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SCREENING FOR DENGUE IN ACUTE FEBRILE ILLNESS PATIENTS

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ABSTRACT

Background: Dengue is a common cause of acute febrile illness in tropical regions, and its clinical presentation often overlaps with other infectious diseases, necessitating laboratory confirmation for accurate diagnosis.
Objectives: To screen patients presenting with acute febrile illness for dengue infection using NS1 antigen, IgM, and IgG antibody assays and to assess the diagnostic utility of individual and combined serological tests.
Materials and Methods: This retrospective observational study was conducted at MediCiti Institute of Medical Sciences, Hyderabad, from May 2023 to May 2024. A total of 850 patients with acute febrile illness, aged 1–78 years, were included. Serum samples were tested for dengue NS1 antigen and IgM and IgG antibodies using a commercially available Dengue Day 1 rapid solid-phase immunochromatographic assay. Data were analyzed descriptively and expressed as frequencies and percentages.
Results: Of the 850 samples analyzed, 36 (4.2%) were positive for NS1 antigen, 28 (3.2%) for IgM antibodies, and 122 (14.3%) for IgG antibodies. Combined NS1 antigen and IgM antibody positivity was observed in 12 patients (1.4%), indicating active dengue infection. The study population showed an almost equal gender distribution, with 428 females and 422 males.
Conclusion: The findings demonstrate that dengue serological markers vary according to the stage of illness and that reliance on a single diagnostic test may result in missed cases. Combined testing using dengue NS1 antigen and antibody assays improves the detection of dengue infection. This integrated diagnostic approach supports early diagnosis and effective management of acute febrile illness in dengue-endemic settings.

Keywords: *Dengue; Acute febrile illness; NS1 antigen; IgM antibody; IgG antibody*

INTRODUCTION:

Dengue is one of the most important mosquito-borne viral infections affecting humans, particularly in tropical and subtropical regions. It is caused by the dengue virus, a single-stranded RNA virus belonging to the genus *Flavivirus*, and is transmitted primarily by *Aedes aegypti* mosquitoes. Dengue infection continues to pose a major public health challenge due to its increasing incidence, rapid urbanization, population mobility, and expansion of mosquito breeding habitats.[1,2]
Clinically, dengue commonly presents as an **acute febrile illness (AFI)** with nonspecific symptoms such as fever, headache, myalgia, arthralgia, retro-orbital pain, and rash. These manifestations often overlap with other infectious diseases

such as malaria, enteric fever, chikungunya, and viral fevers, making clinical diagnosis alone unreliable.[3] Early and accurate laboratory diagnosis is therefore essential for appropriate patient management, monitoring for complications, and reducing morbidity and mortality.[4]

Laboratory diagnosis of dengue is based on the detection of viral components or host immune response, which vary according to the stage of infection. Dengue **NS1 antigen** is detectable during the early viremic phase, usually within the first 3–5 days of illness, and serves as a valuable marker for early diagnosis.[5] As the infection progresses, **IgM antibodies** become detectable, indicating recent infection, followed by **IgG antibodies**, which persist for long periods and are commonly associated with late presentation or secondary dengue infection.[6],[7]

Because these diagnostic markers appear sequentially, reliance on a single test may lead to underdiagnosis, particularly in patients presenting at different stages of illness. Studies have shown that the combined use of NS1 antigen and dengue antibody assays improves diagnostic sensitivity and provides a more comprehensive assessment of dengue infection.[8],[9] This is particularly important in endemic regions, where patients may present late or have prior exposure to dengue virus. In this context, the present study was undertaken to **screen patients presenting with acute febrile illness for dengue infection using NS1 antigen, IgM, and IgG antibody assays** and to evaluate the contribution of combined testing in improving the detection of dengue infection in a tertiary care hospital setting.

MATERIALS AND METHODS:

Study Design

This study was conducted as a **retrospective, hospital-based descriptive study** to evaluate dengue infection among patients presenting with acute febrile illness, in accordance with national dengue diagnostic recommendations.

Study Setting

The study was carried out at **MediCiti Institute of Medical Sciences**, Ghanpur, Hyderabad. Data were obtained from laboratory records maintained in the Department of Microbiology.

Study Period

Laboratory records from a **one-year duration**, spanning **May 2023 to May 2024**, were reviewed.

Study Population

A total of **850 patients** presenting with **acute febrile illness (AFI)** during the study period were included.
As per national guidelines, **acute febrile illness** was defined as fever of **up to 14 days duration**, with or without associated symptoms such as headache, myalgia, arthralgia, rash, retro-orbital pain, or bleeding manifestations.
Patients of all age groups and both sexes were included.

Inclusion Criteria

- Patients presenting with acute febrile illness of ≤14 days duration
- Clinically suspected dengue cases referred for laboratory confirmation
- Patients whose serum samples were tested for dengue NS1 antigen and/or dengue IgM and IgG antibodies

Exclusion Criteria

- Patients with a confirmed alternative diagnosis explaining the febrile illness
- Samples that were inadequate, hemolysed, or unsuitable for testing
- Incomplete laboratory records

Sample Collection and Processing

Venous blood samples were collected under aseptic precautions as part of routine clinical evaluation. Samples were allowed to clot and centrifuged for serum separation. Serum samples were tested immediately or stored at **2–8°C** until processing, following standard laboratory protocols.

Laboratory Diagnosis of Dengue

Dengue testing was performed in accordance with **ICMR / NVBDCP recommendations**, which advocate the use of antigen and antibody detection based on the duration of illness.

All serum samples were tested using a **commercially available Dengue Day 1 Test**, a **rapid solid-phase immunochromatographic assay**, for the detection of:

- **Dengue NS1 antigen**
- **Dengue IgM antibody**
- **Dengue IgG antibody**

Testing and result interpretation were carried out strictly as per the manufacturer's instructions.

Interpretation of Results

- **NS1 antigen positivity** was interpreted as evidence of early acute dengue infection, particularly during the viremic phase.
- **IgM antibody positivity** was considered indicative of recent dengue infection.
- **IgG antibody positivity** suggested late-phase infection or previous exposure, including secondary dengue infection.
- **Concurrent NS1 antigen and IgM antibody positivity** was considered suggestive of active dengue infection during the transitional phase of illness.
- **Concurrent NS1 antigen ± IgM and IgG antibody is** suggestive of secondary infection rather than previous infection.

This interpretation framework is consistent with national dengue diagnostic algorithms.

Data Collection

Demographic variables such as age and sex, along with laboratory test results, were extracted from microbiology laboratory registers using a structured data abstraction format.

Statistical Analysis

Data were entered into **Microsoft Excel** and analyzed using descriptive statistical methods. Results were expressed as **frequencies and percentages**.

Ethical Considerations

The study was approved by the **Institutional Ethics Committee**. As the study involved retrospective analysis of laboratory data, the requirement for informed consent was waived. Patient anonymity and confidentiality were maintained throughout the study.

RESULTS:

A total of **850 patients presenting with acute febrile illness (AFI)** were screened for dengue infection during the one-year study period.

A higher proportion of cases was observed among **young and middle-aged adults**, particularly in the **21–40 year age group**, while comparatively fewer cases were noted at the extremes of age as shown in Table 1.

Table 1: Age Distribution of Acute Febrile Illness Patients (n = 850)

Age group (years)	Number of patients	Percentage (%)
1–10	96	11.3
11–20	118	13.9
21–30	162	19.1
31–40	148	17.4
41–50	126	14.8
51–60	104	12.2
61–70	64	7.5
71–78	32	3.8
Total	**850**	**100**

Among the 850 patients with acute febrile illness included in the study, there was an almost equal distribution between male and female patients as shown in Table 2

Table 2: Gender Distribution of Acute Febrile Illness Patients

Gender	Number of patients	Percentage (%)
Male	422	49.6
Female	428	50.4
Total	**850**	**100**

Among the dengue diagnostic markers tested, **IgG antibody positivity was the most common finding**, followed by NS1 antigen and IgM antibody positivity. NS1 antigen positivity indicated early dengue infection, while IgM antibody positivity reflected recent infection. The higher proportion of IgG antibody positivity suggested **late presentation or secondary dengue infection** among the study population as shown in Table 3

Table 3: Positivity of Individual Dengue Diagnostic Markers

Dengue marker	Number positive	Percentage (%)
NS1 antigen	36	4.2
IgM antibody	28	3.2
IgG antibody	122	14.3

Combined testing using dengue NS1 antigen and IgM antibody and IgG antibody assays identified additional cases of active dengue infection, improving overall diagnostic yield as shown in Table 4.

Table 4: Dengue Positivity Based on Combination method

Diagnostic combination	Number positive	Percentage (%)
NS1 + IgM positive	12	1.4
Ns1+IgG positive	10	1.1
IgM+IgG positive	18	2.1
Ns1+IgM+IgG positive	8	0.9

DISCUSSION:

Dengue remains a major public health concern in endemic regions and continues to be an important cause of acute febrile illness. Because of its nonspecific clinical presentation, laboratory-based diagnosis is essential for accurate identification and appropriate clinical management.

In the present study, the **age of patients ranged from 1 to 78 years**, demonstrating that acute febrile illness, including dengue, affects individuals across all age groups. However, a higher proportion of cases was observed among **young and middle-aged adults**, particularly in the **21–40 year age group**. Similar age distributions have been reported in several Indian studies, where dengue predominantly affected the economically productive population, possibly due to increased outdoor activities, occupational exposure, and greater mobility, resulting in higher contact with mosquito breeding sites.[10,11] With respect to gender distribution, an **almost equal representation of females (428) and males (422)** was observed in the study population. This finding suggests that dengue transmission in the study area is not strongly gender-specific and likely reflects similar environmental exposure and living conditions among both sexes. Previous studies have reported variable gender distributions ranging from male predominance to near-equal representation, depending on regional and sociocultural factors.[12,13] The findings of the present study support the changing epidemiological pattern of dengue with diminishing gender differences.

Analysis of dengue serological markers revealed **NS1 antigen positivity in 4.2% of patients**, indicating early dengue infection, while **IgM antibody positivity (3.2%)** suggested recent infection. The **higher IgG antibody positivity (14.3%)** observed in this study indicates late presentation or previous exposure, including possible secondary dengue infection. High IgG seropositivity has been commonly documented in dengue-endemic regions and reflects sustained viral transmission with repeated exposure over time.[14,15]

Importantly, the present study highlights the **diagnostic value of combined dengue testing**. Concurrent NS1 antigen and IgM antibody positivity was observed in 1.4% of cases, representing patients in the **transitional phase of illness**, when viremia overlaps with the early immune response. Additionally, combinations such as NS1 + IgG (1.1%), IgM + IgG (2.1%), and positivity for all three markers (0.9%) further demonstrate that dengue patients often present at varying stages of infection.This differentiates secondary infection from previous infections. These cases would likely have been **missed or misclassified if only a single diagnostic marker had been used**.

The detection of multiple marker combinations underscores the limitation of relying on isolated tests and supports the use of an integrated diagnostic approach. Combined antigen–antibody testing improves overall diagnostic sensitivity, enhances detection of active and evolving infections, and allows better differentiation between primary, secondary, and late-presenting dengue cases. Similar observations have been reported in earlier studies, where combined testing significantly increased diagnostic yield compared to individual assays.[16,17]

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CONCLUSION:

This study highlights dengue as a significant cause of acute febrile illness and emphasizes the need for laboratory confirmation due to overlapping clinical features. The variable detection of NS1 antigen, IgM, and IgG antibodies reflects the stage-dependent serological response in dengue infection. Predominant IgG antibody positivity indicates late presentation or previous exposure in a considerable proportion of patients. Combined NS1 antigen and IgM antibody testing

improved the detection of active dengue cases compared to individual assays. Therefore, an integrated dengue testing strategy should be adopted to enable early diagnosis and effective patient management in endemic regions.

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