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NEUROLOGICAL MANIFESTATIONS AMONG DENGUE PATIENTS IN AN ENDEMIC POPULATION: INSIGHTS FROM A TERTIARY CARE HOSPITAL IN BANGLADESH

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ABSTRACT

Background: Dengue virus infection is a major public health concern in tropical and subtropical regions, and neurological complications are increasingly recognized as part of its clinical spectrum. Despite their clinical significance, data on neurological dengue from endemic settings such as Bangladesh remain limited. **Aim:** To describe the spectrum, laboratory correlates, and outcomes of neurological manifestations among dengue patients admitted to a tertiary Medical CollegeHospital in Bangladesh. **Materials and Method:** This cross-sectional study was conducted at the department of Neurology, Dhaka Medical College Hospital, from June 2024 to July 2025. A total of 48 laboratory-confirmed dengue patients with neurological manifestations were consecutively enrolled. Clinical, laboratory, cerebrospinal fluid (CSF), and neuroimaging findings were recorded. Outcomes were assessed at discharge. **Results:** The mean age of patients was 34.2 ± 14.8 years, with a male predominance (58%). The most frequent neurological manifestation was encephalitis (47.9%), followed by meningitis (29.2%), seizures (18.8%), and Guillain–Barré syndrome (4.1%). Thrombocytopenia (91.7%), leukopenia (83.3%), and elevated liver enzymes (72.9%) were common laboratory abnormalities. CSF pleocytosis was significantly associated with encephalitis and meningitis (p=0.02), and thrombocytopenia correlated with encephalitis and seizures (p=0.04). Neuroimaging abnormalities were observed in 46.2% of those imaged. At discharge, 79.2% recovered without sequelae, 12.5% had mild to moderate deficits, 4.2% had severe disability, and mortality was 4.2%, deaths were due to encephalitis. **Conclusion:** Neurological manifestations in dengue, though uncommon, contribute substantially to morbidity and mortality, with encephalitis being the most severe and fatal presentation. Early recognition, prompt management, and structured follow-up are critical to improve outcomes and reduce long-term disability in endemic regions.

Keywords: Dengue, Neurological manifestations, Encephalitis, Meningitis, Guillain–Barré syndrome, Bangladesh.

INTRODUCTION

Dengue virus infection is a global mosquito-borne arboviral disease that poses a major public health challenge in tropical and subtropical regions[1].

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The clinical spectrum of dengue ranges from mild febrile illness to severe dengue with hemorrhagic manifestations and shock, and in recent decades, neurological involvement has been increasingly recognized as part of "expanded dengue syndrome"[2,3]. Neurological complications in dengue include a variety of central nervous system (CNS) and peripheral nervous system (PNS) pathologies, such as encephalitis, meningitis, encephalopathy, acute disseminated encephalomyelitis (ADEM), Guillain–Barré syndrome (GBS), myositis, and stroke[3,4,5]. Neurological manifestations among dengue patients, though relatively uncommon, have been reported with varying prevalence ranging from 0.5% to 21%, including encephalopathy, encephalitis, seizures, and neuromuscular complications, highlighting their clinical significance in dengue management[6,7,8].

Neurological manifestations in dengue are believed to result from a combination of direct viral neurotropism, immune-mediated mechanisms, and systemic complications. Dengue virus has been detected in cerebrospinal fluid (CSF) and brain tissue, suggesting direct invasion of the CNS, which may lead to encephalitis, meningitis, and other CNS complications[9]. In addition, immune-mediated mechanisms, including cytokine storm and molecular mimicry, can contribute to demyelination and peripheral nerve involvement, resulting in conditions such as Guillain–Barré syndrome and acute myelitis[9,10].This multifactorial pathophysiology explains the diverse neurological manifestations observed in dengue patients[9,10,11].

Bangladesh is one of the countries where dengue is endemic, with increasing incidence and severity over recent years[12,13]. Outbreaks have been frequent, and clinical profiles of dengue cases in Bangladesh have shown shifts in presentation, but there is relatively limited detailed data on neurological complications from tertiary care settings[12,14]. For example, national studies have described demographic and clinical-epidemiological features of dengue fever including warning signs and severe dengue, but neurological manifestations are not always separately characterized[13,14].

Given the increasing recognition of neurological manifestations and the potential for substantial morbidity and mortality associated with these complications, there is a need for systematic, hospital-based studies from endemic populations to delineate their spectrum, laboratory correlates, and outcomes. Therefore, this study aims to describe the neurological manifestations among laboratory-confirmed dengue patients admitted to a tertiary care neuroscience department in Bangladesh, to examine associated clinical and laboratory parameters, and to assess outcomes, in order to contribute to better recognition, early diagnosis, and management of neurological dengue disease in endemic settings.

MATERIALS AND METHOD

Study Design and Setting

This was a hospital-based cross-sectional study conducted at the department of Neurology, Dhaka Medical College Hospital, Bangladesh, a major tertiary referral center. The study was carried out over 14 months, from June 2024 to July 2025.

Study Population

The study population included patients admitted to the department of Neurology with laboratory-confirmed dengue infection [positive non-structural protein 1 (NS1) antigen, dengue immunoglobulin M/ Immunoglobulin G (IgM/IgG) antibodies, or Reverse Transcription Polymerase Chain Reaction(RT-PCR)] who developed neurological manifestations during the study period. Eligible participants included patients of all ages and both sexes presenting with dengue-related neurological complications such as headache, seizures, altered mental status,

encephalopathy, meningitis, encephalitis, acute disseminated encephalomyelitis, transverse myelitis, Guillain–Barré syndrome, myositis, or stroke. Patients with pre-existing neurological disorders (e.g., epilepsy, old stroke, multiple sclerosis), alternative causes of neurological illness (e.g., bacterial meningitis, tuberculous meningoencephalitis, metabolic encephalopathy), or those unwilling to provide informed consent were excluded.

Sample Size and Sampling Technique

All 48 eligible patients who met the inclusion criteria during the study period were recruited using a consecutive sampling method. Since neurological complications of dengue are rare, we included all cases to capture the full spectrum of clinical presentations and outcomes.

Data Collection and Case Definition

Data were prospectively collected using a structured case record form. Recorded variables included sociodemographic information, clinical features, neurological manifestations, laboratory findings (NS1 antigen, IgM/IgG antibodies, RT-PCR, Complete Blood Count, liver/renal function, electrolytes), CSF analysis when indicated, and neuroimaging that is Computed Tomography/ Magnetic Resonance Imaging(CT/MRI). Neurological involvement was defined as new-onset neurological symptoms or signs occurring in the context of confirmed dengue infection and not attributable to other causes. Manifestations were categorized as central nervous system (e.g., encephalitis, meningitis, encephalopathy, stroke) or peripheral nervous system involvement (e.g., Guillain–Barré syndrome, neuropathies, myositis).

Data Management and Analysis

Data were analyzed using SPSS version 27. Descriptive statistics were applied: categorical variables were expressed as frequency and percentage, while continuous variables were summarized as mean ± SD or median (IQR). Exploratory analyses using chi-square/Fisher's exact test were conducted to examine associations between laboratory parameters and neurological manifestations, with a p-value <0.05 considered statistically significant.

Ethical Considerations

The study was approved by the Ethical Review Committee of Dhaka Medical College Hospital. Written informed consent was obtained from all patients or their legal guardians. Confidentiality and anonymity were strictly maintained.

RESULTS

Demographic and Clinical Characteristics

A total of 48 patients with laboratory-confirmed dengue infection and neurological manifestations were included. The mean age was 34.2 ± 14.8 years (range: 5–72 years), with a slight male predominance (58%). Most patients resided in urban areas (65%), and 60% had occupations with moderate to high exposure to mosquito vectors (Table 1).

Table 1: Demographic Characteristics of Dengue Patients with Neurological Manifestations (N = 48)

Characteristic	Number of Patients (n)	Percentage (%)
Age (years)		
Mean ± SD	34.2 ± 14.8	–
Range	5–72	–
Sex		
Male	28	58
Female	20	42
Residence		
Urban	31	65
Rural	17	35
Occupation (Exposure Risk)		
Moderate to High Exposure	29	60
Low/No Exposure	19	40

n=Number of patients

Spectrum of Neurological Manifestations

All 48 patients had neurological involvement. The most frequent manifestation was encephalitis (23, 47.9%), followed by meningitis (14, 29.2%), seizures (9, 18.8%), and Guillain–Barré syndrome / acute flaccid paralysis (2, 4.1%) (Table 2).

Table 2: Neurological Manifestations in Dengue-Infected Patients (N = 48)

Neurological Manifestation	Number of Patients (n)	Percentage (%)
Encephalitis	23	47.9
Meningitis	14	29.2
Seizures	9	18.8
Guillain–Barré Syndrome / Acute Flaccid Paralysis	2	4.1

N= Total Sample

Laboratory Findings

Thrombocytopenia was observed in 44 patients (91.7%), leukopenia in 40 patients (83.3%), and elevated liver enzymes in 35 patients (72.9%). CSF analysis was performed in 22 patients (45.8%), showing pleocytosis in 13 (59.1%) and elevated protein in 9 (40.9%). Neuroimaging (CT/MRI) was done in 26 patients (54.2%), with abnormalities in 12 (46.2%) (Table 3).

Table 3: Laboratory Findings in Dengue Patients with Neurological Manifestations (N = 48)

Laboratory Parameter	Number of Patients (n)	Percentage (%)
Thrombocytopenia	44	91.7
Leukopenia	40	83.3
Elevated liver enzymes	35	72.9
CSF analysis performed	22	45.8
– Pleocytosis in CSF	13	59.1*
– Elevated protein in CSF	9	40.9*
Neuroimaging performed (CT/MRI)	26	54.2
– Abnormal findings	12	46.2*

*Percentages among those who underwent the respective tests; N= Total Sample;n=Number of patients;CSF=Cerebrovascular fluid;CT=Computed Tomography; MRI=Magnetic Resonance Imaging

Association of Laboratory Parameters with Neurological Manifestations

Among laboratory parameters, thrombocytopenia showed a significant association with neurological manifestations, particularly encephalitis and seizures (p=0.04). Pleocytosis in CSF was also significantly related to encephalitis and meningitis (p=0.02), supporting its role in central nervous system involvement. Elevated liver enzymes demonstrated a borderline association (p=0.05), while leukopenia, neuroimaging abnormalities, and elevated CSF protein did not show statistically significant correlations (Table 4).

Table 4: Association of Clinical and Laboratory Parameters with Neurological Manifestations in Dengue Patients (N = 48)

Variable	Encephalitis (n=23)	Meningitis (n=14)	Seizures (n=9)	*p*-value*
Thrombocytopenia (<50,000/mm³)	18 (78.3%)	10 (71.4%)	8 (88.9%)	0.04
Leukopenia (<4,000/mm³)	20 (87.0%)	12 (85.7%)	7 (77.8%)	0.32
Elevated liver enzymes	15 (65.2%)	8 (57.1%)	6 (66.7%)	0.05
CSF analysis performed	12 (52.2%)	8 (57.1%)	2 (22.2%)	0.08
– Pleocytosis in CSF	8 (66.7%)	5 (62.5%)	0 (0.0%)	0.02
– Elevated protein in CSF	6 (50.0%)	3 (37.5%)	0 (0.0%)	0.06
Neuroimaging performed (CT/MRI)	14 (60.9%)	8 (57.1%)	4 (44.4%)	0.40
– Abnormal findings	8 (57.1%)	3 (37.5%)	1 (25.0%)	0.09

*Chi-square or Fisher's exact test used where appropriate.N= Total Sample; n=Number of patients;CSF=Cerebrovascular fluid;CT=Computed Tomography;MRI=Magnetic Resonance Imaging

Clinical Outcomes

The overall mortality was 2 patients (4.2%), both associated with encephalitis. Most patients (38, 79.2%) recovered with no sequelae, 6 (12.5%) had mild to moderate deficits, and 2 (4.2%) experienced severe long-term disability (Table 5).

Table 5: Clinical Outcome of Dengue Patients with Neurological Manifestations (N = 48)

Outcome	Number of Patients (n)	Percentage (%)
Recovered with no neurological sequelae	38	79.2
Mild to moderate residual deficits	6	12.5
Severe long-term disability	2	4.2
Mortality	2	4.2

N= Total Sample
n=Number of patients

DISCUSSION

This study describes the spectrum, laboratory correlates, and outcomes of neurological manifestations among dengue patients admitted to a tertiary neuroscience department in Bangladesh. We observed that encephalitis (47.9%) and meningitis (29.2%) were the most frequent neurological presentations, followed by seizures (18.8%), while Guillain–Barré syndrome (GBS) and acute flaccid paralysis were rare (4.1%). These findings highlight that CNS involvement is more common than PNS manifestations in dengue, consistent with earlier reports from endemic regions.

In Jamaica, Jackson et al. reported that encephalitis (51.8%) and meningitis (33.3%) predominated among dengue patients with neurological manifestations, while seizures (11.1%) and GBS (3.7%) were less frequent, which is comparable to our findings, although seizures were relatively more common in our series[15]. Similarly, in Sri Lanka, Weeratunga et al. described a broad spectrum of dengue-associated neurological disease, including optic neuritis, cerebellar syndrome, and transverse myelitis, underscoring the heterogeneity of clinical presentations[16].

In contrast, our cohort was dominated by classical CNS manifestations such as encephalitis and meningitis, likely reflecting referral bias at a tertiary neuroscience center where patients with severe or CNS-predominant disease are more likely to be admitted.

Reports from India have also highlighted the significance of CNS involvement. Sahu et al. observed that encephalopathy and encephalitis were the most common complications, while GBS and myositis occurred less frequently, consistent with our observation of low rates of PNS involvement[17]. Carod-Artal et al. noted in their systematic review that neurological manifestations of dengue vary widely in prevalence (0.5–21%) depending on case definitions, populations studied, and geographic regions[18]. In pediatric populations, Pancharoen and Thisyakorn documented neurological features such as seizures and encephalopathy in approximately 5% of hospitalized dengue cases, indicating that neurological involvement is not restricted to adults[19]. A more recent study from Pakistan similarly identified encephalitis, seizures, and altered consciousness as major presentations, while PNS manifestations were less common[20].

Together, these findings reinforce that encephalitis, meningitis, and seizures remain the dominant clinical syndromes in dengue neurological disease across endemic regions.

Our study further demonstrated significant associations between thrombocytopenia and CNS complications, particularly encephalitis and seizures, as well as between CSF pleocytosis and meningoencephalitic presentations. These findings are in line with previous studies suggesting that hematological abnormalities, immune activation, and direct viral invasion of the CNS contribute to neurological injury[17,18]. Elevated liver enzymes showed borderline significance, echoing reports that systemic organ dysfunction often parallels neurological complications[17]. Neuroimaging abnormalities were less frequently observed, but they supported diagnoses such as encephalitis in selected patients.

In our study, mortality was relatively low, with 2 patients (4.2%) dying from dengue-associated encephalitis, while most (79.2%) recovered without sequelae; however, 12.5% developed mild to moderate impairments and 4.2% severe long-term disability. These outcomes align with previous studies showing that although many patients with dengue-related neurological complications achieve full recovery, a subset develops persistent deficits. Wasay et al. reported a wide spectrum of complications, including encephalitis, myelitis, and Guillain–Barré syndrome, with prognosis largely dependent on central nervous system involvement[20]. Similarly, Kulkarni et al. noted that long-term sequelae such as cognitive impairment, motor weakness, or epilepsy may occur despite overall favorable outcomes[21]. Verma et al. also observed that while most patients recovered, some developed chronic neurological impairments, particularly after encephalitis and myelitis[22]. These findings underscore that encephalitis remains the most severe and fatal neurological manifestation of dengue and highlight the need for early recognition, timely intervention, and structured follow-up care.

The present study has several strengths, including the systematic recruitment of all dengue patients with neurological manifestations over a defined period and detailed clinical, laboratory, and outcome assessments. However, because it was conducted in a tertiary neuroscience referral center, our cohort likely represents more severe cases and may not reflect the true population-based prevalence of neurological dengue. Moreover, long-term follow-up to capture delayed sequelae was not performed.

CONCLUSION

Neurological manifestations of dengue, though relatively uncommon, represent a significant contributor to morbidity and mortality. In our study, encephalitis emerged as the most severe presentation, accounting for all deaths and most cases of long-term disability, while the majority of patients recovered without sequelae. These findings are consistent with regional and international evidence, which highlight the variable outcomes of dengue-associated neurological complications, ranging from full recovery to persistent deficits. Early recognition, prompt management, and structured follow-up are essential to reduce fatality and long-term disability in affected patients. Strengthening clinical awareness and preparedness in endemic regions may play a critical role in mitigating the neurological burden of dengue.

CONFLICT OF INTEREST

There is no conflict of interest

REFERENCES

1. Naik BR, Tyagi BK, Xue RD. Mosquito-borne diseases in India over the past 50 years and their global public health implications: a systematic review. J of the Ame Mos Control Assoc. 2023;39(4):258-77. DOI: 10.2987/23-7131.

2. Trivedi S, Chakravarty A. Neurological complications of dengue fever. Curr neurol neurosci reports. 2022;22(8):515-29. DOI: 10.1007/s11910-022-01213-7

3. Umakanth M, Suganthan N. Unusual manifestations of dengue fever: a review on expanded dengue syndrome. Cureus. 2020;12(9). DOI: 10.7759/cureus.10678

4. Li GH, Ning ZJ, Liu YM, Li XH. Neurological manifestations of dengue infection. Frontiers in cellular and infection microbiology. 2017;7:449. DOI: doi.org/10.3389/fcimb.2017.00449

5. Carod-Artal FJ, Wichmann O, Farrar J, Gascón J. Neurological complications of dengue virus infection. The Lancet Neurology. 2013;12(9):906-19. DOI: https://doi.org/10.1016/s1474-4422(13)70150-9

6. Sahu R, Verma R, Jain A, Garg RK, Singh MK, Malhotra HS, et al. Neurologic complications in dengue virus infection: a prospective cohort study. Neurology. 2014;83(18):1601–9. DOI: doi.org/10.1212/WNL.0000000000000935

7. Solomon T, Dung NM, Vaughn DW, Kneen R, Thao LT, Raengsakulrach B, et al. Neurological manifestations of dengue infection. Lancet. 2000;355(9209):1053–9. DOI: 10.1016/S0140-6736(00)02036-5

8. Kulkarni R, Pujari S, Gupta D. Neurological manifestations of dengue fever. Ann Indian Acad Neurol. 2021;24(5):693–702. DOI: https://doi.org/10.4103/aian.aian_157_21

9. Soares CN, Faria LC, Peralta JM, De Freitas MR, Puccioni-Sohler M. Dengue infection: neurological manifestations and cerebrospinal fluid (CSF) analysis. J Neurol Sci. 2006;249(1):19–24. DOI: doi.org/10.1016/j.jns.2006.05.068

10. Fong SL, Wong KT, Tan CT. Dengue virus infection and neurological manifestations: an update. Brain. 2024;147(3):830–8. DOI: https://doi.org/10.1093/brain/awad415

11. Trivedi S, Chakravarty A. Neurological complications of dengue fever. Curr Neurol Neurosci Rep. 2022;22(8):515–29. DOI: 10.1007/s11910-022-01213-7

12. Kayesh ME, Khalil I, Kohara M, Tsukiyama-Kohara K. Increasing dengue burden and severe dengue risk in Bangladesh: an overview. Tropical Medicine and Infectious Disease. 2023;8(1):32. DOI: doi.org/10.3390/tropicalmed8010032

13. Sharif N, Opu RR, Saha T, Masud AI, Naim J, Alsharif KF, et. al, Evolving epidemiology, clinical features, and genotyping of dengue outbreaks in Bangladesh, 2000–2024: a systematic review. Frontiers in Microbiology. 2024;15:1481418. DOI: 10.3389/fmicb.2024.1481418/full

14. Hasan MJ, Islam M, Tabassum T, Khan MM, Islam MK, Afroz R, Tui RR, Baset MA, Syed MA, Manzoor JR, Sharif M. Clinical and epidemiological characteristics of the dengue outbreak of 2024: a multicenter observation from Bangladesh. Tropical Medicine and Health. 2025;53(1):45. DOI: 10.1186/s41182-025-00691-y

15. Jackson ST, Mullings A, Bennett F, Khan C, Gordon-Strachan G, Rhoden T. Dengue infection in patients presenting with neurological manifestations in a dengue endemic population. West Indian Med J. 2008;57(4):373–6.

16. Weeratunga PN, Caldera MC, Gooneratne IK, Gamage R, Perera P. Neurological manifestations of dengue: a cross sectional study. Travel medicine and infectious disease. 2014;12(2):189-93. DOI: doi.org/10.1016/j.tmaid.2013.11.001

17. Sahu R, Verma R, Jain A, Garg RK, Singh MK, Malhotra HS, Sharma PK, Parihar A. Neurologic complications in dengue virus infection: a prospective cohort study. Neurology. 2014;83(18):1601-9. DOI: doi.org/10.1212/WNL.0000000000000935

18. Carod-Artal FJ, Wichmann O, Farrar J, Gascón J. Neurological complications of dengue virus infection. The Lancet Neurology. 2013;12(9):906-19.

19. Pancharoen C, Thisyakorn U. Neurological manifestations in dengue patients. Southeast Asian J Trop Med Public Health. 2001;32(2):341–5.

20. Wasay M, Channa R, Jumani M, Shabbir G, Azeemuddin M, Zafar A. Encephalitis and myelitis associated with dengue viral infection: Clinical and neuroimaging features. Clinical neurology and neurosurgery. 2008;110(6):635-40. DOI: doi.org/10.1016/j.clineuro.2008.03.011

21. Kulkarni R, Pujari S, Gupta D. Neurological manifestations of dengue fever. Ann Indian Acad Neurol. 2021;24(5):693–702. DOI: 10.4103/aian.AIAN_157_21

22. Verma R, Sharma P, Garg RK, Atam V, Singh MK, Mehrotra HS. Neurological complications of dengue fever: experience from a tertiary center of north India. Ann Indian Acad Neurol. 2011;14(4):272–8. DOI: 10.4103/0972-2327.91946