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The Clinical And Laboratory Signature Of Dengue Fever: Insights From A Tertiary Care Hospital Study

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ABSTRACT

Background: Dengue is a viral disease transmitted by mosquitoes that has rapidly spread across various regions, with its global incidence rising significantly in recent decades. Currently, nearly half of the world's population is at risk. The dengue virus (DENV), mainly transmitted by *Aedes* mosquitoes, especially *Aedes aegypti*, can cause symptoms ranging from mild flu-like illness to severe conditions such as dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), both of which can be fatal if not treated appropriately.

Objective: This study was conducted to analyse the clinical and laboratory profiles of adult patients who tested positive for Dengue IgM antibodies and were admitted to the Dhiraj Hospital, Vadodara.

Methods: A prospective observational study was conducted on 150 adult patients who tested positive for IgM Dengue Antibodies and were admitted to the hospital. Each patient was clinically evaluated and underwent relevant laboratory investigations. They were monitored daily until discharge.

Results: In this study, the male to female ratio was 1.62:1. The most common symptom was headache, reported in 125 (78.12%) patients. Bleeding manifestations were observed in 30 (18.75%) patients, with melena being the most frequent, occurring in 13 (43.33%) cases. Skin rash, primarily maculopapular and diffuse flushing, was noted in 44 (27.5%) patients. The tourniquet test was positive in 25 (15.62%) patients. Isolated hepatomegaly and splenomegaly were found in 20 (12.5%) and 22 (13.75%) patients, respectively. Ascites and pleural effusion were observed in 20 (12.5%) and 15 (9.37%) patients, respectively. Dengue with DHF/DSS was present in 21 (13.12%) cases. Complications occurred in 25 (15.62%) patients, with the most common being hepatic dysfunction in 15 (9.37%), followed by hypotension in 10 (6.25%) and renal failure in 8 (5%). A hematocrit level >45% was found in 35 (23.33%) patients, and leukopenia (<4000/cumm) was observed in 58 (38.66%) patients. Thrombocytopenia was noted in all patients, with severe cases (<20,000/cumm) observed in some. Elevated serum bilirubin (> 2mg%) was seen in 17 (11.33%) patients.

Conclusion: The younger age group typically presented with classical dengue fever and responded well to conservative treatment, likely due to the early confirmation of the diagnosis and the prompt initiation of therapy.

Keywords: *Dengue fever, Dengue hemorrhagic fever, Clinical profile, Flavivirus.*

1. INTRODUCTION

Dengue fever is caused by infection with one of the four serotypes of the Dengue virus (DENV), a single-stranded RNA virus transmitted by arthropods, and classified under the Flavivirus genus.[1] The virus consists of four closely related but antigenically distinct serotypes: DENV1, DENV2, DENV3, and DENV4. A person infected with one serotype gains lifelong immunity to that specific serotype and short-term partial immunity to the others, but can eventually be infected by all four serotypes.[2] All four serotypes have been isolated in India, with DENV1 and DENV2 being widely distributed.[3] Dengue is

transmitted by mosquitoes of the *Aedes* genus, mainly *Aedes aegypti*. The disease is most commonly transmitted during the monsoon and post-monsoon seasons. In the initial stages, dengue infection may be asymptomatic in 50-90% of cases.[4]

Dengue infection may lead to a nonspecific febrile illness or present as the symptom complex of classic dengue fever (DF). Classic dengue fever is characterized by the rapid onset of high fever, headache, retro-orbital pain, widespread body pain (muscle and bone), weakness, vomiting, sore throat, altered taste sensation, and a centrifugal maculopapular rash. Dengue caused by DENV infection can manifest as either classic dengue fever or severe dengue (including Dengue Hemorrhagic Fever/Dengue Shock Syndrome), which involves severe plasma leakage, significant hemorrhage, and organ impairment.

Globally, 2.5 to 3 billion people live in approximately 112 countries where dengue transmission occurs. Each year, about 50 to 100 million individuals are infected. Currently, nearly 70% of the global population at risk for dengue resides in the Asia-Pacific region.[5] In India, the incidence of dengue has risen due to factors such as poor water management, unplanned urbanization, and population migration to urban areas. Although initially reported in urban regions, dengue is now being seen in both urban and rural areas.

The dengue virus was first isolated in India in 1945, and the first recorded instance of dengue fever occurred in 1956 in Vellore district, Tamilnadu. The first outbreak of dengue hemorrhagic fever was reported in Calcutta (West Bengal) in 1963. Since then, outbreaks have become increasingly frequent across the country. In recent decades, major outbreaks and fatalities have been reported in Northern India (Haryana, Punjab, Uttar Pradesh), Southern India (Andhra Pradesh, Tamilnadu, Karnataka), Western India (Gujarat, Rajasthan), and Eastern India (West Bengal). Over the past ten years, the case fatality rate has risen above 1%.[6] Dengue is endemic in 31 states and union territories in India. In 2013, a total of 74,168 cases were reported, resulting in 168 deaths. The highest number of cases were reported from Punjab, followed by Tamilnadu, Gujarat, Kerala, and Andhra Pradesh.[7]

2. MATERIALS AND METHODS

This hospital-based prospective study was conducted at Dhiraj Hospital, Vadodara, a tertiary care facility in Gujarat State, over a period of six months, from July 2023 to December 2023. A total of 150 adult patients who tested positive for IgM Dengue antibodies and were admitted for treatment were included in the study. Ethical approval was obtained from the institute, and informed consent was obtained from all patients.

Inclusion Criteria:

Patients of both sexes, aged 12 years or older, who were willing to be admitted and tested positive for Dengue IgM antibodies, were included in the study.

Exclusion Criteria:

Patients under 12 years of age, those who tested negative for Dengue IgM antibodies or those who were unwilling to be admitted as well as patients with concurrent infections such as malaria, typhoid were excluded from the study.

The diagnosis of dengue fever, dengue hemorrhagic fever (DHF), and dengue shock syndrome (DSS) was made based on WHO criteria. Dengue hemorrhagic fever (DHF) is defined as an acute febrile illness accompanied by minor or major bleeding, thrombocytopenia (platelet count < 100,000/cumm), and evidence of plasma leakage, which can be documented by hemoconcentration (hematocrit increase of at least one-fifth or a similar decrease after intravenous fluid therapy), pleural or other effusions, or hypoalbuminemia/hypoproteinemia. Dengue Shock Syndrome (DSS) is characterized as DHF with signs of circulatory failure, including a narrow pulse pressure (≤20 mm Hg), hypotension, or frank shock.[8]

All patients were clinically assessed through a detailed history and thorough physical examination. Laboratory investigations included hemoglobin percentage, total leukocyte count (TLC), differential leukocyte count (DLC), platelet count, hematocrit, liver function tests, blood urea, serum creatinine, blood glucose levels, ECG, chest X-ray, and abdominal ultrasound (USG). Blood counts were monitored regularly as needed. Other potential diagnoses were ruled out through appropriate tests. Dengue IgM antibodies were measured using the dengue IgM capture ELISA, a solid-phase immunoassay based on the immunocapture principle. The data collected was analysed and compared with existing studies.

Results:

A total of 160 patients were included in the study, of whom 99 (61.87%) were male and 61 (38.12%) were female (Table-1). These 160 adult patients, who tested positive for dengue IgM antibodies, were admitted to the medical wards over a 6-month period from July to December 2023. The majority of dengue cases were admitted between September and November, indicating a peak in cases during the monsoon and post-monsoon seasons.The majority of patients were in the 21-40 years age group, with 95 (59.37%) patients, followed by the 12-20 years age group with 33 (20.62%) patients (Table-1).

Clinical Features:

The average duration of symptoms was 5 days, with patients typically staying in the hospital for 7 to 10 days. Fever was present in all 160 (100%) patients, followed by headache in 115 (76.77%), myalgia in 108 (72%), abdominal pain in 63

(42%), vomiting in 35 (23.33%), sore throat in 32 (21.33%), retro-orbital pain in 30 (20%), and pruritus in 19 (12.66%) (Table-2).

Bleeding manifestations were observed in 29 (19.33%) patients, with melena being the most common (13 cases, 44.82%), followed by venepuncture site bleeding (9 cases, 31.03%), epistaxis (5 cases, 17.24%), and gum bleeding (5 cases, 17.24%). Less common bleeding manifestations included petechiae in 4 (13.79%), ecchymosis in 3 (10.34%), hematuria in 3(10.34%), and hematemesis in 2 (6.89%) patients (Table-2). Bleeding was more likely in patients with lower platelet counts, and 12 patients exhibited multiple bleeding manifestations.

Skin rash, mostly maculopapular and diffuse flushing, was seen in 44 (29.33%) patients. Jaundice was observed in 14 (9.33%), and bradycardia (heart rate <60/min) was noted in 17 (11.33%) patients (Table-2), with most showing sinus bradycardia.

The tourniquet test was positive in 28 (18.66%) patients (Table-2), with a higher prevalence observed among young male patients. Isolated hepatomegaly and splenomegaly were noted in 19 (12.66%) and 23 (15.33%) patients, respectively, while hepatosplenomegaly was present in 12 (8%) patients. Ascites and pleural effusion were observed in 22 (14.66%) and 17 (11.33%) patients, respectively. Both pleural effusion and ascites were found in 7 (4.66%) patients, and 10 (6.66%) patients had gall bladder edema (Table-3).

Table:1 Age and Sex Distribution(n = 160)

Age(years)	Male	Female	Total	%
12-20	21	12	33	20.62
21-40	59	36	95	59.37
41-60	15	10	25	15.62
>60	4	3	7	4.37
Total	99(61.87%)	61(38.12%)	160	100

Table:2 Distribution of clinical features of Dengue fever cases

Clinical Features	No. of Patients
Fever	160(100%)
Headache	125(78.12%)
Retro-orbital pain	30(18.75%)
Myalgia	108(67.5%)
Arthralgia	33(20.62%)
Nausea/Vomiting	35(21.87%)
Abdominal pain	63(39.37%)
Diarrhoea	15(9.37%)
Coryza/ Sore throat	32(20%)
Breathlessness	15(9.37%)
Pruritus	19(11.87%)
Lethargy/ Insomnia	11(6.87%)
Bleeding manifestations: Gum bleeding Epistaxis	30(18.75%) 5(16.66%) 5(16.66%)

Haemoptysis	1(3.33%)
Malena	13(43.33%)
Haematuria	3(10%)
Venepuncture bleed	9(30%)
P/V bleed	3(10%)
Petechiae	4(13.33%)
Ecchymosis	3(10%)
Skin rash	44(27.5%)
Bradycardia	15(9.37%)
Jaundice	14(8.75%)
Positive tourniquet test	25(15.62%)

Table-3: Ultrasonography Findings in dengue fever cases

Criteria	**No. of patients**
Hepatomegaly	20(12.5%)
Splenomegaly	22(13.75%)
Ascites	20(12.5%)
Pleural Effusion	15(9.37%)
Gall bladder Edema	9(5.62%)
Both pleural effusion and ascites	1(0.62%)
hepatosplenomegaly	12(7.5%)

Table- 4: Complication of dengue fever cases

Complication	**No. of patients**
Renal failure	8(5%)
Hypotension	10(6.25%)
Cholecystitis	00(00%)
Encephalopathy	00(00%)
ARDS	00(00%)
Pneumonia	2(1.25%)
Multi organ failure	1(0.62%)
Hepatic dysfunction	15(9.37)

Among the 160 patients (100%), 21 (13.12%) were diagnosed with dengue with DHF/DSS according to the WHO case definition. A total of 25 (15.62%) patients experienced complications, with the most common being hepatic dysfunction in 15 (9.37%)patients, followed by hypotension in 10 (6.25%) and renal failure in 6 (5%) patients (Table-4). Additionally, 14 patients had more than one complication.

3. LABORATORY PARAMETERS

Among the hematological parameters, elevated hematocrit (>45%) was seen in 36 (22.5%) patients, and leukopenia (<4000/cumm) was observed in 60 (37.5%) patients. Thrombocytopenia was present in all patients, with varying degrees of severity. Severe thrombocytopenia (<20000/cumm) was observed in 24 (15%) patients, while moderate thrombocytopenia (20000-50000/cumm) was noted in 69 (43.12%) patients (Table-5). At the time of admission, 56.66% of patients had a platelet count of <50000, which continued to decrease during hospitalization. The lowest recorded platelet count was 8000/cumm.

Regarding biochemical parameters, elevated serum bilirubin (>2mg%) was found in 16 (10%) patients. Raised SGOT (>45 IU/L) and SGPT (>45 IU/L) levels were observed in 63 (39.37%) and 42 (26.25%) patients, respectively. Additionally, 6 (3.75%) patients had elevated serum creatinine (>1.5mg/dl) (Table-5).All patients were treated conservatively with IV fluids, antibiotics, and antipyretics. Platelet transfusions were given to patients with active bleeding or as a precaution when platelet counts fell below 10000/cumm.

Table-5: Laboratory parameters of dengue fever cases (n=160)

Laboratory parameters	No. of patients(%)
Hematocrit>45%	36(22.5%)
Leucopenia< 4000/cumm	60(37.5%)
Platelet count <20000/cumm 20000 – 50000/cumm 50000 – 1lac/cumm 1 – 1.5lac/cumm	 24(15%) 69(43.12%) 43(26.87%) 24(15%)
Serum bilirubin >2mg %	16(10%)
SGOT >45 IU/L	63(39.37%)
SGPT >45IU/L	42(26.25%)
Serum creatinine >1.5mg/dl	6(3.75%)

4. DISCUSSION

Dengue is becoming a significant health concern in India, with frequent outbreaks across the country and an increasing number of deaths. In our study, the male-to-female ratio was 1.67:1, a similar pattern of male predominance has been observed in previous studies conducted by SeemaAvasthi et al.[9], Karolie et al.[10], Malavige et al. in Sri Lanka[11], and G Lepakshi et al.[12] Fever was the most common presenting symptom (100%), consistent with findings from several studies conducted in India[12-17] and Southeast Asia[18-20] Headache was present in 76.77% of patients, which is consistent with most previous studies[10,12,14,20] However, the study by Munde D et al.[17] reported a lower incidence of 25%. Myalgia was noted in 72% of patients, aligning with findings from previous studies[15,24], though the study by Mohamed MurtuzaKauser et al.[14] reported a lower incidence of 32.87%. Abdominal pain was observed in 63% of patients, which is consistent with earlier studies[10,20], but studies by Ragini Singh et al.[21] and Munde et al.[17] reported a slightly lower incidence of 3.6% and 15% respectively.

In our study, 21.87% of patients presented with vomiting, similar to the 25% reported by Munde et al.[17] but Rajesh Deshwal et al.[13] and Ragini Singh et al.[23]found lower rates, at 5.4% and 11.4% respectively. Sore throat was noted in 20% of patients in our study, comparable to the 18.6% found by Ragini Singh et al.[21] but G Lepakshi et al.[12] reported it in 50%, and Rachel Daniel et al.[20] observed it in only 5.2% of patients. Retro-orbital pain was present in 18.75% of patients in our study, similar to Rajesh Deshwaletal.[13] at 18.3% and G Lepakshi et al.[15] at 14% though Nandini Chatterjee et al.[22] reported a much higher incidence of 90%. Pruritus was observed in 18.87% of our patients, which aligns with previous studies [13,21] though, Mohamed MurtuzaKauseretal.[14] reported it in only 2.73% of patients.

In the present study, bleeding manifestations occurred in 30 (18.75%) patients, with melena being the most common symptom, observed in 43.33% of the cases. This finding is consistent with previous studies [12,22]. However, studies by Mohamed MurtuzaKauseretal.[14] and Ashwin Kumar et al.[23] reported much lower incidences of 1.36% and 4.7%, respectively. Our results contrast with those of Horvath R et al.[24] from Australia and Sharma et al.[25] from India, who

reported higher incidences of 63% and 69%, respectively.

Vena puncture bleeding was found in 30%, comparable to G Lepakshi et al.[12] at 57.14%. Epistaxis was observed in 17.24%, similar to the findings of G Lepakshi et al.[12] at 14.28% and NP Singh et al.[26] at 14%, although Mohamed MurtuzaKauser et al.[14] and Ashwin Kumar et al.[23] reported lower incidences of 2.73% and 2.6%, respectively. Gum bleeding was observed in 16.66%, consistent with the study by Malavigeetal.[11] from Sri Lanka, which reported 17%. However, G Lepakshi et al.[11] showed a higher incidence of 33.33%, while Mohamed MurtuzaKauser et al.[14] and Ashwin Kumar et al.[23] reported much lower incidences of 1.36% and 5.2%, respectively.

Petechiae were found in 13.33%, which aligns with the study by Ashwin Kumar et al.[23] at 18%. Ecchymosis occurred in 10.34%, while Ashwin Kumar et al.[23] reported a lower incidence of 6.2%. Hematuria was observed in 10%, and hematemesis was noted in 6.87%. However, G Lepakshi et al.[12]reported a much higher incidence of 38.09%, while Mohamed MurtuzaKauser et al.[14] and Ashwin Kumar et al.[23] found lower incidences of 2.05% and 3%, respectively.

Skin rash was found in 27.5%, similar to previous studies[13,25,28]. However, studies by Rajesh Deshwaletal.[13] and Basavaraj Raju et al.[16] showed higher incidences of 66% and 69.5%, while Ragini Singh et al.[21] and Rachel Daniel et al.[20] reported much lower incidences of 15% and 13.2%, respectively.

In our study, jaundice was observed in 8.75%, whereas Ragini Singh et al.[21] reported it in 17.1%. Bradycardia was found in 9.37%, while Rachel Daniel et al.[20] reported it in 16.8%. The tourniquet test was positive in 15.62%, similar to the findings of Rajesh Deshwaletal.[13] at 16.5% and Vanamali D R et al.[27] at 20%. However, the incidence was slightly higher in the studies by Nandini Chatterjee et al.[22] at 31% and Rachel Daniel et al.[20] at 33.7%.

In the present study, hepatomegaly was observed in 12.5%, which is consistent with findings from previous studies in India, Thailand, and Australia[13,23,25,28,29,30]. Splenomegaly was noted in 13.75%, which is comparable to Rajesh Deshwaletal.[13] at 13.2% and G Lepakshi et al.[12] at 18%. Combined hepatosplenomegaly was observed in 7.5%.

Ascites was found in 12.5%, which aligns with studies by Rajesh Deshwaletal.[13] at 16.33%, Nandini Chatterjee et al.[22] at 17.7%, and Rachel Daniel et al.[20] at 12%. However, studies by Ragini Singh et al.[21], G Lepakshi et al.[12] and Sanjay Kumar Mandal et al.[15] reported higher incidences at 38.6%, 22%, and 8.1%, respectively. Pleural effusion was found in 9.37%, similar to Mohamed MurtuzaKauseretal.[14] at 13.69% and Rachel Daniel et al. [20] at 13.2%. However, studies by G Lepakshi et al.[12], Sanjay Kumar Mandal et al. (15), and Rajesh Deshwal et al.[13] showed slightly higher incidences at 18.91%, 18.9%, and 20%, respectively. Both ascites and pleural effusion were observed in 0.62%.

Dengue Hemorrhagic Fever (DHF)/Dengue Shock Syndrome (DSS) was found in 14%, similar to findings by Vanamali D R et al.[27] at 12.6% and Sharma et al.[25] at 13.5%. The most common complication observed was hepatic dysfunction, noted in 15 patients (9.37%).

Regarding hematological parameters, raised hematocrit (>45%) was found in 22.5%, consistent with previous studies [12,13,15,20]. Leukopenia (<4000/cumm) was observed in 37.5%, similar to findings in earlier studies[16,23,25] though studies by Munde et al.[17] and RituKarolie et al.[10] reported higher incidences at 50% and 89%, respectively. A platelet count of <50,000/cumm was found in 56.66%, in line with previous studies[13,20] while Munde et al.[17] and Karolie et al.[10] found it in 75% and 89%, respectively.

Raised bilirubin (>2mg/dl) was seen in 10%. Raised SGOT (>45 IU/L) was found in 39.37%, which is consistent with Vanamali D R et al.[27] but higher rates were reported by Rajesh Deshwal et al.[13] at 88.54%, Nandini Chatterjee et al.[22] at 72%, and Ragini Singh et al.[18] at 50%. Similarly, RituKarolietal.[10]and Rachel Daniel et al.[20] found raised SGOT in 92% and 83.9%, respectively. Raised SGPT (>45 IU/L) was observed in 26.25%, similar to Vanamali D R et al.[27] who reported 23%. Raised serum creatinine (>1.5mg/dl) was noted in 3.75%, which is comparable to Mohamed MurtuzaKauseretal.[14] who reported 1.36%.

No fatalities were reported in our study, which suggests that prompt diagnosis and early intervention significantly improved the prognosis.

5. CONCLUSION

The ongoing dengue fever outbreak primarily impacted younger males, with most cases presenting as febrile illness accompanied by headache, myalgia, gastrointestinal symptoms, and mild to moderate bleeding tendencies. Accurate diagnosis and early initiation of treatment resulted in a prompt response to conservative management, with no fatalities reported.

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