

Seroprevalence of Dengue NS1 Antigen in a Tertiary Care Hospital, Jamnagar

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ABSTRACT

Background: Dengue is one of the most serious mosquito-borne viral infections affecting tropical and subtropical countries in the world. Since there is no immune prophylactic or specific antiviral therapy available, timely and rapid diagnosis plays a vital role in patient management and implementation of control measures.

Study design: Cross sectional Study was conducted from April-2018 to March-2019. Total 1786 blood samples of patient suspected of Dengue NS-1 Antigen by ELISA method.

Objectives: To find out sero-prevalence of dengue NS-1 in and around Jamnagar by presence of virus specific NS-1 antigen from serum samples taken from patients with clinical features suggestive of Dengue.

Material and methods: Patients attending outpatient department or admitted in a tertiary care hospital, Jamnagar with fever, headache, body ache, myalgia or signs and symptoms suggestive of Dengue were included in the study. Blood samples were screened for dengue NS-1 antigen by ELISA.

Result: Total 1786 samples were tested for dengue NS1 antigen, out of these 280 samples (16%) were tested positive for NS1.

Out of 280 positive samples, 168 samples (60%) were of 3-4 days of illness. Dengue fever shows seasonal peak in the month of October when 95 out of 280 (34%) samples were positive.

Conclusion: NS1 antigen detection has potential value for screening patient samples during the early acute phase. It is rapid, easy to perform & interpret and has an extended shelf life. We conclude that dengue NS1 antigen detection is an effective tool for early diagnosis of dengue infection.

Key words: Dengue, NS1 Antigen

INTRODUCTION

Dengue is a mosquito-borne virus infection prevalent in tropical and subtropical regions around the world, and it has emerged as an important global public health challenge. ⁽¹⁾ It is widely distributed throughout tropics & subtropics. It is also known as break-bone fever, this term was coined during the Philadelphia epidemic in 1780. Four type of dengue viruses exist: DEN 1, DEN 2, DEN 3, DEN 4. ^(12,13) DEN 1 was first isolated from Hawaii in 1944,

DEN 2 from Guinea 1944, DEN 3 & 4 from Philippines in 1956. Dengue virus belongs to genus Flavivirus and family Flaviviridae. Dengue virus is an envelope positive -sense RNA virus. The genomic RNA is approximately 11 kb in length, and is composed of three structural protein genes that encode the nucleocapsid or core protein (C), a membrane - associated protein (M), an envelope protein (E), and seven nonstructural (NS) protein genes. ⁽⁹⁾ NS1 test detects the non-structural protein NS1

of dengue virus. This protein is secreted into the blood from infected cells during acute phase of dengue infection and is found in serum at detectable levels that overlap with peak viremia. (15,17) NS1 levels also coincide with the onset of detectable IgM in acute primary cases and IgG in acute non primary cases. (17,18) It has been found that elevated levels of serum NS1 directly indicate increased viral burden and further establish the positive correlation between viremia and NS1 profiles. (19,20) NS1 is a generally conserved protein among flaviviruses but has been found to contain both cross-reactive and serotype-specific epitopes among dengue viruses. (21-23) The immature form of NS1 is that of a monomer that is variably glycosylated but readily forms heat-labile homodimers which are usually associated with the surface of infected cells, from there, the major oligomeric form of sNS1 is thought to be a hexamer of around 300kDa. The hexamer consists of 3 dimeric subunits that are non covalently bound and are less stable than NS1 dimers. (24,25)

There has been a gradual increase in the global incidence of dengue since the year 2000 (World Health Organization 2009) which is believed to be due to factors such as rapid urbanization, expanding human population and activities, and increased global travel and geographical expansion of the primary vector, *Aedes aegypti*. (10)

Clinical manifestations occur after an incubation period of 3-14 days. Approximately 1 in 20 patients with dengue virus disease progress to develop severe, life threatening condition called severe dengue. Severe dengue is defined by dengue with any of the following symptoms: severe plasma leakage leading to shock or fluid accumulation with respiratory distress, severe bleeding or severe organ impairment such as elevated transaminases >1000 IU/L, impaired consciousness or heart impairment. (16) To date, accurate and timely diagnosis of early detection with DENV remains a problem for management of dengue infected patients in many parts of

the world, especially in countries with limited resources. (5) Nonstructural protein 1 (NS1) of DENV has shown to be useful as a tool for the early diagnosis of acute dengue infections. (8)

MATERIAL & METHODS

Present study was conducted in the Department of Microbiology, Shri. M.P. Shah Govt. Medical College, Jamnagar, Gujarat from April 2018 to March 2019, Total 1786 blood samples were collected from clinically suspected cases of dengue viral infection, patients presenting with acute onset of fever, headache, body aches, rash spreading from the trunk. Sera were separated and subjected to detection of dengue NS1 antigen by enzyme-linked immunosorbent assay (ELISA). The test kits used were Platelia™ dengue NS1 AG manufactured by Bio-Rad, Marnes-la-Coquette France. The tests were performed strictly as per the manufacturer's instructions and guidelines.

INCLUSION CRITERIA:

Blood samples of patients having fever, headache, myalgia, retro-orbital pain, rash, hemorrhagic manifestations of 1-5 days referred by the physicians in various OPDs, IPDs, emergency ward of the hospital.

EXCLUSION CRITERIA:

Blood samples of patients with >5 days of illness.

Unlabeled, haemolysed, and lipaemic blood samples were excluded.

RESULT

Total 1786 samples were tested for dengue NS1 antigen, out of these 280 samples (16%) were tested positive for NS1. Out of 280 positive samples, 168 samples (60%) were of 3-4 days of illness. Followed by 84 samples (30%) for 5 days of illness, 25 samples (9%) for 2 days of illness and 3 samples (1%) for 1 day of illness. Dengue fever shows seasonal peak in the month of October when 95 samples out of 280 (34%) were positive.

Out of 280 positive samples, 157 samples (56%) were of male patients and 123 samples (44%) were of female patients.

Table 1. Prevalence of dengue NS1 Ag

Total number of samples tested	Total number of positive samples	% Positive samples
1786	280	16%

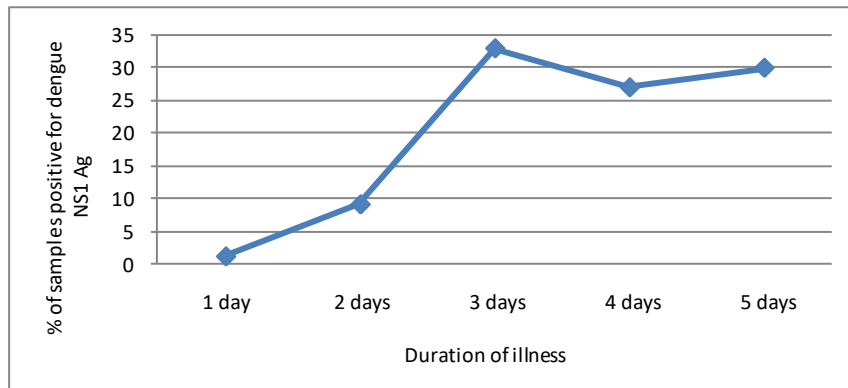


Fig. 1 Detection of dengue infection by duration of illness

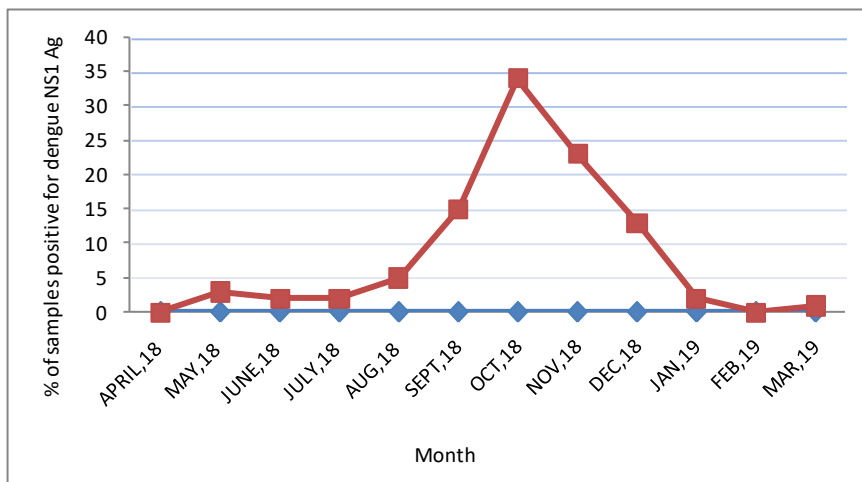


Fig.2 Month wise (seasonal) analysis of dengue NS1 antigen positive cases

DISCUSSION

Dengue infection presents as a non specific fever mimicking other viral fevers. Dengue virus infection has emerged as a notable public health problem in recent decades in term of the mortality and morbidity associated with it. NS1 tests are sensitive during first 1-7 days of symptoms, after 7 days NS1 tests are not recommended. (15) Dengue virus specific IgM and neutralizing antibodies typically develop towards the end of first week of illness. IgM antibodies are detectable starting 4-5 days after onset of symptoms and are reliably detectable for approximately 12 weeks. In the present study maximum NS1 antigen

positive are between 3 to 4 days of illness (60%), which is similar to the study conducted by Fauziah Md. Kassim et al (2011). (5) A positive NS1 test result is indicative of a dengue infection but does not provide serotype information. (2,3) A negative NS1 test result does not rule out infection. People with negative NS1 result should be tested for the presence of dengue IgM antibodies.

The seasonality of transmission of dengue with increased activity in the post monsoon season was seen in the present study. Most of the positive cases (34%) occurred during the month of October. This is in comparison with similar pattern of

month-wise case distribution seen with authors Aditi Garg et al in 2015, Gomber et al in 2001, Jayasimha VL et al.2010. (1,6,7) These findings indicate that dengue infections are mostly seen in post monsoon season hence preventive measures should be in full swing at the very onset of the monsoon. The reason for this can be the heavy rains of monsoon season, which usually start in August, September resulting in stagnant water that serves as breeding ground for vectors of this virus and lead to increased activity in post monsoon period. Also the breeding habit of *Aedes aegypti* is highest during post monsoon period. The tropical zones of the world having monsoon rains are the usual habitat of this mosquito. The breeding of *Aedes aegypti* is highest during post monsoon period.

CONCLUSION

Study shows that Dengue NS1 Ag is most detectable in 3 to 4 days of illness. NS1 picks early detection. NS1 antigen detection has potential value for screening patient samples during the early acute phase. It is rapid, easy to perform & interpret and has an extended shelf life. We conclude that dengue NS1 antigen detection is an effective tool for early diagnosis of dengue infection.

Surveillance is pre-requisite for monitoring the dengue situation in the study area especially during post rainy season (October). In the absence of a vaccine, dengue prevention is focused upon controlling mosquito vectors. Development of improved surveillance methods for DENV in mosquito populations would be of great value for public health and vector control programs. (4,11,14)

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