the most prevalent etiology (41.3%), followed by non-dengue viral fever (25.3%), enteric fever (14%), sepsis (11.4%), and malaria (8%). Most children exhibited mild to moderate thrombocytopenia (74%). The majority (74.7%) improved with supportive management, while 18.7% required ICU admission. Complications such as bleeding or shock occurred in 5.3% of cases, and the mortality rate was 1.3%. Younger age groups and severe thrombocytopenia were more frequently associated with adverse outcomes. The findings underscore the need for early identification of high-risk children, careful monitoring, and timely intervention to prevent complications. Strengthening diagnostic practices and clinician awareness can significantly improve outcomes in paediatric febrile thrombocytopenia.

Keywords: Fever; Thrombocytopenia; Children; Prognostic indicators; Dengue fever; Paediatric infections; Platelet count; Clinical outcomes; Complications; ICU admission.

Introduction

Fever with thrombocytopenia is one of the most frequently encountered clinical presentations in pediatric emergency and inpatient settings, particularly in countries with a high burden of infectious diseases. In children, the coexistence of fever and reduced platelet count often signals an underlying systemic illness, most commonly infectious in origin, and warrants careful evaluation to determine severity and potential complications [1]. The pediatric population is especially vulnerable due to their immature immune response and higher susceptibility to rapid clinical deterioration during acute infections [2]. Thrombocytopenia in febrile children may arise from a wide range of etiologies, including viral infections (such as dengue, chikungunya, influenza, or viral hemorrhagic fevers), bacterial illnesses (such as septicemia, meningitis, or enteric fever), protozoal infections like malaria, and bone marrow-suppressive conditions [3,4]. Among these, dengue remains one of the most prevalent causes of acute thrombocytopenia in pediatric age groups in many tropical regions, causing significant morbidity and occasional mortality due to plasma leakage, bleeding, and organ dysfunction [5]. In malaria-endemic areas, *Plasmodium falciparum* and *Plasmodium vivax* infection also contribute substantially to thrombocytopenia through immune-mediated destruction and bone marrow suppression [6].

Platelets play a vital role in hemostasis, inflammation, and immune regulation; therefore, a decline in platelet count can have serious implications in an already febrile child. Studies have shown that severe thrombocytopenia is often associated with increased risk of bleeding, shock, prolonged hospitalization, and need for intensive care support [7,8]. Early identification of prognostic markers—such as persistent high-grade fever, rapid fall in platelet count, elevated liver enzymes, coagulopathy, positive serological markers, hepatosplenomegaly, and warning signs of dengue—can help clinicians anticipate complications and initiate timely management [9]. The clinical spectrum of febrile thrombocytopenia in children is highly variable. While some children experience mild thrombocytopenia with complete recovery, others may present with complications such as mucosal bleeding, petechiae, altered sensorium, hepatic dysfunction, or multi-organ involvement, depending on the underlying disease and immune response [10]. Moreover, the lack of disease-specific symptoms in early stages often leads to diagnostic uncertainty, making it essential to rely on laboratory parameters and clinical predictors to guide treatment decisions [11]. In resource-limited settings, where advanced diagnostic facilities may not be readily available, understanding simple and reliable predictors of outcomes becomes even more crucial. Identifying which children are at higher risk for severe disease not only helps clinicians prioritize monitoring and interventions but also improves resource utilization and reduces preventable morbidity and mortality [12]. Therefore, evaluating prognostic indicators in children with fever and thrombocytopenia remains an important area of research, contributing to better disease stratification and improved clinical outcomes.

Materials and Methods

Study Design

This hospital-based observational cross-sectional study was conducted to evaluate the clinical profile and identify predictors influencing the outcomes of children presenting with febrile thrombocytopenia.

Study Setting and Duration

The study was carried out over a period of 18 months in the Department of Pediatrics at Pushpagiri Medical College and Hospital Research Institute, Kerala.

Study Population

The study population comprised children aged more than 1 month and less than 12 years who were admitted with fever and thrombocytopenia during the study period. Eligible participants were enrolled using a convenience sampling technique.

Sample Size

A total of 150 children were included in the study. The sample size was determined based on the number of eligible children admitted during the study period.

Inclusion Criteria

Children aged above 1 month and below 12 years presenting with fever (body temperature $>99.9^{\circ}\text{F}$) and thrombocytopenia, defined as a platelet count of less than $150,000/\mu\text{L}$, were included in the study.

Exclusion Criteria

Children with thrombocytopenia in the absence of fever, known cases of immune thrombocytopenic purpura, previously diagnosed hematological disorders or malignancies, those receiving chemotherapy or immunosuppressive therapy, platelet function disorders, children taking antiplatelet or thrombocytopenia-inducing medications, and those with cirrhosis or chronic liver disease were excluded from the study.

Data Collection Tool

After obtaining written informed consent from parents or legal guardians, demographic details, clinical history, presenting symptoms, duration of fever, physical examination findings, and relevant medical history were recorded using a structured case record proforma. Blood samples were collected under aseptic precautions at the time of admission for laboratory investigations, including complete blood count with platelet count, peripheral blood smear, liver function tests, renal function tests, coagulation profile, and other relevant investigations based on the suspected etiology. Additional diagnostic tests such as dengue serology, malaria parasite examination, Widal test, blood culture, leptospira serology, scrub typhus serology, and viral markers were performed whenever clinically indicated. The etiology of febrile thrombocytopenia was established based on clinical findings supported by laboratory investigations.

Clinical outcomes including bleeding manifestations, platelet transfusion requirement, intensive care unit admission, duration of hospital stay, recovery, and mortality were documented. All observations were systematically recorded in a structured proforma and cross-verified for completeness and accuracy.

Ethical Considerations

The study protocol was approved by the Institutional Ethics Committee of Pushpagiri Medical College and Hospital Research Institute, Kerala, prior to commencement of the study. Written informed consent was obtained from the parents or legal guardians of all participating children after explaining the objectives and procedures of the study. Confidentiality and anonymity of participant information were maintained throughout the study in accordance with the ethical principles of the Indian Council of Medical Research (ICMR) guidelines.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS) software version 26.0. Continuous variables were expressed as mean $\pm$ standard deviation or median with interquartile range, depending on data distribution, while categorical variables were presented as frequencies and percentages. Normality of continuous variables was assessed using the Shapiro–Wilk test. Comparisons between groups were performed using the independent sample t-test or Mann–Whitney U test for continuous variables and the Chi-square test or Fisher's exact test for categorical variables. Variables showing statistical significance in univariate analysis were included in multivariate logistic regression analysis to identify independent predictors of adverse outcomes. Adjusted odds ratios (AORs) with 95% confidence intervals were calculated, and a p-value <0.05 was considered statistically significant.

Results

Table 1: Age Distribution of Children with Fever and Thrombocytopenia (n = 150)

Age Group	Number of Cases (n)	Percentage (%)
1 month – <1 year	22	14.7%
1 – 5 years	48	32.0%
6 – 9 years	44	29.3%
10 – 12 years	36	24.0%
Total	150	100%

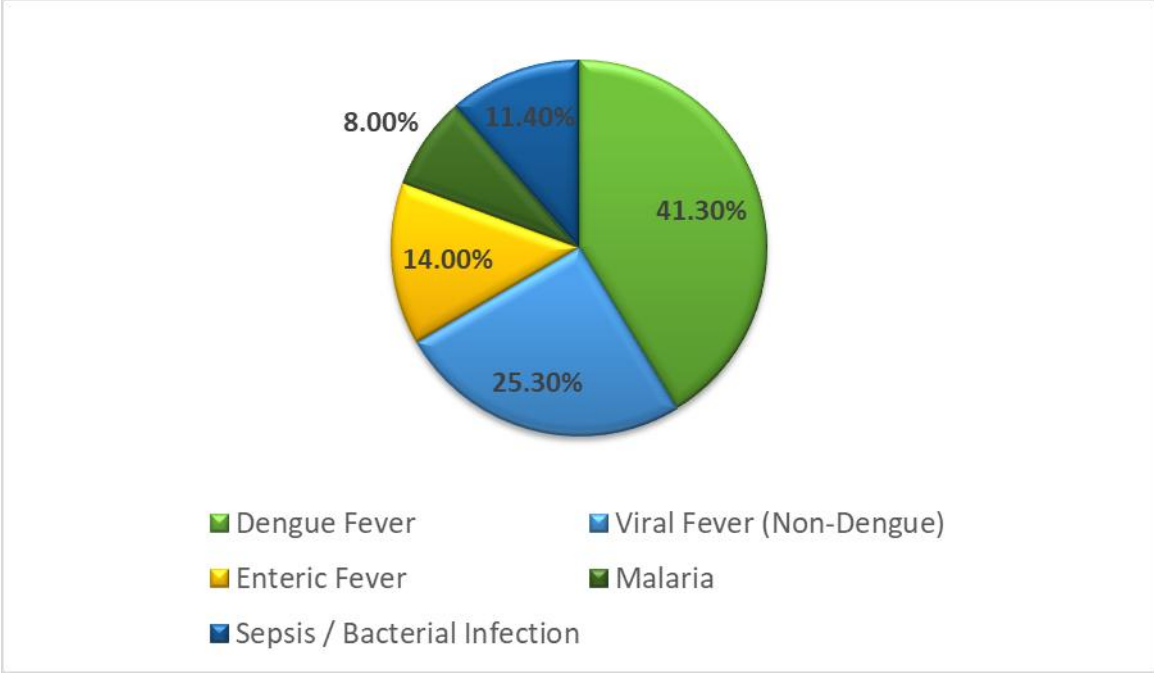
The study included 150 children with fever and thrombocytopenia, ranging from 1 month to 12 years of age. The largest proportion of cases occurred in the 1–5-year age group (32%), followed by children aged 6–9 years (29.3%). Infants below 1 year constituted 14.7%, while children aged 10–12 years made up 24% of the study population.

Table 2: Gender Distribution of Study Participants

Gender	Number (n)	Percentage (%)
Male	86	57.3%
Female	64	42.7%
Total	150	100%

In this study of 150 children with fever and thrombocytopenia, males accounted for 57.3% (n=86) of the cases, while females constituted 42.7% (n=64).

Figure 1: Etiological Profile of Fever with Thrombocytopenia



In this study, dengue fever was the most common cause, accounting for 41.3% (n=62) of the cases of fever with thrombocytopenia. This was followed by viral fever of non-dengue origin at 25.3% (n=38) and enteric fever at 14% (n=21). Malaria contributed to 8% (n=12) of cases, while sepsis or bacterial infections accounted for 11.4% (n=17).

Table 3: Severity of Thrombocytopenia Among Study Participants

Platelet Count Category	Number (n)	Percentage (%)
Mild (100,000–150,000/ μ L)	59	39.3%
Moderate (50,000–99,999/ μ L)	52	34.7%
Severe (<50,000/ μ L)	39	26.0%
Total	150	100%

In this study, most children presented with mild thrombocytopenia, accounting for 39.3% (n=59) of the cases. Moderate thrombocytopenia was seen in 34.7% (n=52) of the participants, while severe thrombocytopenia was observed in 26% (n=39).

Table 4: Clinical Outcomes of Children with Fever and Thrombocytopenia

Outcome	Number (n)	Percentage (%)
Improved with Supportive Treatment	112	74.7%
Required ICU Care	28	18.7%
Developed Complications (Bleeding / Shock)	8	5.3%
Mortality	2	1.3%

In this study, the majority of children, 74.7% (n=112) showed improvement with standard supportive treatment, indicating a generally favorable prognosis. However, 18.7% (n=28) required ICU care due to more severe presentations. A small proportion, 5.3% (n=8), developed complications such as bleeding or shock. Mortality was low, recorded in 1.3% (n=2) of the total cases.

Discussion

In this study of 150 children presenting with fever and thrombocytopenia, distinct epidemiological and clinical patterns were observed. The age distribution revealed that the most affected group was 1–5

years (32%), followed by 6–9 years (29.3%), indicating a higher susceptibility among younger children. Similar age-related patterns have been reported by Saravu et al. and Kumar et al., who demonstrated that febrile thrombocytopenia is more common in preschool and early school-aged children [14,15]. A male predominance was noted in the present study (57.3% males vs. 42.7% females), which is consistent with findings by Patel et al. and Shrivastava et al., both of whom reported a comparable male preponderance in pediatric thrombocytopenia [23,17]. This gender difference may be related to increased outdoor exposure among male children, predisposing them to vector-borne infections. Regarding etiology, dengue fever was identified as the most common cause (41.3%), followed by non-dengue viral fevers (25.3%), enteric fever (14%), sepsis (11.4%), and malaria (8%). The predominance of dengue aligns with observations by Gupta et al., Narayanappa et al., and Lokireddy et al., who consistently reported dengue as the leading cause of febrile thrombocytopenia in children [9,2,3]. The endemic nature of dengue in South India and its seasonal outbreaks further support these findings, as highlighted by Chandy et al. and Mathew and Kuruvilla [12,21].

Most children in the present study had mild to moderate thrombocytopenia (74%), while 26% had severe thrombocytopenia ($<50,000/\mu\text{L}$). Comparable platelet distribution patterns were reported by Sharma and Kumar and Patel et al., who noted severe thrombocytopenia in approximately 20–30% of pediatric cases [22,23]. Although platelet count alone is not a definitive predictor of disease severity, lower counts are often associated with dengue and bacterial sepsis, as emphasized by Ranjit and Kissoon and Faust et al. [20,18]. In terms of outcomes, 74.7% of children improved with supportive treatment alone, which is in agreement with studies by Mittal et al. and Aggarwal et al., both of whom reported favorable recovery in the majority of children with febrile thrombocytopenia when managed promptly [6,5]. However, 18.7% of patients required ICU admission, particularly those presenting with persistent shock, severe bleeding, or organ dysfunction. Similar ICU admission rates have been documented by Kumar and Rai and Debnath and Sinha [26,24]. Complications such as bleeding or shock occurred in 5.3% of cases, comparable to the complication rates of 4–7% reported by Wani and Hussain [25]. The mortality rate in the present study was 1.3%, which aligns with findings by Ahmed et al. and Verma et al., who reported mortality rates ranging from 1% to 3% in hospital-based pediatric cohorts with febrile thrombocytopenia [27,28]. Overall, the findings reaffirm that fever with thrombocytopenia in children is a common clinical presentation, most frequently caused by dengue and viral infections, and is generally associated with favorable outcomes. Nevertheless, children presenting with severe thrombocytopenia, sepsis, or clinical instability require early identification, intensive monitoring, and timely intervention to minimize adverse outcomes, as emphasized by Rajesh et al. [13].

Strengths

This study included a broad spectrum of children with febrile thrombocytopenia and systematically evaluated clinical features, laboratory parameters, etiological factors, and patient outcomes. The use of standardized data collection methods and comprehensive laboratory investigations enhanced the reliability of identifying predictors of disease outcome.

Limitations

The study was conducted at a single tertiary care center using convenience sampling, which may limit the generalizability of the findings. Additionally, the cross-sectional design precluded long-term follow-up of patients and assessment of delayed complications or long-term outcomes following recovery.

Conclusion

This study highlights that fever associated with thrombocytopenia is a common clinical presentation in children up to 12 years of age, with dengue fever emerging as the leading cause. Most children had mild to moderate thrombocytopenia and responded well to supportive management, reflecting the generally favorable prognosis of these conditions. However, a notable proportion required ICU care, particularly those with severe thrombocytopenia or underlying bacterial infections. A small but significant number developed complications such as bleeding or shock, and mortality, though low, was present. These findings emphasize the importance of early evaluation, close monitoring of platelet trends, and timely intervention to prevent adverse outcomes. Strengthening awareness and improving early diagnostic practices can further enhance clinical outcomes in pediatric febrile thrombocytopenia.

Conflict of interest: Nil

Source Of Fund: Nil

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