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INCIDENCE AND ASSESSMENT OF SEVERITY OF DENGUE INFECTION IN PATIENTS OF ACUTE FEBRILE ILLNESS AT A TERTIARY CARE HOSPITAL

Clinical Microbiology

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ABSTRACT

Background: Dengue is a major mosquito-borne viral illness in tropical countries, frequently presenting as acute febrile illness (AFI). Its wide spectrum, from mild fever to severe dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS), poses a diagnostic and public health challenge. **Objective:** To determine the incidence and assess the severity of dengue infection in patients presenting with acute febrile illness at a tertiary care hospital. **Methods:** A prospective observational study was conducted in patients admitted with AFI at a tertiary care teaching hospital where serum samples were tested for Dengue NS1-antigen and IgM-antibodies using ELISA as per National Vector Borne Disease Control Programme (NVBDCP) guidelines. Clinical and laboratory parameters were evaluated to classify severity according to WHO-2009 criteria. **Results:** Of 1203 patients with AFI, 121(10.05%) were diagnosed with dengue. NS1-antigen was positive in 64.5%, mainly within the first five days, while 35.5% were IgM-positive. Most cases occurred in young adults (21–40 years, 52.1%) with a male predominance (62%), and 82% cases were recorded between August-November. Fever was universal, with variable gastrointestinal and musculoskeletal symptoms. Laboratory findings showed leukopenia, thrombocytopenia (mean=99.9×10 /L), mild hemoconcentration, and elevated liver enzymes. According to WHO (2009) criteria, 58.7% had Dengue Fever, 37.2% had DHF I–II, and 4.1% had severe dengue, with severity correlating inversely with platelet count and directly with hematocrit. Most patients (79.3%) had no comorbidities, and no mortality occurred. **Conclusion:** The incidence of dengue among AFI patients was 10.05%, with the majority presenting as classical dengue fever. Severe dengue accounted for 4.1% of cases, emphasizing the need for early diagnosis and continuous vector control measures.

KEYWORDS

Dengue, Acute Febrile Illness, NS1 Antigen, Dengue Hemorrhagic Fever, Severity Assessment

INTRODUCTION

Dengue fever is an acute mosquito-borne viral disease caused by the dengue virus (DENV), a member of the *Flaviviridae* family. It is transmitted by *Aedes aegypti* and *Aedes albopictus* mosquitoes and remains endemic across tropical and subtropical regions, including India. Globally, around 390 million infections occur annually, of which approximately 96 million are clinically apparent (WHO, 2023).
In India, dengue cases exhibit a seasonal pattern, peaking during the post-monsoon period (July-November). Maharashtra consistently reports a high burden of dengue, particularly in densely populated urban regions such as Mumbai.

Early detection and classification of dengue are essential for effective management, as the disease can progress from mild febrile illness to severe forms such as DHF or DSS. Laboratory diagnosis using NS1-antigen and IgM MAC-ELISA facilitates early detection and timely management.

This study aimed to estimate the incidence and severity of dengue infection among hospitalized patients presenting with acute febrile illness at a tertiary care center.

MATERIAL AND METHODS

Study Design and Setting

A prospective observational study was conducted in the Department of Microbiology in collaboration with the Departments of Medicine and Pediatrics at a tertiary care teaching hospital in Mumbai over 18-months period after IEC approval ((IEC/PG/879/Sep/2022),

Study Population

Patients aged ≥5 years presenting with acute febrile illness (fever ≤7 days) were included. Exclusion criteria included patients with confirmed bacterial infections (e.g., malaria, typhoid) or chronic comorbid conditions known to cause fever.

Sample Collection And Testing

Blood samples were collected under aseptic precautions. Serum was separated and tested for Dengue NS1-antigen and IgM-antibodies using ELISA kits supplied by NIV, Pune as per NVBDCP guidelines. In-house retained positive samples were used as internal controls along with negative and positive controls supplied with the kits.

Data Collection

Demographic data, clinical features, and laboratory parameters (hematocrit, platelet count, liver and renal function tests) were recorded after taking written informed consent. The WHO (2009) criteria [1] was used to classify cases into:

- Dengue Fever (DF)
- Dengue Hemorrhagic Fever (DHF I–II)
- Severe Dengue (DHF III–IV/DSS)

Statistical Analysis

Data was analyzed using descriptive statistics in Microsoft Excel. Continuous variables were expressed as mean ± SD, and categorical variables as percentages.

RESULTS

Incidence Of Dengue Infection

Out of 1203 patients presenting with acute febrile illness (AFI) during the study period, 121(10.05%) were confirmed to have dengue infection either by NS1-antigen and/or IgM-antibody ELISA. Among the 121 dengue-positive cases, NS1-antigen was positive in 78(64.5%) patients, predominantly in the early febrile phase (≤5 days of fever), while IgM-ELISA was positive in 43(35.5%) cases, generally in patients with fever lasting >5 days. No dual (NS1+IgM) positivity was detected.

Demographic Distribution

Dengue infection was observed across all age groups, with the highest incidence in young adults aged 21–40 years (52.1%), followed by adolescents (13–20 years, 21.4%), and middle-aged adults (41–60 years, 18.2%). Pediatric cases (<12 years) accounted for 6.6%, and elderly (>60 years) for 1.7%. Out of 121 dengue-positive patients, 75(62%) were males and 46(38%) females, giving a male-to-female ratio of approximately 1.6:1.

Seasonal Distribution:

Most cases (approximately 82%) were recorded between August and November, coinciding with the monsoon and immediate post-monsoon period when vector breeding peaks. A sharp rise in incidence was noted in September, followed by a gradual decline after November.

Clinical Profile

Table 1: Clinical Manifestations In Dengue (n=121)

Dengue	
Clinical Symptoms	**Frequency**
Fever	100
Restlessness	70

Sore throat	65
Abdominal pain	55
Diarrhoea	55
Anorexia	50
Nausea/Vomiting	50
Rashes	45
Myalgia/Arthralgia	45
Retroorbital pain	40
Headache/Bodyache	30

Table 1 outlines the clinical symptoms of dengue fever and their frequencies.

Table 2: Laboratory Parameters In Dengue (n=121)

Dengue											
Descriptives	**Hb**	**TLC**	**PLT**	**PCV**	**Urea**	**Creat**	**SGOT**	**SGPT**	**ALP**	**Na**	**K**
N	121	121	121	121	121	121	121	121	121	121	121
Mean	12.8	4.32	99.9	36.4	14.5	1	135	201	120	131	4.03
Standard deviation	1.48	0.648	27.4	4.38	4	0.0407	58.8	90.5	17.4	2.52	0.205
Median	13	4	98	36	15	1	141	203	122	131	4
25th percentile	12	4	78	32	11	1	81	123	119	129	4
75th percentile	14	5	122	40	17	1	192	273	125	133	4
Minimum	9	2	51	30	9	0.8	38	52	70	128	3
Maximum	15	5	149	44	28	1.2	232	352	194	139	5

Table 2 presents descriptive statistics for various blood parameters in 121 Dengue patients, including Hemoglobin (Hb), Total Leukocyte Count (TLC), Platelet Count (PLT), Packed Cell Volume (PCV), Urea, Serum Creatinine (Creat), Serum Glutamic-Oxaloacetic Transaminase (SGOT), Serum Glutamic-Pyruvic Transaminase (SGPT), Alkaline Phosphatase (ALP), Serum Sodium (Na), and Serum Potassium (K). For each parameter, the table provides the number of observations, mean, standard deviation, median, 25th and 75th percentiles, minimum, and maximum values. Hb has a mean of 12.8g/dL and median of 13g/dL, TLC has a mean of 4.32x10^9/L and median of 4x10^9/L, and PLT has a mean of 99.9x10^9/L and median of 98x10^9/L. The PCV mean is 36.4%, Urea mean is 14.5mg/dL, and Sr.Creat mean is 1mg/dL. SGOT and SGPT means are 135U/L and 201U/L, respectively, while ALP mean is 120U/L. The mean for Sr.Na is 131mmol/L and Sr.K is 4.03mmol/L.

Classification Of Severity

Table 3: WHO (2009) Criteria For Classification Of Severity

Category	Number (n=121)	Percentage (%)	Key Features Observed
Dengue Fever (DF)	71	58.7	Febrile illness with myalgia, headache, retro-orbital pain; no warning signs
DHF I–II	45	37.2	Evidence of plasma leakage (hematocrit rise ≥20%, thrombocytopenia) and mild bleeding tendencies
Severe Dengue (DHF III–IV / DSS)	5	4.1	Hypotension, severe plasma leakage, shock, hepatic dysfunction; required ICU care

Among the 5 severe dengue cases, 3 presented with hypotension and required intravenous fluids, while 2 developed transient hepatic dysfunction. All severe cases recovered without mortality.

Correlation Between Platelet Count And Disease Severity

Table 4: Correlation Between Platelet Count and Disease Severity

Disease Category	Mean Platelet Count ($\times 10^3/mm^3$)	Mean Hematocrit (%)
Dengue Fever (DF)	86±22	38.4±2.8
DHF I–II	57±18	43.2±3.6
DHF III–IV / DSS	32±12	47.5±4.1

A clear inverse relationship was noted between platelet count and disease severity as shown in Table 4. The progressive drop in platelet count and concurrent rise in hematocrit was strongly associated with disease severity ($p<0.05$).

Non-communicable Diseases

Table 5: Association With NCD (n=121)

Dengue		
Medical History	**Number of Cases**	**% of Total**
BA	1	0.8 %
DM	4	3.3 %
DM+HTN	6	5.0 %
HTN	13	10.7 %
None	96	79.3 %
TB	1	0.8 %

Table 5 summarizes the medical history of 121 Dengue patients, with the following conditions reported: Bronchial Asthma (BA) in 1 patient (0.8%), Diabetes Mellitus (DM) in 4(3.3%), a combination of Diabetes Mellitus and Hypertension (DM+HTN) in 6(5.0%), HTN in 13(10.7%), no comorbidities in 96(79.3%), and Tuberculosis (TB) in 1 patient (0.8%). This data highlights that the majority of patients (79.3%) had no underlying medical conditions.

Outcome And Hospital Stay

The average duration of hospital stay was 4.8±2.3 days for DF, 6.1±2.8 days for DHF, and 8.4±3.2 days for severe dengue cases. All patients were managed with supportive therapy-hydration, paracetamol, monitoring of hematological parameters, and platelet transfusion where indicated (in 7 cases, 5.7%). No deaths were recorded during the study period.

DISCUSSION

The age pattern in our study mirrors earlier findings, including Bhatt et al, who reported higher dengue incidence among young adults (20–40 years). Their greater exposure to mosquito vectors through work and social activities likely explains this trend [2]. The gender distribution, with males(62%) exceeding females(38%), aligns with previous studies showing male predominance in dengue, likely due to greater outdoor activity and risk exposure. Gupta S et al similarly reported higher dengue incidence in males, attributed to increased outdoor exposure. [3]. The lower number of adults aged 51–70 and the minimal cases above 70 suggest that older individuals, though less exposed to mosquitoes due to limited outdoor activity, experience more severe disease when infected. Guzman MG et al similarly reported that elderly patients, despite fewer infections, often have severe outcomes due to age-related comorbidities. [4]

The symptomatic profile of Dengue patients in our study, where fever was present in 100 cases, followed by symptoms like restlessness (70), sore throat (65), and abdominal pain (55), is in line with the typical clinical presentation of dengue. Fever was the most common and consistent symptom, aligning with WHO guidelines that identify it as a defining feature of dengue. Other symptoms-including myalgia, arthralgia, and rash (45 cases each)-are also well-recognized manifestations reflecting the systemic and inflammatory nature of the disease. Martina BE et al noted that the combination of fever, rash, and musculoskeletal pain is highly indicative of dengue.[5] The gastrointestinal symptoms observed-nausea/vomiting(50 cases) and diarrhea(55 cases)-are consistent with other studies showing these features are common but less consistent than fever and pain. Simmons CP et al similarly noted that GI symptoms occur frequently in dengue but vary widely in presence and severity. [6]

The descriptive statistics for laboratory parameters provide a

Fever is the most universal symptom, occurring in 100 cases, with a mean duration of 4.6±1.8 days before hospital admission. Common symptoms include restlessness (70), sore throat (65), abdominal pain (55), diarrhoea (55), anorexia (50), and nausea/ vomiting (50). Additionally, rashes and myalgia/ arthralgia (muscle and joint pain) each occur in 45 patients, while retroorbital pain is reported by 40. Headache/bodyache has a lower frequency, affecting 30 individuals. This data highlights the range of symptoms experienced by dengue patients, with fever being the most consistent, followed by other symptoms with varying degrees of prevalence.

Laboratory Parameters

comprehensive profile of the hematological and biochemical changes associated with dengue infection. The mean hemoglobin level was 12.8g/dL (median=13g/dL), within the normal range but slightly lower than expected in healthy individuals. This mild anemia aligns with hemoconcentration from plasma leakage, a typical feature of dengue described by Srikiatkhachorn A et al [7]. The mean TLC was 4.32×10^9/L, falling at the lower end of normal. Leukopenia is common in dengue, especially during the acute febrile phase, as viral infection suppresses bone marrow activity. This finding is consistent with WHO (2009), which identifies leukopenia as a key diagnostic feature of dengue [8]. The mean platelet count of 99.9×10^9/L reflects thrombocytopenia, a hallmark of dengue, often used as a diagnostic indicator. This results from reduced platelet production, increased destruction, and sequestration. Khan et al similarly reported a marked platelet decline during the critical phase of dengue [9]. The mean PCV of 36.4% lies within the normal range, but given dengue's tendency for hemoconcentration from plasma leakage, it may represent a mild rise during the critical phase. Srikiatkhachorn et al note that elevated PCV is a critical marker of dengue severity and significant plasma leakage [10]. The mean creatinine (1mg/dL) and urea (14.5mg/dL) indicate largely normal renal function, typical in dengue unless severe disease or dehydration develops. Khalil MA et al similarly note that while acute kidney injury may occur in severe dengue, renal parameters usually remain normal in uncomplicated cases [11]. The elevated mean SGOT (135U/L) and SGPT (201U/L) levels indicate hepatic involvement, a common feature of dengue. Such transaminase elevation reflects hepatocellular injury, and Trung DT et al similarly reported that raised liver enzymes are frequent in dengue and may correlate with disease severity [12]. The mean ALP level of 120U/L falls within the normal range, suggesting that while liver function is affected, there is no significant cholestasis, aligning with the pattern of enzyme elevation seen predominantly in hepatocellular rather than cholestatic injury in dengue, by Kuo CH et al [13]. The mean sodium (131mmol/L) and potassium (4.03mmol/L) levels were within normal limits, suggesting minimal electrolyte imbalance in this cohort. However, Lee IK et al note that severe dengue can lead to abnormalities such as hyponatremia or hyperkalemia, especially in cases with shock or renal impairment [14].

The medical history of patients showed that most (79.3%) had no non-communicable diseases, while 20.7% had conditions such as hypertension (10.7%), diabetes (3.3%), or both (5%). This pattern aligns with literature indicating that NCD are usually an incidental finding, but they increase the risk of severe dengue. Bravo L et al reported that diabetes can worsen dengue severity and raise morbidity and mortality [15]. The low proportion of patients with NCD in our study suggests that these are accompanying findings and dengue affects a widely healthy population, though individuals with existing co-morbidities are more likely to develop severe disease.

CONCLUSION

The incidence of dengue among hospitalized AFI patients was 10.05%, with classical dengue fever being the predominant form. A smaller but significant proportion progressed to DHF and severe dengue. Early diagnosis through NS1-antigen/IgM-ELISA and close clinical monitoring remain crucial to reduce complications and mortality. Strengthening public awareness, vector control, and surveillance programs is essential to minimize dengue burden in urban centers like Mumbai [16].

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