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Dengue virus infection: a study on clinical, haematological, and radiological profiles of patients admitted to a tertiary care hospital in Central India

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Summary

Background: dengue fever is an emerging mosquito-borne viral infection with a broad clinical spectrum ranging from mild febrile illness to severe dengue haemorrhagic fever and dengue shock syndrome. Haematological and radiological assessments play a crucial role in the early detection and management of severe cases.
Materials and Methods: this cross-sectional study was conducted at the Government Medical College, Nagpur, Maharashtra, India, from July 2022 to June 2024. 429 patients with acute febrile illness were screened for dengue infection using NS1 antigen, IgM, and IgG ELISA. Clinical data, haematological parameters, and radiological findings were collected to evaluate disease severity.
Results: out of 429 suspected cases, 25.41% were confirmed dengue-positive. Common clinical features included fever (100%), myalgia/arthralgia (77.98%), nausea/vomiting (63.3%), and headache (62.39%). Haemorrhagic manifestations were observed in 36.7% of cases, with petechiae being the most common. Radiological findings such as ascites (21.1%), hepatomegaly (18.35%), and gallbladder wall oedema (13.76%) were notable indicators of severe disease. Among the positive cases, 57.8%, 36.7% and 5.5% were classified as DHF, DF, and DSS respectively.
Conclusions: clinical presentation combined with haematological and radiological parameters are valuable for early diagnosis and management of dengue infection. Early recognition of warning signs and monitoring key indicators can help reduce dengue-related morbidity and mortality.

Key words: dengue fever, clinical features, haematological profile, radiological findings.

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Introduction

Dengue Fever (DF) is a rapidly spreading, mosquito-borne infection caused by the dengue virus. It is transmitted primarily by *Aedes aegypti* and *Aedes albopictus*. The number of dengue cases reported to the World Health Organization (WHO) increased from 505,430 in 2000 to 5.2 million in 2019, indicating a sharp increase in dengue incidence worldwide in recent decades [24].

Dengue infection exhibits a broad clinical spectrum, ranging from asymptomatic or mild febrile illness to severe forms such as Dengue Haemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) [5]. The clinical manifestations typically include high-grade fever, headache, retro-orbital pain, myalgia, arthralgia, rash, and, in severe cases, bleeding tendencies and plasma leakage, which may lead to shock and multi-organ failure [19].

Haematological abnormalities are hallmark features of dengue infection. These include leukopenia, thrombocytopenia, and haemoconcentration due to plasma leakage [6]. The progressive decline in platelet count and rise in haematocrit are critical indicators of disease severity and are closely monitored during the illness [21].

Radiological imaging provides valuable insights into the complications and severity of the disease. Ultrasonography and chest radiographs are commonly utilized to detect signs such as pleural effusion, ascites, hepatomegaly, and gallbladder wall thickening, which are suggestive of plasma leakage and increase in capillary permeability [16]. These findings often precede clinical deterioration, thus aiding in early intervention and improved patient outcomes [22].

This study aims to evaluate the clinical, haematological, and radiological profile of patients with dengue infections, to identify the key parameters associated with disease severity and outcomes. Early recognition of these factors is essential for prompt diagnosis, risk stratification, and optimal management of dengue cases.

Materials and Methods

The study was conducted in the Department of Microbiology at Government Medical College, Nagpur, Maharashtra, India, from July 2022 to June 2024, after receiving permission from the

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institutional ethical committee. Blood samples were collected from 429 patients admitted with acute febrile illness in various wards and Intensive Care Units (ICUs) whose clinical features were of dengue infection. The clinical basis for suspecting dengue infection was based on the febrile illness of 2-7 days duration with features like headache, myalgia, arthralgia, rash, haemorrhagic manifestations, and leucopenia [23].

Around 5 ml of blood were collected aseptically from suspected dengue cases by venepuncture. The serum was separated by centrifugation and collected in a serum vial. The specimen was properly labelled. Detailed clinical history was obtained from all patients, followed by a thorough clinical examination. Data regarding haematological and radiological findings were also collected.

All 429 samples were tested for dengue NS1 antigen, IgM and IgG antibodies by ELISA. Tests were performed and calculations were done according to the manufacturer's instructions.

The results obtained were analysed statistically by IBM Statistical Package for Social Sciences (SPSS) Statistics 20.0. The chi-square test and Fisher Exact test were used to calculate the p-value. Only p-values of less than 0.05 were considered statistically significant.

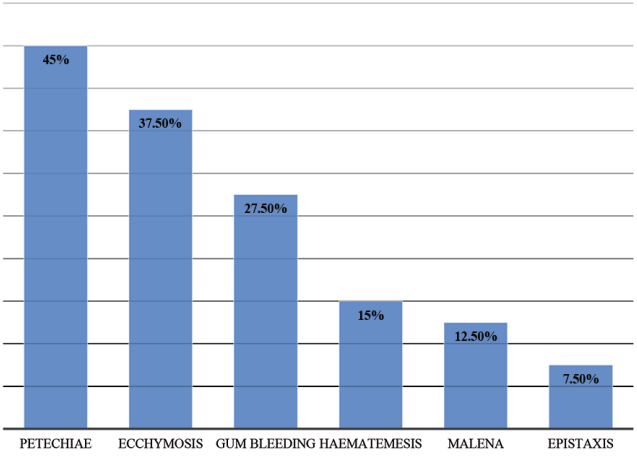

Figure 1. Haemorrhagic manifestations in dengue-positive cases.

Results

Among the 429 suspected cases, 109 (25.41%) came positive for dengue by one or more of the dengue-specific serum parameters (NS1, IgM and/or IgG) by ELISA.

Table 1 shows the association of clinical presentation in dengue-positive cases. Fever is the most common presentation and is present in all cases. Myalgia/arthralgia was present in 85 (77.98%) of positive cases, haemorrhagic manifestations in 40 (36.7%), skin rashes in 20 (18.35%), retro-orbital pain in 17(15.6%) and breathlessness in 12 (11.01%) of cases. Among the clinical features, myalgia/arthralgia, nausea/vomiting, retro-orbital pain, skin rashes and haemorrhagic manifestations were found to be statistically significant.

Various haemorrhagic manifestations were observed in dengue-positive cases. Petechiae is the most common manifestation, accounting for 45% of positive cases. Ecchymosis is the second most common, followed by gum bleeding, haematemesis, melaena and epistaxis (Figure 1).

Various haematological findings and their association with dengue-positive cases are shown in Table 2. Thrombocytopenia was detected in 88.99% of dengue-positive cases, and it is the most common haematological finding. The association of thrombocytopenia, leukopenia, elevated haematocrit, elevated liver enzymes and hypoproteinaemia among dengue-positive cases were found to be statistically significant.

Table 3 shows various radiological findings observed in suspected dengue cases. The most common USG finding in dengue-positive cases is ascites, which was found in 23 (21.10%) dengue-positive cases. Among the radiological findings, hepatomegaly, ascites and gall bladder wall oedema were found to be statistically significant.

Based on the clinical, laboratory and radiological features, the dengue-positive cases were classified into three major categories based on WHO guidelines. Most of the cases were DHF (57.8%), followed by DF (36.7%). Only 5.5% were DSS (Figure 2).

Discussion

Dengue infection represents one of the most critical global public health concerns of the 21st century. Dengue is endemic in over 100 countries, predominantly in tropical and subtropical regions, placing nearly half of the world's population at risk [2]. Early recognition and accurate assessment of clinical**,** haematological, and radiological findings are crucial in its management.

Table 1. Clinical manifestations of the cases.

Clinical manifestation	Positive cases (n=109)	Negative cases (n=320)	p-value
Fever	109 (100%)	320 (100%)	-
Myalgia/Arthralgia	85 (77.98%)	211 (65.94%)	0.01*
Headache	68 (62.39%)	182 (56.87%)	0.31
Nausea/vomiting	69 (63.30%)	137 (42.81%)	0.002*
Abdominal pain	36 (33.03%)	93 (29.06%)	0.43
Diarrhoea	13 (11.93%)	61 (19.06%)	0.08
Retro-orbital pain	17 (15.60%)	26 (8.13%)	0.02*
Skin rashes	20 (18.35%)	104 (32.50%)	0.004*
Breathlessness	12 (11.01%)	59 (18.44%)	0.07
Haemorrhagic manifestations	40 (36.70%)	93 (29.06%)	0.04*

*Statistically significant clinical manifestations.

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In this study, fever is present in all cases. Myalgia/arthralgia was present in 77.98% of positive cases, headache in 62.39%, bleeding manifestations in 36.7%, abdominal pain in 33.03%, skin rashes in 18.35%, and retro-orbital pain in 15.6% of cases. These results are comparable to research by Mishra S. *et al*., where all patients had fever. Other symptoms were vomiting, retroorbital pain, abdominal distension, and abdominal pain [12]. The most common clinical signs Pothapregada S. *et al.* study, were fever (94.6%), conjunctival congestion (89.6%), and myalgia (81.9%) [14]. In the study by Kumar *et al*., fever 99.1% was the most frequent manifestation, followed by myalgia (64.6%), headache (47.6%), vomiting (47.6%), and stomach pain (37.6%) [8]. In research by Siddiqi Z. *et al*., headache and fever were reported by all patients. Retroorbital pain was reported by 75% of patients, and body aches, and rashes by 90% and 88%, respectively [18]. It was mentioned that all patients in a Mandal S. K. *et al*. study had fever. In the same study, headache was the next typical symptom, followed by rash. In 13.51% of cases, there were bleeding manifestations. Headache and retro-orbital pain, primarily caused by systemic inflammatory mediators, are well-known symptoms of dengue fever [11].

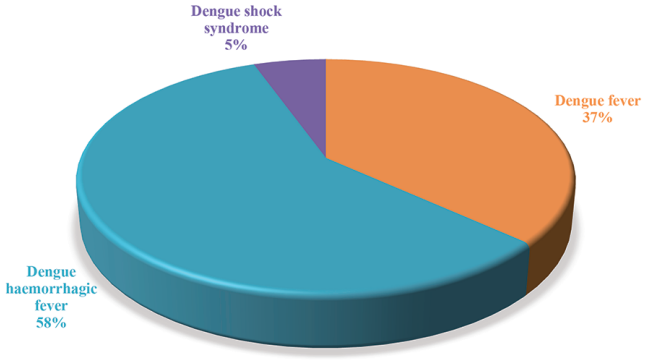

Figure 2. Classification of dengue-positive cases.

In this study, haemorrhagic manifestations were present in 36.7% of dengue-positive cases. Petechiae (45%) is the most common manifestation seen. Petechiae and ecchymosis were found to be statistically significant. In research by Mandal *et al.*, 13.51% of patients had visible bleeding from various sites. [11]. According to Kumar *et al*., petechiae (67.2%) was the most common haemorrhagic manifestation. Ecchymosis, gum bleeding, haematuria, melaena, hematemesis and epistaxis were among the other haemorrhagic symptoms [8]. Unlike the current investigation, the study by Lee *et al*. in Taiwan found that 73% of patients had haemorrhagic symptoms [10]. A well-known characteristic of dengue is bleeding diathesis, due to low platelet counts and blood vessel leakage. Immunologic reactions lead to rashes. When the dengue virus interacts with host cells, it releases cytokines and stimulates immune mechanisms, which lead to alterations in vascular endothelium, mononuclear cell infiltration, and perivascular oedema [11].

According to the current study, thrombocytopenia, leucopenia, elevated haematocrit and hypoproteinaemia were observed in 88.99%, 53.21%, 35.78% and 43.12% of the dengue-positive cases, respectively. Leucopenia was found in 73% of dengue-positive cases in a study conducted in 2008 by Shahid Ahmed *et al*., which is higher than the current study. Eighty-four percent of cases had thrombocytopenia, comparable to our findings [17]. A study by Singh *et al*. showed thrombocytopenia in 61.39% of cases and the liver enzymes were elevated in 16%. The factors responsible for thrombocytopenia are bone marrow suppression, immune-mediated clearance and spontaneous aggregation of platelets to virus-infected endothelium. Elevation of liver enzymes could be due to virus-induced damage of the hepatocytes [20]. Compared to DF, there is a greater frequency and degree of elevated liver enzymes with DHF. Rising haematocrit indicates plasma leakage in dengue and can be used to distinguish between DHF and DF [15]. Hence, the baseline haematocrit, leucopenia and liver

Table 2. Haematological findings of the cases.

Haematological finding	Positive cases (n=109)	Negative cases (n=320)	p-value
Thrombocytopenia	97 (88.99%)	125 (39.06%)	0.001*
Leukopenia	58 (53.21%)	53 (16.56%)	0.001*
Elevated haematocrit	39 (35.78%)	74 (23.13%)	0.009*
Elevated liver enzymes	67 (61.47%)	45 (14.06%)	0.001*
Hypoproteinaemia	47 (43.12%)	18 (5.63%)	0.001*
Deranged renal function tests	9 (8.26%)	38 (11.87%)	0.29

*Statistically significant haematological findings.

Table 3. Radiological findings of the cases.

Radiological finding	Positive cases (n=109)	Negative cases (n=320)	p-value
Hepatomegaly	20 (18.35%)	16 (5%)	0.004*
Splenomegaly	8 (7.34%)	33 (10.31%)	0.36
Ascites	23 (21.10%)	26 (8.13%)	0.009*
Pleural effusion	10 (9.17%)	19 (5.94%)	0.14
Gall bladder wall oedema	15 (13.76%)	7 (2.19%)	0.002*

*Statistically significant radiological findings.

enzymes should be looked at in all patients with suspected Dengue and must be monitored continuously.

In the present study, the most common radiological findings were ascites (21.1%), followed by hepatomegaly (18.35%). Other findings include gall bladder wall oedema, pleural effusion and splenomegaly. Similarly, in a study by Dewan *et al*., the most common ultrasound findings in dengue were ascites (60%). It was followed by pleural effusion (58%), and gallbladder wall thickening (55%) [3]. In another study by Lakra *et al*., 89.18% had abnormal USG findings. All individuals suffering from severe dengue exhibited abnormal USG findings. Ascites (64.86%) were a common finding in that study, followed by gallbladder oedema (48.64%) and pleural effusion (32.43%) [9]. The most common ultrasonographic finding in a study by Motla *et al.* was ascites (74.6%), which was followed by gall bladder wall oedema (72%), hepatomegaly (46.2%) and splenomegaly (39.1%). Of the subjects, 28.4% showed evidence of a right-side pleural effusion, while 11.2% had a bilateral effusion [13]. While ascites, pleural effusion, and hepatosplenomegaly are frequently observed in dengue patients. A sensitive tool for plasma leakage is USG [9].

In this study, most of the cases were DHF (57.8%), followed by dengue fever (36.7%). Only 5.5% of cases were DSS. Conversely, in the study by Dussart *et al*., dengue fever and DHF were distributed equally (45.1%). Only 9.8% of cases were DSS [4]. In Bharaj P. *et al*. study DHF was present in 41.67% of the dengue-positive cases and DF in 50% [1]. In a study by Kalayanarooj S., 65.69%, 26.28% and 8.03% were DF, DHF and DSS cases respectively [7]. In most of the studies, most dengue cases belonged to DF. On the contrary, in this study, most cases were DHF, probably because this study was conducted among patients admitted to a hospital. Dengue classification prioritises plasma leakage and helps with clinical triage for better patient care [7].

Conclusions

The present study highlights the critical role of clinical, haematological, and radiological assessments in the management of dengue. Clinical features such as high-grade fever, myalgia, rash, and warning signs like persistent vomiting and mucosal bleeding remain essential for early identification. Haematological parameters, particularly thrombocytopenia and rising haematocrit levels, serve as valuable indicators of disease severity and plasma leakage, aiding in timely intervention to prevent complications. Radiological findings, especially ultrasonographic evidence of pleural effusion, ascites, hepatomegaly, and gallbladder wall thickening, provide non-invasive markers for identifying patients at risk of severe dengue. An integrated approach combining clinical evaluation, laboratory monitoring, and radiological imaging enhances the accuracy of diagnosis, facilitates early detection of severe disease, and helps to formulate prompt management strategies, ultimately reducing morbidity and mortality associated with dengue infection.

References

1. Bharaj P, Chahar HS, Pandey A, et al. Concurrent infections by all four dengue virus serotypes during an outbreak of dengue in 2006 in Delhi, India. Virol J 2008;5:1.
2. Bhatt S, Gething PW, Brady OJ, et al. The global distribution and burden of dengue. Nature 2013;496:504-7.
3. Dewan N, Zuluaga D, Osorio L, et al. Ultrasound in dengue: a scoping review. The American Journal of Tropical Medicine and Hygiene 2021;104:826.
4. Dussart P, Duong V, Bleakley K, et al. Comparison of dengue case classification schemes and evaluation of biological changes in different dengue clinical patterns in a longitudinal follow-up of hospitalized children in Cambodia. PLoS Neglected Tropical Diseases 2020;14:e0008603.
5. Guzman MG, Harris E. Dengue. The Lancet 2015;385:453-65.
6. Kalayanarooj S. Clinical manifestations and management of dengue/DHF/DSS. Tropical Medicine and Health 2011;39:S83-7.
7. Kalayanarooj S. Dengue classification: current WHO vs. the newly suggested classification for better clinical application. J Med Assoc Thai 2011;94:S74-84.
8. Kumar A, Rao CR, Pandit V, et al. Clinical manifestations and trend of dengue cases admitted in a tertiary care hospital, Udupi district, Karnataka. Indian Journal of Community Medicine 2010;35:386-90.
9. Lakra MS, Karotkar SA, Lakhkar B, et al. To study ultrasound and chest X-ray findings and their role in the diagnosis of dengue fever in children. Journal of Family Medicine and Primary Care 2023;12:1938-42.
10. Lee MS, Hwang KP, Chen TC, et al. Clinical characteristics of dengue and dengue hemorrhagic fever in a medical center of southern Taiwan during the 2002 epidemic. Journal of Microbiology, Immunology, and Infection 2006;39:121-9.
11. Mandal SK, Ganuly J, Sil K, et al. Clinical profiles of dengue fever in a teaching hospital of eastern India. National Journal of Medical Research 2013;3:173-6.
12. Mishra S, Ramanathan R, Agarwalla SK. Clinical profile of dengue fever in children: a study from Southern Odisha, India. Scientifica 2016;2016:6391594.
13. Motla M, Manaktala S, Gupta V, et al. Sonographic evidence of ascites, pleura-pericardial effusion and gallbladder wall oedema for dengue fever. Prehospital and Disaster Medicine 2011;26: 335-41.
14. Pothapregada S, Kamalakannan B, Thulasingham M, Sampath S. Clinically profiling pediatric patients with dengue. Journal of Global Infectious Diseases 2016;8:115-20.
15. Rahman MA, Zaki RA, Sarimin R, et al. Adherence to clinical practice guidelines (CPG) management of dengue infection in adults (revised 2nd edition). PLoS One 2017;12:e0184559.
16. Setiawan MW, Samsi TK, Wulur H, et al. Dengue haemorrhagic fever: ultrasound as an aid to predict the severity of the disease. Pediatric Radiology 1998;28:1-4.
17. Shahid Ahmed SA, Nadir Ali NA, Shahzad Ashraf SA, et al. Dengue fever outbreak: a clinical management experience. J Coll Physicians Surg Pak 2008:8-12.
18. Siddiqi Z, Fatima J, Karoli R, et al. A study of typical and atypical clinical manifestations in dengue patients. Era's Journal of Medical Research 2019;6:57-62.
19. Simmons CP, Farrar JJ, van Vinh Chau N, Wills B. Dengue. New England Journal of Medicine 2012;366:1423-32.
20. Singh NP, Jhamb R, Agarwal SK, et al. The 2003 outbreak of Dengue fever in Delhi, India. Headache 2005;114:61-6.
21. Srikiatkhachorn A, Kelley JF. Endothelial cells in dengue hemorrhagic fever. Antiviral Research. 2014;109:160-70.
22. Venkata Sai PM, Dev B, Krishnan R. Role of ultrasound in dengue fever. The British Journal of Radiology. 2005;78:416-8.

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23. World Health Organization (WHO). Dengue guidelines, for diagnosis, treatment, prevention and control. 2009. Available from: https://www.who.int/publications/i/item/9789241547871.

24. World Health Organization (WHO). Dengue and severe dengue. 2023. Available from: https://www.who.int/health-topics/dengue-and-severe-dengue#tab=tab_1

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