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# Screening for Suspected Cases of Dengue using a Rapid Immunochromatographic Test at a Tertiary Care Centre

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**Original Research Article**

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**Abstract:**Dengue is a viral infection that affects millions of lives each year. A rapid screening test that would detect the NS1 antigen, IgM and IgG antibodies to recombinant antigens of all the dengue viruses helps in early detection of a potentially fatal disease. SD Bioline Duo, with the lateral flow technique, was employed in 24 cases of suspected dengue fever over a one-month period in a tertiary care hospital, with 14 cases (58.33%) testing positive. It helped in timely management of the cases and prevention of further complications of the viral disease.
**Keywords:** Dengue, immunochromatographic test.

## INTRODUCTION

Dengue is a viral infection caused by the dengue virus (DENV). DENV is a member of the Flaviviridae family of ribonucleic acid (RNA) viruses [1, 2]. There are four serotypes of dengue virus (DENV-1, DENV-2, DENV-3 and DENV-4) although a possible fifth serotype (DENV-5) was reported quite recently [3]. The virus being arthropod borne is transmitted to humans by the bite of an infected female mosquito, the primary vector being the *Aedesaegypti* mosquito but other species like *Aedesalbopictus* and less commonly *Aedespolynesiensis* can also transmit the virus [4]. Clinical presentations of dengue diseases range from asymptomatic or self-limiting dengue fever (DF) to severe dengue characterized by plasma leakage (DHF, grades 1 and 2) that can lead to a life-threatening syndrome (DSS, grades 3 and 4) and severe bleeding and/or severe organ impairment [5].

Each year, more than 250,000 cases of dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) are reported from an estimated 50 million dengue infections [6].

Accurate and timely identification of emerging infectious diseases is a must for early initiation of treatment. The patients present with mild symptoms sometimes with a fever and/ or malaise history of a few days to the emergency departments which progressively become severe over a course of time. The aim of the study was to screen for dengue in suspected cases using a rapid immunochromatographic test.

## MATERIALS AND METHODS

The retrospective cross-sectional study was conducted in a tertiary care hospital in Andhra Pradesh, India. It is a 1000-bedded hospital with a fully equipped laboratory. Patients who presented to the emergency departments with fever and malaise and low platelet counts were eligible to take the rapid immunochromatographic test for screening of dengue fever. The test used was SD Bioline Duo, which tests for dengue NS1 antigen, IgM and IgG antibodies. It contains two in-vitro immunochromatographic assays for analysis of dengue infection in human serum, plasma or whole blood. It is a lateral flow based immunochromatographic rapid test for the qualitative detection of NS1 antigen and anti-dengue IgM and IgG from patient's samples. The device is designed to detect IgM antibodies to dengue, as well as elevated IgG titers that are indicative of a secondary infection. The rapid tests were read and interpreted according to the manufacturers' instructions. The test is a qualitative assay to detect antibodies for all four dengue serotypes by using a mixture of recombinant dengue envelope proteins.

Serum samples were collected from the patients presenting to the emergency departments with clinical suspicion of dengue. The patients with other known causes of fever were excluded from the study. Any tests where the control line did not appear were considered as invalid and excluded from the study. Statistical analysis was done in percentages and proportions in this descriptive study.

## RESULTS

24 cases were tested during a one-month period of study (10th August 2018- 10th September 2018). The median age of the cases was found to be 24 years. The appearance of any test line was considered as positive. 14 cases tested positive (58.33%) with the preliminary screening test for dengue (Table-1), with 11 positive for NS1, 7 for IgG and 9 cases positive for IgM antibodies (cases inclusive) (Table-2 and Chart 1).

**Table-1: Tests screened positive for Dengue with SD Biolineimmunochromatographic test**

| Total number of cases screened | Number of cases found positive in screening test |
|---|---|
| 24 | 14 (58.33%) |

**Table-2: Tests found positive for Dengue NS1antigen, IgG and IgM antibodies** (cases inclusive)

| NS1 Antigen | IgG antibodies | IgM antibodies |
|---|---|---|
| 11 (78.6%) | 7 (50%) | 9 (64.3%) |

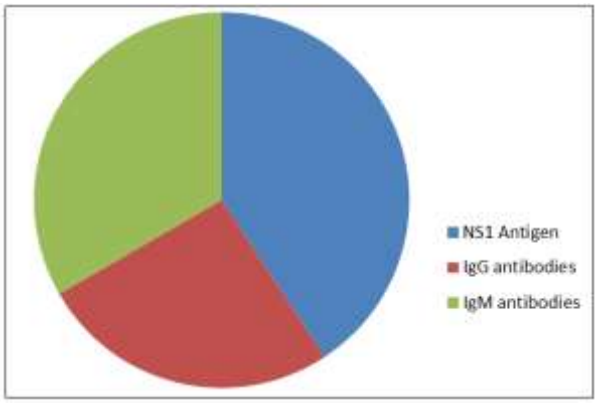


**Chart-1: Cases positive for dengue NS1, IgG and IgM antibodies**

## DISCUSSION

Dengue has become one of the most important global health problems in the past few decades, affecting millions of people annually [7]. Serological assays performed on a single serum specimen using rapid test devices, in many instances, provide presumptive diagnosis of dengue infections [8]. The kit used in this study, the SD Bioline Duo, has nearly 92.4% (95%CI: 86.1-95.9%) sensitivity and 98.4% (95% CI: 95.5-99.5%) specificity for dengue NS1 antigen. It is designed to have 94.2% (95%CI: 88.5-97.2%) sensitivity and 96.4% (95% CI: 93.0- 98.2%) of specificity for dengue IgG/IgM, as reported by a study done in Korea.

Dengue NS-1 antigen can be found in patient's serum until anti-NS-1 IgG is produced. The variable levels of NS-1 antigen in different phases of infection might be due to the immune-complex formation of NS1 antigen with anti-dengue IgG, resulting in less sensitive dengue detection in acute-phase secondary infection [9]. In the present study a good number of cases (78.6%) showed positivity of NS1 antigen in suspected cases of dengue, and could be correlated clinically. These cases showed rapid improvement with specific treatment and follow-up. IgM was also positive in many cases (64.3%) and was often found positive in conjunction with NS1 antigen. IgG was often found positive (50% cases) in patients with fever of longer duration.

The NS1 test has been proven as a valuable test in increasing the sensitivity of the acute-phase and early-convalescent-phase of dengue diagnosis, surveillance and clinical diagnosis [10]. The NS1 Ag capture sensitivity tends to be lower in asymptomatic patients than that in symptomatic individuals [11]. According to literature, rapid tests can identify patients with atypical dengue presentations. Fever was one of the important points of reference for patients to access the health care systems. A study done by Shih *et al*., suggested that if fever was used as the indicator of dengue, NS1Ag, alone or either combining IgM, IgG or both would increase the sensitivity up to 85–100% in the first 5 days [12].

The present study has several limitations. An increased sample size with comparison done with ELISA or RT-PCR would have given much better results. The authors plan to perform comparison with ELISA in the future.

## CONCLUSIONS

The use of a rapid diagnostic kit for NS1, IgM and IgG as a screening tool for dengue was a cost efficient and time-saving method. It is easier to use and compared to RT-PCR and other tests, did not need a huge laboratory support and was easier to use in our clinical laboratory, demonstrating satisfactory sensitivity and cost-effectiveness. Early, proper

treatment could be provided to the patients, and optimal infection control measures, such as insecticide sprays and environmental cleaning in the community could be enacted for maximal beneficial effects.

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