ORIGINAL RESEARCH

Study of Immunological Markers in Clinically Suspected Cases of Dengue

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Abstract

Dengue virus is transmitted by mosquitoes and represents a major public health problem in tropical and subtropical regions of the world. Early diagnosis is essential for appropriate patient management and prevention of complications.

Aim of the study: The main objective was to assess the distribution of dengue immunological markers [NS1 antigen, immunoglobulin M (IgM) antibody, and immunoglobulin G (IgG) antibody] among clinically suspected dengue patients and to correlate these findings with thrombocytopenia.

Materials and methods: The present study was a retrospective descriptive study that involved 352 serum samples from clinically suspected dengue patients. NS1 antigen and antibody (IgM, IgG) levels were measured using an immunochromatography (ICT) test for NS1.

Results: Out of 352 samples, 109 (30.96%) were seropositive for at least one dengue serological marker. NS1 antigen was detected in 42 (38.53%) cases, IgM antibody in 28 (25.68%) cases, and IgG antibody in 9 (8.25%) cases. Multiple-marker positivity was observed in 30 (27.54%) cases, including combinations of NS1 + IgM, IgM + IgG, and NS1 + IgM + IgG. Thrombocytopenia was the most prominent hematological finding and was observed more frequently among seropositive patients than seronegative patients.

Conclusion: NS1 antigen, IgM, and IgG antibodies are important markers for the laboratory diagnosis of dengue infection. NS1 antigen helps with early detection during the acute phase, while IgM indicates recent infection and IgG suggests past exposure. The combined use of these markers improves diagnostic accuracy and helps determine the stage of disease.

Keywords: Dengue, IgG, IgM, NS1 antigen, Retrospective, Serological markers, Serology.

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Introduction

The dengue virus is a mosquito-borne viral illness with four serotypes and is an important public health concern in tropical and subtropical countries.[1,2] The disease has a wide clinical spectrum from mild febrile disease to severe disease, like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). Early diagnosis is very important for patient management and prevention of complications.[3] There are several ways of testing for dengue [NS1 antigen, immunoglobulin M (IgM) antibody, and immunoglobulin G (IgG) antibody]. NS1 antigen is useful for the early diagnosis of dengue infection, while IgM and IgG antibodies help differentiate recent and past infections.[4,5] Previous studies have emphasized that these markers should be used in conjunction with one another to aid in detection. The typical clinical picture of dengue infection is an acute febrile illness with headache, retro-orbital pain, muscle pain, joint pain, rash, nausea, and vomiting. In a few cases, the disease progresses to a severe form like DHF and DSS, including plasma leakage, bleeding manifestations, and organ involvement.[5,6] Timely clinical diagnosis and laboratory diagnosis are crucial for correct patient management. Although there are diagnostic tests, no data on the serological markers of dengue are available for clinically suspected cases in the north Gujarat region. Hence, this study assesses the distribution and pattern of the NS1 antigen, IgM antibody, and IgG antibody in clinically suspected cases of dengue.

Materials and Methods

Study Design

This was a retrospective study (performed for two year) done at a tertiary hospital in Gujarat. Study design was not employed to estimate diagnostic accuracy, but rather to estimate the distribution of dengue serological markers.

Study Population and Sampling

During the study period, 352 serum samples from clinically suspected dengue patients were received for analysis. Only the first sample from each patient was used. Duplicate samples from the same patient were not included to avoid duplication of data.

Case Definition

Acute febrile illness with at least one clinical feature suggestive of dengue infection—headache, myalgia, rash, retro-orbital pain, nausea, vomiting, and/or other clinically compatible features—was defined as clinically suspected dengue infection. To ensure detection of different serological markers, patients presenting at

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various stages of illness were included, including both early and late phases of infection (≤5 days after symptom onset and >5 days, respectively).

Laboratory Testing

Detection of dengue NS1 antigen, IgM antibody, and IgG antibody was done by using an immunochromatographic (ICT)-based assay (Advantage Dengue NS1 Ag & Ab Combi Card, J. Mitra & Co. Pvt. Ltd., New Delhi, India). The manufacturer reported a sensitivity and specificity of 96 and 98%, respectively, for the NS1 antigen, and 95 and 97%, respectively, for IgM and IgG antibodies.

Platelet Count

All patients had a platelet count recorded as part of the hematological investigations at the time of sample collection.

Inclusion Criteria

Patients of both sexes and any age with clinical features suggestive of dengue infection, for whom serological tests for dengue were requested during the study period, were included.

Exclusion Criteria

Excluded patients were those with incomplete laboratory records, duplicate samples from a single patient, and patients with a confirmed alternative diagnosis. Laboratory tests were done as part of the routine clinical management and excluded alternative diagnoses such as malaria, typhoid fever, and other suspected illnesses.

Statistical Analysis

Data analysis was done using the Statistical Package for the Social Sciences (SPSS) for the Chi-square test and MS Excel for basic descriptive statistics; only frequencies and percentages were calculated.

Results

Of the 352 serum samples that were analyzed, 109 (30.96%) were seropositive for at least one dengue marker (NS1 antigen, IgM or IgG antibody). Isolated NS1 antigen positivity was observed in 42 samples (38.53%), followed by isolated IgM positivity in 28 samples (25.68%) and isolated IgG positivity in 9 samples (8.25%) among the seropositive samples (Table 1).

Out of 109 seropositive samples, 30 (27.54%) cases were found to be "multiple"-marker positive. Of these, 8 (7.34%) were positive for NS1 antigen and IgM antibody, 4 (3.71%) were positive for NS1 antigen and IgM and IgG antibodies, and 18 (16.51%) were positive for both IgM and IgG antibodies (Table 1).

Overall, 131 patients were diagnosed with thrombocytopenia (<100,000/µL). A higher prevalence of thrombocytopenia was observed among seropositive patients (88/109, 80.7%) compared to seronegative patients (43/243, 17.7%) (Table 2). There was a highly significant association between dengue seropositivity and thrombocytopenia (Chi-square test, $\chi^2 = 128.37$, $p < 0.0001$).

Table 1: Distribution of dengue serological markers among seropositive cases ($n = 109$)

Marker	*Seropositive samples (n =109)*	*Percentage (%)*
NS1	42	38.53
IgM	28	25.68
IgG	9	8.25
NS1 + IgM	8	7.34
NS1 + IgM + IgG	4	3.71
IgM + IgG	18	16.51
Total	109	100

Table 2: Platelet count distribution among seropositive and seronegative cases

Platelet count	*Seropositive (n = 109)*	*Seronegative (n = 243)*
Platelet count <100,000/µL	88	43
Platelet count >100,000/µL	21	200

A higher proportion of thrombocytopenia was observed among seropositive cases compared to seronegative cases

Discussion

Dengue fever remains one of the most serious mosquito-borne viral diseases in tropical and subtropical countries around the world. Symptoms range from mild fever to more severe forms, such as DHF and DSS. This is why early laboratory diagnosis is very important for swift clinical management, prevention of complications, and reduction of mortality.[7] The present study was designed to evaluate the distribution of immunologic markers (NS1 antigen, IgM antibody, and IgG antibody) in clinically suspected dengue cases and to correlate these markers with thrombocytopenia in these cases. The results of this study give an insight into the diagnostic value of serological markers in routine clinical practice.

The present study showed that 30.96% (109/352) of the clinically suspected patients were seropositive for one or more dengue markers. This finding showed that there is a significant burden of dengue infection in the study area, as nearly one-third of cases were confirmed by serology among clinically suspected cases. This has also been observed in other studies that were done in endemic areas, where the proportion of dengue-positive cases among the clinically suspected individuals was between 25 and 40%.[8] Laboratory confirmation is important, and the high rate of seropositivity shown indicates that clinical symptoms of dengue are similar to those of other febrile diseases such as malaria, chikungunya, typhoid, and viral fever.[2,5]

The NS1 antigen was found to be the most common finding in seropositive cases, with a positivity rate of 38.53%. The NS1 antigen has been reported to be present during the early phase of illness[3,9] (first 5 days of acute febrile illness) and is a useful diagnostic marker for rapid diagnosis during the early period of illness.[10] This high proportion of patients who were NS1 positive in this study suggests that many presented during the early stages of disease. Other investigators also reported similar results; Alcon et al.[9] demonstrated that the detection of NS1 antigen has turned out to be very useful for the early diagnosis of dengue infection before the production of antibodies and clinical manifestations. In a clinical setting, early diagnosis is crucial to allow for postponing the stage of severe dengue and for appropriate fluid management and monitoring.

In the present study, 25.68% of the IgM antibody-positive patients were also found. IgM antibody is typically seen in recent or acute infection.[11] The presence of a positive IgM in the present study means that the person has an active or recent infection with

the dengue virus. The same findings have been reported in several previous studies where IgM was considered a key parameter of a recent infection and frequently incorporated in the serological diagnosis of routine practice.[11,12] Moreover, the presence of IgG antibody was seen in 8.25% of the patients, indicating either previous infection, secondary infection, or convalescent stage of the disease. IgG antibodies are usually present in infections and may cause more severe clinical manifestations in patients because of antibody-dependent enhancement, and may persist for a longer period of time.[10] These findings are comparable to earlier reports describing the role of IgM and IgG in identifying different stages of dengue infection.[13]

Multiple positivity of serological markers was another important finding in the present work, which is 27.54% of the patients for whom the positivity of more than one serological marker was observed. The presence of mixed serological patterns (NS1 + IgM, IgM + IgG, and NS1 + IgM + IgG) suggests possible overlapping phases of immune response and different phases of infection. In endemic areas where the infection of the second type is frequently seen, the mixed serological type is considered typical, a type that has been reported previously.[12] Concurrently using NS1 antigen and antibody testing, hence, improves the diagnostic sensitivity and understanding of the stage of infection.

Another significant finding of the present study was thrombocytopenia. For seropositive patients, 80.7% had platelets < 100,000/μL, and only 17.7% of seronegative patients had thrombocytopenia. There was a highly statistically significant association between dengue seropositivity and thrombocytopenia.[14] This finding agrees with previous research, which showed that one of the prominent hematological changes in dengue infection is thrombocytopenia.[7] Platelet consumption, bone marrow suppression, and immune-mediated platelet destruction are responsible for decreased platelet counts in dengue patients. In severe cases of thrombocytopenia, bleeding symptoms may occur and an increased risk of developing DHF. Thus, there remains a key role for platelet monitoring in the management of patients with dengue.

Since NS1 antigen and antibodies are simple, fast, cost-effective, and suitable for routine use in a hospital setting, the study used ICT rapid diagnostic tests (RDTs) to detect NS1 antigen and antibodies. RDTs are vital in making early diagnostic and treatment decisions, particularly in resource-constrained healthcare environments.[15] In the study, however, there were a few limitations noted. No confirmatory tests [e.g., enzyme-linked immunosorbent assay (ELISA), reverse transcription polymerase chain reaction (RT-PCR)] were available, which limited the capacity to determine the diagnostic accuracy of the rapid test used. Further, the retrospective design and lack of detailed demographic and clinical severity classification may not allow for broader interpretation of results.

Finally, the present study demonstrates that the triad of NS1 antigen, IgM antibody, and IgG antibody is quite useful for the diagnosis of dengue infection and the classification of various stages of the disease.[16] A high correlation of the percentage of dengue-positive patients and the decrease in the number of platelets in suspected patients further highlights the significance of monitoring hematological parameters in suspected dengue. The study supports the role of frequent clinical testing with rapid serological tests and emphasizes the need for more studies with confirmatory molecular testing to increase diagnostic accuracy and better manage patients.

Conclusion

In the present study, the serological markers of dengue (NS1 antigen, IgM, and IgG) were reported in clinically suspected cases. These results could be useful in understanding the distribution of these markers at different stages of infection and may help in clinical interpretation in a clinical setting. The combination of these markers could be used to gain insight into the progression of a dengue infection and to more adequately assess cases suspected of having the infection. Due to this, the present study relied on the feasibility of using the RDT to detect the serological markers of dengue in a routine clinical setting. Better diagnostic accuracy can be obtained through confirmatory tests, and the use of gold standard tests like RT-PCR and ELISA is recommended.

Ethics Statement

Clearance was obtained from the Institutional Ethics Committee of Nootan Medical College & Research Centre, Sankalchand Patel University, Visnagar, with reference number EC/NEW/INST/2022/GJ/0083. All participants gave written informed consent.

Data Availability Statement

Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

Anjaliben Rajubhai Patel contributed to study design, data collection, data analysis, and manuscript preparation. Vaishnavi Patel contributed to study supervision, manuscript review, and final approval of the manuscript. Both authors read and approved the final manuscript.

AI Disclosure

The authors used artificial intelligence tools only for language editing and grammar improvement. All scientific content, interpretation, and conclusions were reviewed and approved by the authors.

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References

1. Bhatt S, Gething PW, Brady OJ, et al. The global distribution and burden of dengue. Nature 2013;496(7446):504–507. DOI: 10.1038/nature12060
2. Schaefer TJ, Panda PK, Wolford RW. Dengue fever. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK430732/
3. Murray NE, Quam MB, Wilder-Smith A. Epidemiology of dengue: past, present and future prospects. Clin Epidemiol 2013;5:299–309. DOI: 10.2147/CLEP.S34440
4. Edeling MA, Diamond MS, Fremont DH. Structural basis of flavivirus NS1 assembly and antibody recognition. Proc Natl Acad Sci U S A 2014;111(11):4285–4290. DOI: 10.1073/pnas.1322036111
5. Kuo HJ, Lee IK, Liu JW, et al. Analyses of clinical and laboratory characteristics of dengue adults at their hospital presentations based on the World Health Organization clinical-phase framework:

emphasizing risk of severe dengue in the elderly. J Microbiol Immunol Infect 2018;51:740–748. DOI: 10.1016/j.jmii.2016.08.024
6. World Health Organization. Dengue Haemorrhagic Fever: Diagnosis, Treatment, Prevention and Control, 2nd edition. Geneva: World Health Organization; 1997.
7. Kalayanarooj S. Clinical manifestations and management of dengue/DHF/DSS. Trop Med Health 2011;39(4 Suppl.):83–87. DOI: 10.2149/tmh.2011-S10
8. Khor YS, Sam SS, Tong KL, et al. Evaluation of immune-endothelial activation markers for the differentiation of severe dengue.J Transl Med 2025;24(1):93. DOI: 10.1186/s12967-025-07521-z
9. Alcon S, Talarmin A, Debruyne M, et al. Enzyme-linked immunosorbent assay specific to dengue virus type 1 nonstructural protein NS1 reveals circulation of the antigen in the blood during the acute phase of disease in patients experiencing primary or secondary infections. J Clin Microbiol 2002;40(2):376–381. DOI: 10.1128/JCM.40.02.376-381.2002
10. Ur Rahman M, Tabassum S, Salman M, et al. Clinical and laboratory markers of acute dengue infection. Ann Abbasi Shaheed Hosp Karachi Med Dent Coll 2024;29(3):283–290. DOI: 10.58397/ashkmdc.v29i3.882
11. Thergarajan G, Sekaran SD. Diagnostic approaches for dengue infection. Expert Rev Mol Diagn 2023;23(8):643–651. DOI: 10.1080/14737159.2023.2234815
12. Guzman MG, Kouri G. Dengue diagnosis, advances and challenges. Int J Infect Dis 2004;8(2):69–80. DOI: 10.1016/j.ijid.2003.03.003
13. Vaughn DW, Nisalak A, Solomon T, et al. Rapid serologic diagnosis of dengue virus infection using a commercial capture ELISA that distinguishes primary and secondary infections. Am J Trop Med Hyg 1999;60(4):693–698. DOI: 10.4269/ajtmh.1999.60.693
14. Velu V, Manivel A, Sabastin M, et al. Assessment of expression of TNF signaling proteins in dengue cases as potential biomarkers for predicting severity of the disease in the study population. Microb Pathog 2025;206:107688. DOI: 10.1016/j.micpath.2025.107688
15. Mukherjee S, Saha B, Tripathi A. Clinical significance of differential serum-signatures for early prediction of severe dengue among Eastern Indian patients. Clin Exp Immunol 2022;208(1):72–82. DOI: 10.1093/cei/uxac018
16. Pereira SH, Franco-Luiz APM, Nogueira CT, et al. Clinical, serological, and molecular profile of dengue patients with warning signs during the 2024 outbreak in Belo Horizonte, Brazil. J Med Virol 2026;98(1):e70805. DOI: 10.1002/jmv.70805