Beyond the Fever – A Prospective Analysis of Acute Neuropsychiatric Morbidity and Sleep Disturbances During Epidemic Dengue Outbreaks

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ABSTRACT

Background: Dengue outbreaks are intensifying globally, yet the focus remains largely on hematological parameters. This study sought to explore the "hidden" neuropsychiatric morbidity and sleep disturbances during a historic epidemic in Bangladesh. **Methods & Materials:** A prospective observational analysis was conducted on 292 laboratory-confirmed cases at BIRDEM General Hospital, Dhaka. Data on classic clinical symptoms, diagnostic markers (NS1/IgM/IgG), and acute mental health status were evaluated. **Results:** Beyond the hallmark febrile symptoms, significant psychiatric morbidity was observed: 7.9% of patients experienced acute irritability, and 7.9% suffered from insomnia. Despite the absence of prior psychiatric history, low mood (3.8%) and lack of interest (4.1%) were documented during the acute phase. **Conclusion:** Acute dengue infection exerts a measurable neuropsychiatric toll. Identifying these symptoms is crucial for holistic patient care and understanding the expanded clinical spectrum of the virus.

Keywords: *Bangladesh, Dengue fever, Neuropsychiatric morbidity.*

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INTRODUCTION

Dengue is a paramount tropical infection orchestrated by an arbovirus belonging to the *Flaviviridae* family, comprising four distinct serotypes (DENV-1–4). Transmitted primarily through the bite of infected female *Aedes aegypti* and *Aedes albopictus* mosquitoes, the virus exploits urbanized landscapes and climate-driven variables such as rainfall and humidity to sustain its transmission cycles [1,2]. While the global burden of dengue is staggering—with approximately 390 million infections annually—the clinical focus has traditionally remained tethered to the "fever-pain-bleed" triad of classic Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) [3].

However, the catastrophic 2023 outbreaks in Bangladesh have highlighted an increasingly complex diagnostic landscape. Beyond the standard febrile and critical phases, there is an emerging recognition of Expanded Dengue Syndrome (EDS), where the virus exhibits significant neurotropic potential [4]. While hematological complications often dominate the clinical foreground, a "hidden" epidemic of neuropsychiatric morbidity frequently unfolds in the shadows. Recent evidence suggests that the acute phase of dengue is not merely a systemic inflammatory event but a neuro-inflammatory one, capable of inducing profound changes in mood, behavior, and sleep architecture [5,6].

Recent international studies have begun to quantify this psychological toll. Research found that hospitalized dengue patients exhibited acute psychiatric manifestations, including anxiety and depressive episodes, often independent of the severity of the systemic illness [7]. Furthermore, studies highlighted that sleep-wake disturbances, particularly insomnia, are prevalent during the viremic phase, yet they remain largely under-reported in tropical medicine literature [8]. These symptoms—ranging from acute irritability to suicidal ideation—often emerge in patients with no prior psychiatric or neurological history, suggesting a direct viral impact on the blood-brain barrier or a cytokine-mediated neuro-inflammatory response [9].

In Bangladesh, despite decades of experience in managing dengue, the neuropsychiatric dimension remains critically under-explored. The intersection of this viral threat with a high metabolic burden, such as diabetes mellitus, further complicates the neurological prognosis. This study, titled **"**Beyond the Fever**,"** seeks to bridge this significant gap in the literature. By prospectively analyzing the prevalence of acute neuropsychiatric morbidity and sleep disturbances during a major epidemic surge, we aim to refine the clinical understanding of the "hidden" mental health burden of dengue and advocate for a more holistic approach to management in the hyper-endemic regions of the world.

METHODS & MATERIALS

An observational study was carried out on 292 laboratory-confirmed dengue patients who were admitted to BIRDEM General Hospital in Dhaka from January 2023 to December 2024. Data on sociodemographic, such as age, gender, and residence, were gathered, along with initial clinical characteristics and existing chronic comorbid conditions. The group mainly included adults with an average age of 35.6 ± 15.2 years, showing a slight lean towards males. Patients experiencing simultaneous acute illnesses were meticulously recorded, guaranteeing that noted neuropsychiatric symptoms were probably linked to the acute dengue infection instead of prior health issues.

Primary diagnostic confirmation was obtained via NS1 antigen testing, complemented by serological evaluation for IgM and IgG antibodies. Laboratory measurements, such as C-reactive protein (CRP) and serum glutamic pyruvic transaminase (SGPT), were assessed to determine systemic inflammation and liver involvement. Typical dengue symptoms, including fever, body pain, and headaches, were documented to provide context for

clinical presentation and to contrast with new neuropsychiatric results.

Data were examined to establish the frequency of symptoms, their association with laboratory and clinical results, and the effect of the acute viral exposure on mental and behavioral well-being. This method offered a thorough description of both traditional dengue characteristics and the rarer neuropsychiatric issues observed in the study group throughout the 24-month study period.

RESULTS

Table I shows total of 292 laboratory-confirmed dengue patients were enrolled, with a mean age of 35.63 ± 15.22 years (range: 11–85 years). A slight male predominance was observed (54.8%), and the vast majority of participants resided in urban areas (83.9%). Notably, 89.4% of the cohort had no concurrent acute illness, and 65.1% had no prior chronic comorbidities, ensuring that the observed neuropsychiatric symptoms were predominantly associated with the acute viral insult rather than pre-existing conditions.

Table I
Sociodemographic and Baseline Clinical Profile (*n*=292).

Variable	Frequency(n)	Percentage (%)
Age Group (Years)		
< 40	190	65.1
≥ 40	102	34.9
Gender		
Male	160	54.8
Female	132	45.2
Residence		
Urban	245	83.9
Rural	47	16.1
Comorbidities		
None	190	65.1
Diabetes Mellitus	75	25.7
Hypertension	42	14.4

Table II shows Most cases were confirmed by NS1 antigen (82.3%), with fewer showing IgM (13%) or IgG (9.2%) positivity. Elevated CRP (80.1%) and raised SGPT (50.3%) indicate that systemic inflammation and hepatic involvement were common.

Table II
Diagnostic and Inflammatory Profile of the Study Population (*n* = 292).

Parameter	Number of Cases(n)	Percentage (%)
NS1 antigen positivity	240	82.3
IgM seropositivity	38	13.0
IgG seropositivity	27	9.2
Elevated C-reactive protein (CRP)	234	80.1
Raised SGPT levels (hepatic involvement)	147	50.3

Table III presents acute irritability was the most prominent behavioral change, documented in 7.9% (n=23) of the cohort. Sleep architecture was significantly compromised, with insomnia reported by 7.9% of patients. Although the cohort was largely psychologically resilient prior to infection, acute-phase affective symptoms emerged, including a lack of interest (4.1%) and low mood (3.8%). Hypersomnia and excessive talking were rare, occurring in 1.0% and 0.3% of cases, respectively.

Table III
Acute Neuropsychiatric and Behavioral Manifestations.

Variables	Present n (%)	Absent n (%)
Irritability	23 (7.9)	269 (92.1)
Insomnia	23 (7.9)	269 (92.1)
Lack of Interest	12 (4.1)	280 (95.9)
Low Mood	11 (3.8)	281 (96.2)
Decreased Food Intake	20 (6.8)	272 (93.2)
Hypersomnia	3 (1.0)	289 (99.0)

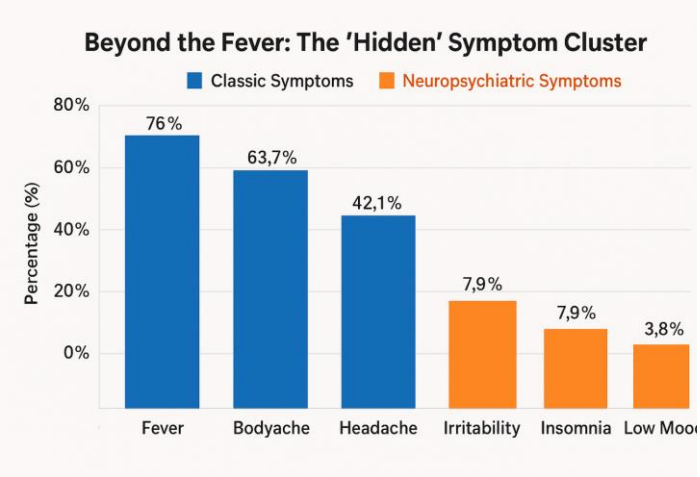

Figure 1 Symptom cluster

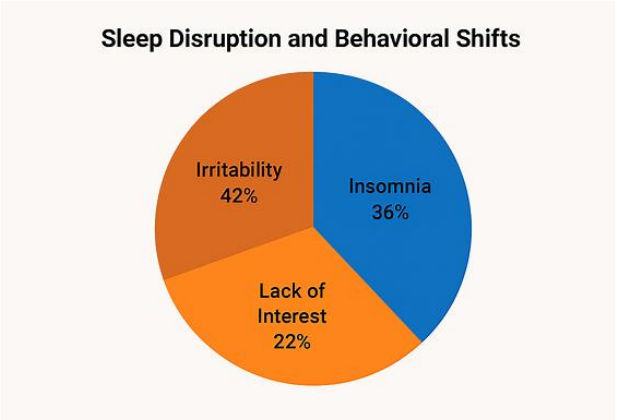

Figure 2 Sleep Disruption and Behavioral Shifts – a visual breakdown of behavioral changes among symptomatic patients

Figure 1 shows the traditional "dengue triad" of fever (76%), body ache (63.7%), and headache (42.1%), the study identified a significant cluster of neuropsychiatric and behavioral disturbances. *Figure 2* shows that irritability (42%, orange) and insomnia (36%, blue) are the dominant neuropsychiatric features, while lack of interest (22%, burnt orange) is less common.

DISCUSSION

This study offers a granular exploration of the clinico-behavioral landscape of dengue during the catastrophic 2023–2024 outbreak in Bangladesh. While the systemic morbidity of Dengue Virus (DENV) is well-documented, our findings illuminate a neglected dimension of the illness: the acute neuropsychiatric and sleep-wake disruptions that occur during the viremic phase. By identifying a significant prevalence of irritability and insomnia even in patients without prior neurological vulnerabilities, this research underscores the necessity of expanding the clinical definition of dengue to include acute mental health disturbances.

The demographic profile of our study—characterized by a mean age of 35.63 years and a 65.1% concentration of patients under 40—reflects a distinct epidemiological shift in South Asia. This aligns with findings by Prattay et al. (2022), who noted a similar adult predominance (73.33%) during the 2019 Dhaka surge [10]. Historically a pediatric disease, the transition toward an adult-centric epidemic may be attributed to the re-emergence of DENV-3 and DENV-4 serotypes, against which the young adult population lacks sufficient herd immunity. The male preponderance (54.8%) observed in our study mirrors regional trends described by Karunakaran et al. (2014), likely driven by gendered patterns of outdoor labor and mobility that increase exposure to the peak-daylight feeding activity of *Aedes aegypti* [11].

A primary contribution of this study is the documentation of acute neuropsychiatric morbidity, a facet often overshadowed by hematological markers. We observed a 7.9% prevalence of acute irritability and an approximately 4% incidence of low mood and anhedonia (lack of interest). These findings are consistent with recent international data; for instance, reported that dengue patients in Sri Lanka exhibited depressive or anxiety symptoms during hospital stay [7].

Unlike classic delirium, the irritability noted in our cohort occurred in a clear conscious state, suggesting that DENV-induced pro-inflammatory cytokines—such as IL-6 and TNF-alpha—may cause transient limbic system dysfunction [9]. This "behavioral viremia" supports the classification of such symptoms under Expanded Dengue Syndrome (EDS), where the virus exerts direct or indirect effects on the central nervous system [5].

The disruption of sleep was another critical finding, with 7.9% of patients suffering from acute-onset insomnia. While physical discomfort from high-grade fever (76%) and severe musculoskeletal pain (63.7%) undoubtedly contributes to sleep fragmentation, recent studies suggest a more complex mechanism. Hypothesized that DENV may interfere with the circadian regulatory pathways or the blood-brain barrier's integrity, leading to significant sleep-wake disturbances [8]. The presence of insomnia in our study, documented even during the recovery phase for some, indicates that the viral impact on sleep architecture may persist beyond the febrile period, necessitating closer psychological follow-up.

The diagnostic landscape of our study was dominated by NS1 antigen sensitivity (82.3%), reinforcing its role as the premier sentinel marker during early outbreak cascades [12]. The significant prevalence of thrombocytopenia (70.9%) and hepatic distress (raised SGPT in 50.3%) aligns with the systemic inflammatory profile described by Muller, Depelsenaire and Young (2017) [13].

Furthermore, the intersection of dengue with diabetes mellitus (25.7%) in our study proved clinically significant. Uncontrolled glycemic status (HbA1C >6.5%) was a potent predictor of complications, doubling the risk of severe manifestations (26.2% vs 12.4%). This synergy between metabolic phenotypes and viral pathogenesis suggests that glucose dysregulation may enhance viral replication or exacerbate the vascular leak syndrome characteristic of severe dengue.

CONCLUSION

The "Beyond the Fever" paradigm reveals that DENV is as much a neuropsychiatric challenge as it is a systemic one. While the majority of patients achieve clinical recovery, the acute toll on mental health—specifically irritability and insomnia—remains an under-recognized morbidity. Our study advocates for a holistic diagnostic approach that integrates psychological screening and sleep assessment into standard dengue protocols. As Bangladesh continues to face intensifying arboviral cycles, recognizing these "hidden" symptoms is essential for mitigating the long-term psychological sequelae of the disease and refining national health strategies for the most vulnerable populations.

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