Section: Microbiology

Original Research Article

HEMATOLOGICAL MANIFESTATIONS OF DENGUE FEVER: AN OBSERVATIONAL STUDY ON THE PREVALENCE AND PATTERNS OF THROMBOCYTOPENIA AND LEUKOPENIA IN AFFECTED PATIENTS

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ABSTRACT

Background: Dengue fever is a significant public health concern in tropical and subtropical regions, characterized by various clinical and hematological manifestations. Hematological abnormalities, particularly thrombocytopenia and leukopenia, are hallmarks of the disease and are essential for diagnosis, monitoring, and management. **Objective:** To evaluate the prevalence and patterns of thrombocytopenia and leukopenia in patients diagnosed with dengue fever. **Materials and Methods:** This observational study was conducted on 100 patients with confirmed dengue fever. Detailed demographic, clinical, and hematological data were collected. Complete blood counts were performed to assess platelet and leukocyte levels. Data were analyzed using descriptive statistics. **Result:** Out of 100 patients, 58% were male and 42% were female, with the majority (42%) aged between 15–30 years. The most common clinical symptom was fever (100%), followed by headache (76%) and myalgia (68%). Thrombocytopenia was present in 82% of patients, with 26% exhibiting mild, 38% moderate, and 18% severe thrombocytopenia. Leukopenia was observed in 54% of cases. The mean platelet count was 85,000 ± 42,500/mm³, and the mean total leukocyte count was 3,900 ± 1,200/mm³. No mortality was recorded in the study cohort. **Conclusion:** Thrombocytopenia and leukopenia are prevalent hematological abnormalities in dengue fever and can serve as useful diagnostic and prognostic indicators. Early identification and monitoring of these parameters are crucial for timely intervention and management.

INTRODUCTION

Dengue fever is a rapidly emerging mosquito-borne viral infection caused by the Dengue virus (DENV), which poses a significant public health threat in tropical and subtropical regions, particularly in Asia and South America. The global incidence of dengue has increased substantially over recent decades, with an estimated 390 million infections annually, of which a considerable proportion progresses to severe disease forms requiring hospitalization,[1]

The clinical manifestations of dengue fever range from asymptomatic infection and mild febrile illness to life-threatening complications such as dengue hemorrhagic fever and dengue shock syndrome.[2] Early diagnosis and recognition of warning signs are essential to prevent complications and reduce mortality. Hematological abnormalities, especially thrombocytopenia and leukopenia, are hallmark features of dengue infection and serve as important diagnostic and prognostic markers.[3,4]

Thrombocytopenia in dengue is primarily attributed to bone marrow suppression, immune-mediated destruction of platelets, and increased peripheral consumption, while leukopenia is a result of direct viral suppression of hematopoiesis and immune modulation.[5] Several studies have shown that the degree of thrombocytopenia correlates with the severity of disease and risk of bleeding, making serial platelet monitoring crucial in clinical management.[3,6]

Despite the well-established importance of these hematological parameters, limited regional data are available on their prevalence and patterns, particularly in the Indian population. Therefore, this study aims to evaluate the prevalence and severity of thrombocytopenia and leukopenia among dengue

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patients in a tertiary care setting, contributing valuable insights for better clinical decision-making and patient outcomes.

MATERIALS AND METHODS

Study Design and Setting

This was a hospital-based observational study conducted in the Department of General Medicine, Government Medical College (GMC), Mahbubabad, Telangana, India. The study was carried out over a period of six months, from June 2024 to November 2024.

Study Population

A total of 100 patients of all age groups and both genders with serologically confirmed dengue fever were enrolled in the study. The diagnosis was established based on NS1 antigen positivity and/or IgM antibody detection using standard ELISA techniques.

Inclusion Criteria

1. Patients with laboratory-confirmed dengue fever (NS1 antigen or IgM positive)
2. Patients willing to provide informed consent

Exclusion Criteria

1. Patients with pre-existing hematological disorders (such as leukemia, idiopathic thrombocytopenic purpura)
2. Patients on medications known to affect platelet count or white blood cell count
3. Patients with co-infections such as malaria or chikungunya

Data Collection

After obtaining informed written consent, demographic details including age and gender, clinical features such as fever, headache, rash, and bleeding manifestations, and laboratory parameters were recorded for each participant. Complete blood counts (CBC) including hemoglobin level, total leukocyte count, platelet count, and hematocrit were performed using an automated hematology analyzer in the hospital laboratory.

For the purpose of this study

Thrombocytopenia was defined as a platelet count of less than 150,000/mm³, and was further classified into:

Mild thrombocytopenia: platelet count between 100,000–150,000/mm³

Moderate thrombocytopenia: platelet count between 50,000–99,999/mm³

Severe thrombocytopenia: platelet count less than 50,000/mm³

Leukopenia was defined as a total leukocyte count of less than 4,000/mm³.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0 (IBM, Chicago, USA). Descriptive statistics were used to summarize categorical variables as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation (SD). The association between hematological parameters and demographic variables was assessed using the Chi-square test or Student's t-test as appropriate. A p-value < 0.05 was considered statistically significant.

Ethical Consideration

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Ethics Committee of GMC Mahbubabad.

RESULTS

The study included a total of 100 patients diagnosed with dengue fever. The mean age of the participants was 28.6 ± 12.4 years with a range of 5 to 62 years. The majority of the patients (42%) were between 15–30 years of age. There was a slight male predominance with 58% males and 42% females (Table 1).

The most common clinical presentation observed was fever, which was present in 100% of cases. Other frequently reported symptoms included headache in 76%, myalgia/body aches in 68%, retro-orbital pain in 44%, rash in 24%, and bleeding manifestations in 12% of the patients (Table 2).

Hematological abnormalities were prominent among the study population. Thrombocytopenia was observed in 82% of cases. Among these, 26% had mild thrombocytopenia (platelet count 100,000–150,000/mm³), 38% had moderate thrombocytopenia (50,000–99,999/mm³), and 18% exhibited severe thrombocytopenia (platelet count < 50,000/mm³). The remaining 18% of patients had normal platelet counts (> 150,000/mm³). Leukopenia, defined as a total leukocyte count of < 4,000/mm³, was identified in 54% of patients, while 46% had normal or elevated leukocyte counts (Table 3).

The mean platelet count among patients was 85,000 ± 42,500/mm³, and the mean total leukocyte count was 3,900 ± 1,200/mm³. The average hemoglobin level was 12.5 ± 1.8 g/dL, and the hematocrit averaged 42.3 ± 4.5% (Table 4).

No significant difference in the prevalence of hematological abnormalities was observed between male and female participants. Notably, patients presenting after the 5th day of illness tended to have lower platelet counts, although this difference did not reach statistical significance (p > 0.05).There were no reported cases of mortality in the present study population.

Table 1: Demographic Characteristics of Study Participants (n = 100)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
< 15	18	18%
15–30	42	42%

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31–45	28	28%
> 45	12	12%
Gender		
Male	58	58%
Female	42	42%

Table 2: Clinical Presentation of Dengue Fever (n = 100)

Clinical Symptom	Frequency (n)	Percentage (%)
Fever	100	100%
Headache	76	76%
Myalgia/Body aches	68	68%
Retro-orbital pain	44	44%
Rash	24	24%
Bleeding manifestations	12	12%

Table 3: Hematological Abnormalities in Dengue Patients (n = 100)

Hematological Parameter	Frequency (n)	Percentage (%)
Mild (100,000–150,000/mm³)	26	26%
Moderate (50,000–99,999/mm³)	38	38%
Severe (< 50,000/mm³)	18	18%
No Thrombocytopenia (>150,000/mm³)	18	18%
Leukopenia (< 4,000/mm³)	54	54%
Normal Leukocyte Count	46	46%

Table 4: Mean Hematological Values of Study Participants (n = 100)

Parameter	Mean ± SD
Hemoglobin (g/dL)	12.5 ± 1.8
Total Leukocyte Count (/mm³)	3,900 ± 1,200
Platelet Count (/mm³)	85,000 ± 42,500
Hematocrit (%)	42.3 ± 4.5

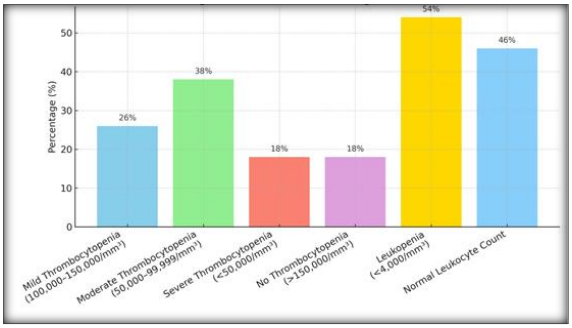

Figure 1: Hematological Abnormalities in Dengue Patients

DISCUSSION

This observational study evaluated the prevalence and patterns of hematological manifestations, particularly thrombocytopenia and leukopenia, in patients with dengue fever. Our findings revealed that 82% of patients exhibited thrombocytopenia, while 54% demonstrated leukopenia, highlighting the commonality of these hematological abnormalities in dengue infection.

The high frequency of thrombocytopenia observed in this study is consistent with findings from other studies conducted in dengue-endemic regions. Thapa et al. reported similar results, demonstrating that thrombocytopenia and leukopenia are prevalent in dengue patients presenting to emergency departments.[7] The underlying mechanisms of thrombocytopenia are multifactorial, involving bone marrow suppression, immune-mediated destruction of platelets, and increased peripheral sequestration, as emphasized by Castilho et al. in their retrospective cohort study.[8]

Leukopenia, another key laboratory feature in dengue, is attributed to direct viral suppression of hematopoiesis and has been validated as a useful diagnostic marker for dengue fever, especially in the setting of acute febrile illnesses, as shown by Chaloemwong et al.[9] In the current study, leukopenia was observed in more than half of the cases, supporting its relevance in clinical evaluation.

A study from Nepal by Gupta et al. also corroborated the association of both leukopenia and thrombocytopenia with dengue infection, emphasizing the role of these hematological parameters in early diagnosis and risk stratification.[10] Furthermore, research by de Azeredo et al. has highlighted the complex interplay between the dengue virus, coagulation pathways, and inflammatory mediators in the development of thrombocytopenia, which may contribute to severe disease manifestations.[11]

It is noteworthy that Unnikrishnan et al. identified that elderly dengue patients tend to have different clinical and laboratory profiles, including more profound hematological changes, which necessitates careful monitoring in vulnerable populations.[12] Although the present study did not specifically analyze age-related differences, the findings reinforce the importance of individualized care in dengue management.

Overall, our results underscore the value of routine hematological monitoring, particularly platelet and white blood cell counts, in guiding the management of dengue fever. Early identification of these changes

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can assist in preventing progression to severe complications, including bleeding and shock.

Limitations

This study was limited by its single-center design and small sample size. The absence of follow-up data on platelet recovery and outcomes also restricts the ability to establish long-term clinical correlations.

CONCLUSION

This observational study highlights the high prevalence of hematological abnormalities, particularly thrombocytopenia and leukopenia, among patients with dengue fever in a tertiary care setting. Thrombocytopenia was observed in the majority of cases, with a significant proportion experiencing moderate to severe reductions in platelet counts. Leukopenia was also common, reinforcing its role as a useful early diagnostic indicator. Regular monitoring of hematological parameters is essential for timely identification of disease progression and prevention of complications such as bleeding and shock. Early recognition and supportive management based on simple laboratory findings can significantly improve patient outcomes in dengue fever, especially in resource-constrained healthcare settings.

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