

Seroprevalence of Dengue infection in clinically suspected cases of dengue at tertiary care hospital in central India

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Abstract

Introduction: Dengue is one of the most serious mosquito borne viral infection of man affecting mainly tropical and subtropical countries and caused by four serotypes of dengue virus, namely DEN-1, DEN-2, DEN-3 and DEN-4 belonging to genus flavivirus and family flaviviridae. It spreads through the bite of infected Aedes mosquito. Dengue is potentially fatal viral infection that can culminate into dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). The newer parameter NS1 antigen is detectable from day 1 of fever both in primary and secondary infections. **Materials and Methods:** Blood samples from clinically suspected cases of dengue tested immediately for qualitative detection of NS1 Ag, IgM and IgG antibodies by rapid solid phase immunochromatography test (ICT). **Results:** Out of 1090 samples tested, a total of 354 samples were tested positive for either one or more of the three markers i.e. NS1 Ag, IgM and IgG antibody tested. Of the 354 serum samples, 182 (51.41%) patients were positive for NS1 Ag only, 29 (8.19%) positive for IgM only, while 54 (15.25%) were positive for IgG only. More than one marker was detected in the remaining 89 (25.14%) samples. Primary dengue was detected in 224 (63.27%) cases and secondary dengue infection was detected in 130 (36.73%) cases. **Conclusions:** All suspected cases must be monitored for all three parameters i.e. NS1 Ag, IgM and IgG antibodies to differentiate between primary and secondary infection. Discrimination between primary and secondary dengue infections is important as the possibility of DHF and DSS is more in secondary infection.

Key words: Dengue, IgM dengue antibody, IgG dengue antibody, NS1 antigen.

Introduction

Dengue is one of the most serious mosquito borne viral infection of man affecting mainly tropical and subtropical countries caused by dengue viruses (DV) belonging to family *Flaviviridae*. There are four serotypes of the virus referred to as DV-1, DV-2, DV-3 and DV-4. It spreads through the bite of infected female Aedes mosquito [1]. All four serotypes of dengue virus can cause full spectrum of disease from a subclinical infection, the dengue fever (DF) and a severe disease that may be fatal, the dengue hemorrhagic fever/dengue shock syndrome (DHF/DSS) [2]. The Infection with any one serotype confers an individual life-long immunity to that same serotype but it has cross reactivity to the other serotype. Secondary infection with another serotype or multiple infections with different serotypes leads to severe form of dengue,

dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS) due to this cross-reactivity [3]. The incidence of dengue has increased over last 50 years with 2.5 billion people living in areas where dengue is endemic [4]. It affects 100 million people each year with 500,000 cases of DHF and DSS with around 30,000 deaths mostly among children [1]. It is known that early and specific diagnosis of DHF and DSS followed by supportive therapy reduces mortality and morbidity [5]. Viral Isolation by cell culture and subsequent detection by immunofluorescence, though the gold standard tests for identification of dengue infection are not within the reach of peripheral and even most tertiary care laboratories [6]. For a long time, detection of dengue – specific IgM/IgG has been the main stay of diagnosis of dengue infection. Antibody detection is an indirect method of diagnosis and therefore is prone to false positive as well as false

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negative results [7]. NS₁ antigen is detectable from day 1 of fever both in primary and secondary infections. NS₁ is shown to be highly specific viral marker making it extremely reliable parameter for diagnosis of dengue infection from day 1 of fever [8]. The present study was done to assess the seroprevalence of dengue infection in clinically suspected cases of dengue fever at tertiary care hospital in Amravati city.

Aims and Objectives

1. To determine the prevalence of primary and secondary infections among the clinically suspected cases of dengue.
2. To assess the seasonal pattern of dengue fever.

Materials and Methods

The Study was conducted in the department of Microbiology at Dr. Panjabrao Deshmukh Memorial Medical College, Amravati from January 2014 to December 2014, after receiving permission from Institutional ethical committee.

Study Design: Observational type of study.

Results

Out of 1090 samples tested, a total of 354 samples were tested positive for either one or more of the three markers i.e. NS₁ Ag, IgM and IgG antibody tested. Primary dengue was identified when either NS₁ antigen or IgM was positive with a negative IgG test, while secondary dengue was diagnosed when either of the above was associated with IgG positivity.

Table No 1: Distribution of various dengue specific parameters.

Parameter	Total	Percent (%)
Only NS ₁ positive	182	51.41%
Only IgM positive	29	08.19%
Both NS ₁ IgM positive	13	03.67%
Only IgG positive	54	15.25%
IgG and NS ₁ positive	20	05.64%
IgG and IgM positive	27	07.27%
IgG, IgM and NS ₁ positive	29	08.19%
Seropositivity	354	32.47%

Seropositivity for dengue infection was 32.47%.

Out of 1090 samples 354 were positive for NS₁ / IgM / IgG. Of the 354 serum samples, 182 (51.41%) patients were positive for NS₁ Ag only, 29 (8.19%) positive for IgM only, while 54 (15.25%) were positive for IgG only. More than one marker was detected in the remaining 89 (25.14%) samples. In Pediatric age group seropositivity for dengue was **41.46%** i.e. 204 samples were positive out of 492 samples. In adult age group seropositivity for dengue was **25.08%** i.e. 150 samples were positive out of 598 samples

Table No 2: Showing distribution of primary and secondary dengue infection.

Parameter	Total	Percent (%)
Only NS1 positive	182	51.41%
Only IgM positive	29	08.19%
Both NS1 IgM positive	13	03.67%
Primary Infection	224	63.27%
Only IgG positive	54	15.25%
IgG and NS1 positive	20	05.64%
IgG and IgM positive	27	07.27%
IgG, IgM and NS1 positive	29	08.19%
Secondary Infection	130	36.73%

.Primary dengue was detected in 224 (63.27%) cases and secondary dengue infection was detected in 130 (36.73%) cases. Maximum number of serologically positive cases were found in September (71), October (139) and November (79). Though dengue was present throughout the year there was significant dip in March.

In Pediatric patients' primary dengue was detected in 133 (65.20%) cases and secondary dengue infection was detected in 71 (34.80%) cases. In Adult patients primary dengue was detected in 91 (60.66%) cases and secondary dengue infection was detected in 59 (39.33%) cases.

Discussion

Dengue infection presents with non specific fever that mimics other viral illnesses. To prevent the outbreaks it is necessary to diagnose the dengue virus infection as early as possible. For a long time, the diagnosis of dengue infection was based on detection of dengue specific IgM / IgG antibody. The new parameter for diagnosis of dengue infection, NS1 antigen, is detectable from day one of fever in both primary and secondary infections and declines to undetectable levels by 5-6 days. It was revealed from the study, that seropositivity was higher in pediatric age group (0 to 15 years), i.e. 41.46%, as compared to adult age group i.e. 25.08%. It is very significant finding because true endemicity of dengue is reached when the adult infection declines and only the new entrants into the population, that is children are affected more by the disease. The study by Garg et al. [9] has also shown similar results. However other similar studies have reported the seroprevalence of dengue in the age group of 15 to 45 years [10, 11].

In our study only NS1 antigen was positive in 182 (51.41%) patients, NS1 alone or in combination with either IgM or IgG was positive in 244 (68.92%) cases. Datta et al [8] and Kulkarni et al [12], have shown that NS1 was positive in 140 out of 600 (23.3%) and 95 out of 320 (29.68%) serum samples. Dengue specific IgM is a very good indicator of recent infection. It is detectable within 3-5 days of infection. The titer of IgM

rises quickly within 2 weeks and wanes to undetectable levels after 2-3 months. It may also be detectable in secondary dengue infection. In our study only IgM was positive in 29 (8.19%) cases and in combination with NS1 including only NS1 positive was in 224 (63.27%) cases indicating primary dengue infection. Seropositivity for primary dengue infection was more in pediatric age group.

Among two antibodies IgG is less reliable marker in the diagnosis of dengue infection [12]. Both clinical and subclinical infections can produce IgG which may persist for several years. In our study only IgG was positive in 54 (15.25%) cases and in combination with NS1 antigen and IgM in 130 (36.73%) cases indicating secondary dengue infection. Secondary dengue infection was more in 59 (39.33%) samples out of 150 samples of adult age group as compared to 71 (34.80%) samples of pediatric age group out of 204 samples. Largest proportion of serologically positive cases recorded in monsoon and post monsoon period. This is essentially related to the increase in mosquito population during this period.

The limitation of study is that enzyme linked immunosorbent assay (ELISA) for qualitative and quantitative detection or polymerase chain reaction (PCR) were not used. ELISA has higher sensitivity than ICT based tests. But as dengue has become an important public health problem in our country, the

ease, speed and dependability of immunochromatography make it an excellent tool in detecting this potentially fatal epidemic prone infection. As dengue often breaks out in resource poor peripheral areas where ICT based tests could be the only support available.

Conclusion

1. All suspected cases must be monitored for all three parameters i.e. NS1 Ag, IgM and IgG antibodies to differentiate between primary and secondary infection.
2. Discrimination between primary and secondary dengue infections is important as the possibility of DHF and DSS is more in secondary infection.
3. The morbidity and mortality of DHF can be reduced by early diagnosis, hospitalization and symptomatic care.
4. Monitoring of vector borne diseases like dengue will help to take appropriate measures against mosquitoes like *Aedes aegypti* which will further help to prevent large outbreaks of the disease.

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