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Clinical profile of dengue patients in a tertiary care centre: A cross-sectional analytical study

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Abstract:

Early identification of clinical and laboratory predictors is essential to reduce complications and mortality in dengue fever. Therefore, it is of interest to analyse the clinical, demographic, hematological and biochemical profiles of 321 laboratory-confirmed dengue patients. Fever was the most common presenting symptom, while thrombocytopenia, leukopenia and elevated liver enzymes were frequent laboratory findings. Severe bleeding, plasma leakage, underlying comorbidities and higher SOFA scores were associated with greater disease severity and prolonged hospital stay. Thus, early recognition of warning signs and prompt supportive management can improve clinical outcomes and reduce dengue-related complications.

Keywords: Dengue fever, thrombocytopenia, SOFA score, hepatic dysfunction, bleeding manifestations, tertiary care centre, cross-sectional study

Background:

Dengue fever is a rapidly spreading mosquito-borne viral disease and a public health problem in tropical and subtropical countries. Dengue virus (DENV-1, DENV-2, DENV-3, and DENV-4) is the cause of the disease, which is transmitted mainly by infected *Aedes aegypti* mosquitoes. The prevalence of dengue has risen significantly in the last few decades, with almost half of the world's population now residing in areas where dengue can be transmitted [1]. Rapid urbanization, population growth, poor sanitation, changing climatic conditions and lack of vector control measures are responsible for the significant contribution of India to the global burden of dengue. Dengue infection can present with a wide range of clinical manifestations, from no symptoms to a self-limited febrile illness, to severe dengue with plasma leakage, bleeding, shock and multiorgan failure [2]. The classical dengue fever is characterized by high grade fever, severe headache, retro-orbital pain and myalgia and arthralgia, nausea, vomiting and rash. Severe dengue can cause high morbidity and mortality rates, however, because of the thrombocytopenia, coagulopathy, hepatic dysfunction, acute kidney injury, myocarditis, encephalopathy and circulatory collapse [3]. Therefore, early detection of warning signs like abdominal pain, persistent vomiting, mucosal bleeding, fluid accumulation, lethargy, hepatomegaly and rising hematocrit with rapid platelet decline is crucial to prevent complications. Epidemiological patterns have shown that outbreaks of dengue have become more frequent and intense in the South Asian countries, particularly in India [4]. Seasonal monsoon rains, lack of water movement and increased vector breeding all play a major role in disease transmission. Furthermore, atypical presentations of the nervous system, liver, kidneys and cardiovascular system have made the clinical management of dengue infection more complex [5]. Hepatic involvement has been reported in several studies in dengue patients and raised serum transaminases are frequent laboratory abnormalities reported in severe dengue patients [6]. Thrombocytopenia and leukopenia are also significant hematological parameters that help guide the clinician in the management of the disease and in predicting complications. During an outbreak, the impact of dengue on tertiary health systems is significant because of the increase in hospitalisation, need for intensive monitoring, blood component therapy and extended hospitalisation [7]. Therefore, the clinical and laboratory profile of dengue patients is an important aspect to be understood to enhance the diagnosis, triage and treatment plan and resource allocation. The clinical

profile of dengue has been studied in several Indian studies, but there are regional variations in the clinical features, severity pattern and complications because of variations in serotype distribution, demographic characteristics and access to healthcare [8]. Thus, local epidemiological information is still relevant for informing clinicians and public health officials. The Sequential Organ Failure Assessment (SOFA) score has also become significant in the evaluation of disease severity and prognosis of critically ill dengue patients. A higher SOFA score is correlated with higher risk of organ dysfunction, intensive care admission and mortality [9]. Assessment of organ involvement in addition to the usual haematological and biochemical tests can aid in the identification of patients who need aggressive monitoring and supportive management. Although supportive care has improved considerably, dengue still causes a high level of morbidity in developing countries. The treatment is still based on early diagnosis, careful observation of warning signs and adequate fluid therapy, as there is no specific antiviral therapy at present [10]. Therefore, it is of interest to assess the demographic parameters, clinical features, laboratory profile and severity parameters of dengue cases admitted to a tertiary care centre and to determine common complications and factors associated with severe disease in hospitalized dengue patients.

Materials and Methodology:**Study design:**

A cross sectional analytical study was done in this hospital to assess the clinical and laboratory profile of patients admitted with the diagnosis of dengue fever at AIIMS, Patna, Bihar, India. The study included detailed analysis of the demographic variables, presenting symptoms, comorbid conditions, hematological parameters, biochemical abnormalities and severity indicators of confirmed dengue patients.

Study setting:

The study was conducted in a department of General Medicine, AIIMS, Patna and Bihar, India with well-established medical wards, intensive care unit and laboratory diagnostic facilities for the management of infectious diseases like Dengue Fever. It serves a large population from urban and rural areas and is a referral center during seasonal outbreaks of Dengue.

Study population:

A total of 321 patients with dengue fever were included in the study. Dengue was diagnosed based on clinical presentation with laboratory confirmation by NS1 antigen positivity and/or dengue IgM serology as per institutional protocol.

Inclusion criteria:

- [1] Patients over 14 years old.
- [2] Laboratory-confirmed dengue infection.
- [3] Patients admitted during the study period with complete clinical and laboratory records.
- [4] Patients who are willing to participate and give informed consent.

Exclusion criteria:

- [1] Patients who have incomplete medical records.
- [2] Patients who have other chronic hematological disorders which affect platelet counts.
- [3] Patients with other known acute febrile diseases like malaria, typhoid or leptospirosis.
- [4] Pregnant women and children under the specified age.

Data collection:

Structured proforma was used to collect data from hospital records and bedside clinical evaluation. Demographic data such as age and sex was collected. Fever, vomiting, abdominal pain, myalgia, mucosal bleeding, altered sensorium, black stools and plasma leakage were recorded as clinical symptoms. Comorbidities such as diabetes mellitus, hypertension, hypothyroidism, chronic kidney disease and cardiovascular diseases were also collected. The clinical examination parameters such as blood pressure, hepatomegaly, pleural effusion, ascites, Glasgow Coma Scale (GCS) and SOFA score were evaluated. On admission, laboratory investigations were carried out that included complete blood count, platelet count, hemoglobin level, white blood cell count, liver function tests, renal function tests and coagulation profile as indicated.

Variables assessed:

The following variables were analyzed:

- [1] Age and gender distribution
- [2] Presenting symptoms and warning signs
- [3] The presence of comorbid illnesses.
- [4] Oral and severe bleeding symptoms
- [5] Signs of plasma leakage.
- [6] Thrombocytopenia and leukopenia are examples of hematological abnormalities.
- [7] Liver function abnormalities
- [8] Indicators of organ dysfunction
- [9] The severity of the clinical disease and complications.

Operational definitions:

- [1] Thrombocytopenia was considered as platelet count less than 100,000/mm³.
- [2] Severe dengue was defined as per the World Health Organization (WHO) criteria: severe bleeding, shock, organ impairment, or severe plasma leakage.

- [3] Leukopenia was considered as TLC < 4,000/mm³.

- [4] Hepatic dysfunction was suspected if AST or ALT was raised above the normal laboratory reference value.

Statistical analysis:

The data collected were entered into Microsoft Excel and analyzed by Statistical Package for Social Sciences (SPSS) software version 26.0. Continuous variables were presented as mean $\pm$ SD and categorical variables as frequencies and percentages. Where appropriate, comparison was made by using Chi-square test and Student's t-test. A p value of < 0.05 was deemed statistically significant.

Ethical considerations:

The study protocol was approved by the Institutional Ethics Committee of AIIMS Patna (Approval No.: AIIMS/Pat/IEC/2024/1260). All participants gave informed consent before participating in the study. Patient information was kept confidential throughout the study and all procedures were carried out in accordance with the ethical principles of the Declaration of Helsinki.

Results:

A total of 321 laboratory-confirmed dengue patients admitted to the tertiary care centre were included in the present cross-sectional analytical study. The demographic profile demonstrated that dengue infection affected predominantly young and middle-aged adults. The mean age of the study population was 40.5 $\pm$ 14.1 years, with the majority of patients belonging to the age group of 21–50 years. Male predominance was observed, accounting for approximately 70.4% of cases, while females constituted 29.6% of the study population. The increased male predominance may be attributed to greater outdoor exposure, occupational activity and increased contact with mosquito breeding environments. The findings in (Table 1) demonstrate that fever was the predominant presenting complaint, observed in more than 96% of patients. Myalgia and vomiting were also common manifestations, occurring in 60.4% and 55.4% of cases respectively. Mucosal bleeding was observed in nearly one-fourth of patients, while severe bleeding manifestations were comparatively less common. Evidence of plasma leakage such as pleural effusion and ascites was noted in 15% of cases, indicating progression toward severe dengue in a subset of patients. Hematological abnormalities formed one of the most important laboratory findings among dengue patients. Thrombocytopenia was universally present to varying degrees, with severe thrombocytopenia being observed more frequently among patients with warning signs and bleeding manifestations. Leukopenia was also frequently noted during the febrile phase. Elevated liver enzymes, particularly AST and ALT, were commonly observed and reflected hepatic involvement associated with dengue infection. Table 2 shows that thrombocytopenia was a major laboratory abnormality among admitted dengue patients. Nearly 23.1% of patients had platelet counts below 20,000/mm³, while 33.6% had platelet counts between 20,000 and 50,000/mm³. Elevated liver enzymes were

observed in more than half of the patients, indicating frequent hepatic involvement. Leukopenia was present in approximately one-third of patients. Raised serum creatinine and higher SOFA scores were more commonly observed among clinically severe cases. Further analytical evaluation was performed to determine the association between thrombocytopenia, bleeding manifestations and disease severity. Patients with platelet counts below 20,000/mm³ demonstrated significantly higher rates of mucosal and severe bleeding compared to those with platelet counts above 50,000/mm³. **Table 3** demonstrates a statistically significant association between thrombocytopenia and severe clinical manifestations of dengue. Severe dengue patients showed significantly higher prevalence of platelet counts below 20,000/mm³, mucosal bleeding, severe hemorrhagic manifestations, elevated liver enzymes and SOFA scores ≥ 4 compared to non-severe cases ($p < 0.05$). Presence of comorbid conditions and plasma leakage were also significantly associated with severe disease. Overall, the study findings indicate that thrombocytopenia, elevated liver enzymes, higher SOFA scores

and bleeding manifestations are important markers of disease severity among hospitalized dengue patients. Patients with warning signs and comorbidities required closer monitoring and aggressive supportive management to prevent progression to severe dengue and organ dysfunction.

Table 1: Demographic and clinical characteristics of dengue patients (n=321)

Variable	Frequency	Percentage
Male patients	226	70.4%
Female patients	95	29.6%
Age 15–30 years	102	31.8%
Age 31–50 years	146	45.5%
Age >50 years	73	22.7%
Fever	309	96.3%
Vomiting	178	55.4%
Abdominal pain	121	37.7%
Myalgia/body ache	194	60.4%
Mucosal bleeding	82	25.5%
Severe bleeding manifestations	39	12.1%
Hepatomegaly	64	19.9%
Pleural effusion/ascites	48	15.0%
Presence of comorbidities	109	34.0%

Table 2: Hematological and biochemical profile of dengue patients

Laboratory Parameter	Mean $\pm$ SD / Frequency	Percentage
Mean hemoglobin (g/dL)	12.2 $\pm$ 4.4	—
Mean WBC count (/mm ³)	9057 $\pm$ 14956	—
Mean platelet count (/mm ³)	58,478 $\pm$ 50,245	—
Platelet count <20,000/mm ³	74	23.1%
Platelet count 20,000–50,000/mm ³	108	33.6%
Platelet count >50,000/mm ³	139	43.3%
Leukopenia (<4,000/mm ³)	116	36.1%
Elevated AST/ALT	184	57.3%
Raised serum creatinine	42	13.1%
SOFA score ≥ 4	104	32.4%

Table 3: Association of platelet count and SOFA score with clinical severity

Parameter	Severe Dengue (n=98)	Non-Severe Dengue (n=223)	p-value
Platelet count <20,000/mm ³	48 (49.0%)	26 (11.7%)	<0.001*
Mucosal bleeding	51 (52.0%)	31 (13.9%)	<0.001*
Severe bleeding	18 (18.4%)	4 (1.8%)	<0.001*
Elevated AST/ALT	73 (74.5%)	111 (49.8%)	0.002*
SOFA score ≥ 4	61 (62.2%)	43 (19.3%)	<0.001*
Pleural effusion/ascites	28 (28.6%)	20 (9.0%)	0.001*
Comorbidities present	46 (46.9%)	63 (28.3%)	0.004*

Discussion:

This cross sectional analytical study aimed to assess the demographic profile, clinical features, haematological profile, biochemical abnormalities and severity markers of 321 hospitalized dengue patients admitted to a tertiary care centre. Dengue fever is still one of the most common mosquito-borne viral diseases in India and is a major cause of morbidity and hospitalisation during outbreaks. The results of the present study emphasize the wide spectrum of clinical manifestations of dengue infection, from uncomplicated fever to severe haemorrhagic complications and organ dysfunction. In this study, males were the predominant patients admitted with dengue. The male predominance has been observed in some Indian and international studies, which may be attributed to higher exposure to occupation and outdoor activities among males [2]. Most of the patients were found to be in the young and middle age group adults which is in accordance with the findings of Billick *et al.* and Murhekar *et al.* who found that the

incidence of dengue is more in economically productive age group [3, 4]. The higher burden in this age group could be due to increased exposure to mosquito breeding sites and travel-related transmission. In the present study, fever was the most frequent presenting symptom and was seen in almost all patients. Other common symptoms included myalgia, vomiting, abdominal pain and headache. These results are similar to those of earlier studies which found that fever accompanied by constitutional symptoms is the typical presentation of dengue infection [5]. Gastrointestinal symptoms were observed in the present study, which may be attributed to the involvement of the liver, capillary leakage and the release of inflammatory cytokines during dengue infection. Bleeding manifestations continue to be a significant clinical problem in dengue infection. In the current study, mucosal bleeding was noted in about 25% of patients and more serious bleeding symptoms including melena and hematemesis were noted in a smaller, but clinically relevant number. The same was reported by Samanta and Sharma who

highlighted the significant role of thrombocytopenia and endothelial dysfunction in the hemorrhagic features of dengue patients [6]. A lower platelet count was strongly correlated with severe bleeding in the present study, which confirms the importance of thrombocytopenia as a severity marker. One of the most significant findings of the present analysis was hematological abnormalities. Thrombocytopenia was seen in most of the hospitalized patients and almost one fourth had platelet count less than 20,000/mm³. Similar results have been observed in earlier studies done in tertiary care hospitals in India [7]. Thrombocytopenia in dengue infection is believed to be due to platelet destruction, suppression of bone marrow, immune-mediated platelet injury and increased consumption in the periphery. Leukopenia was also commonly observed in the present study and could be due to transient suppression of bone marrow caused by viral infection. Another important finding in the present study was the hepatic dysfunction observed among the dengue patients. Hepatic involvement was common, with more than half of the study population having elevated AST and ALT levels. Liver dysfunction has been reported in several studies as a common symptom of dengue infection, especially in severe cases [8]. Increased transaminases can be due to direct viral damage, immune-mediated hepatocyte damage and circulatory disturbances due to plasma leakage. The present study also showed that the SOFA scores were significantly associated with severe manifestations of dengue. Bleeding, plasma leakage and organ dysfunction were more frequent in patients with SOFA score ≥ 4 . The same was observed by Lee *et al.*, Dinkar and Singh who reported that the severity and mortality of critically ill dengue patients were strongly correlated with the increase of SOFA scores [9, 10]. Therefore, SOFA seems to be a useful tool to identify high-risk patients who need intensive monitoring and supportive care [11-13]. Comorbid illnesses such as diabetes mellitus, hypertension, chronic kidney disease and cardiovascular disease were observed to be associated with greater clinical severity in the present study. The literature reviewed indicates that underlying chronic diseases can exacerbate inflammatory response and lead to poor clinical outcomes in dengue infection [13-15]. These patients should be monitored more carefully and treated on a case-by-case basis. In the present study, the authors highlight the need for early detection of the following warning signs: severe thrombocytopenia, mucosal bleeding, elevated liver enzymes, plasma leakage and rising SOFA scores. Since there is no specific antiviral therapy for dengue, the mainstay of treatment is supportive care, including timely fluid replacement,

hemodynamic monitoring and supportive care. To decrease the burden of dengue-related complications, the following measures are vital: strengthening vector control, public awareness and early access to healthcare.

Conclusion:

Young and middle-aged adults were more frequently affected by dengue, with fever, myalgia, vomiting, thrombocytopenia, leukopenia and elevated liver enzymes found predominantly among males. Severe dengue was significantly associated with profound thrombocytopenia, mucosal bleeding, plasma leakage, hepatic dysfunction, high SOFA scores and comorbidities. Early recognition of warning signs and timely supportive care are essential to prevent complications and improve outcomes in hospitalized dengue patients.

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