Epidemiology and seropositivity of dengue fever cases in a rural tertiary care hospital of western Maharashtra, India

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Abstract
Introduction: Dengue fever is rapidly emerging in India, even in non endemic areas. Dengue fever is more commonly seen in adults and older children. It was earlier confined to urban areas and now has penetrated into rural setup. Clinical presentation varies from mild to severe fatal form; therefore laboratory diagnosis is very essential.
Objective: To study the seropositivity of clinically suspected dengue fever cases
Material and method: Blood samples from clinically suspected dengue fever cases were screened for NS1 dengue virus antigen and IgM and IgG dengue specific antibodies by rapid immuno chromatographic test (ICT) Dengue Day 1 kit (Mfd by J. Mitra & Co. Pvt. Ltd).
Result: Out of total 917 blood samples tested, 281(30.6%) were positive for one or more of three markers. Of 281 blood samples NS1 was positive in 198 cases while NS1 with either IgM or IgG was positive in 16 cases. Only IgG in 25cases and only IgM in 28 cases was observed. All the three parameters were positive in 3 cases.
Conclusion: From the present study it can be concluded that the dengue cases are on rise and this underlines the need for continuous surveillance and rapid implementation of dengue control programme.
Keywords: Dengue, Dengue specific IgM, Dengue specific IgG, Epidemic, India, NS1 Ag.

1. Introduction

Among mosquito-borne viral infections Dengue is serious disease affecting tropical and subtropical countries like India. Dengue in India has been endemic for over two centuries with mostly benign and self limited course. Currently there is increase in frequency of outbreaks. There has been a considerable increase in the number of cases, severity of disease as well as wide geographic spread. Dengue Fever (DF) manifest as an acute febrile illness with headache, excruciating and myalgia in older children and adults. India is one of the seven identified countries in the South-East Asia region regularly reporting incidence of DF and Dengue Hemorrhagic Fever outbreaks and may soon transform into a major niche for dengue infection.

The mosquito eggs of Aedes can survive for long periods due their capacity to withstand desiccation. Improper disposal of waste and sewage are responsible for high mosquito densities. This is the cause for post monsoon epidemics in country like India. The rural spread of the vector is relatively recent occurrence associated with the development of rural water supply schemes, improved transport system, scarcity of water and life style changes. The degree of morbidity and
mortality associated with dengue infectivity necessitates the early diagnosis, which could be established either by demonstrating dengue specific immunoglobulins (IgM and IgG) or detection of viral antigen in clinical sample.

Non structural protein1 (NS1) dengue virus antigen begins to appear in blood from day one of infection while IgM antibodies from seventh day onwards. Dengue specific IgG antibody appear after 14 days and persist for life in case of primary infection and rise within 1-2 days after onset of symptoms in secondary infection. NS1 dengue virus antigen is highly conserved glycoprotein which appears essential for virus replication. It can be detected during acute phase of disease in patients experiencing primary and secondary infection. It possesses not only group specific but also type specific determinants and has been recognized as an important antigen in dengue infection. Thus targeting NS1 antigen detection should be the approach for early diagnosis and timely management. 6-9

2. Material and method

The study was carried out in Department of Microbiology, Rural Medical College, Loni (Western Maharashtra) during the period of October 2012 to May 2013.

Blood samples were collected from clinically suspected DF /Dengue Hemorrhagic Fever (DHF) cases (within 10 days of onset of fever) attending clinical departments with prior consent of patients. 10 The study hospital, a tertiary care hospital is situated in rural area draining most of the villages around. A total of 917 blood samples from all ages and both sexes were taken for the study.

Serology: Serum samples from 917 patients were tested for Dengue NS1 Antigen and Dengue specific IgM and IgG antibodies by rapid immune-chromatography (ICT) test (Dengue Day 1 kit Mfd by J. Mitra and Co. Pvt. Ltd). Results were considered valid after checking control band for both antigen and antibodies. Virus isolation and confirmation could not be made due to unavailability of viral culture methods at our rural institution.

3. Results

| Table 1: Distribution of dengue fever cases. |
| Total no. of cases. | Positive | Negative |
|---------------------|----------|----------|
| 917                 | 281      | 636      |
| Percentage          | 30.6     | 69.4     |

| Table 2: Sex wise distribution of dengue fever cases |
| No. of cases | Male | Female |
|--------------|------|--------|
| 281          | 162  | 119    |
| Percentage   | 57.7%| 42.3%  |

Figure 1: Age wise distribution of dengue fever cases
A total 917 blood samples tested for dengue viral infection under study, of which 281 blood samples showed positive result for one or more parameters (Table 1). Out of 281 cases under study sex wise distribution showed male predominance. Male to female ratio found to be 1.3:1 (Table 2). Age wise distribution of dengue fever cases showed significant involvement of adults 15-44 years (50.8%) followed by older children 5-14 yrs (23.4%) (Figure 1).

The maximum number of positive cases was reported in month of November, with second peak in month of May (Figure 2). The presence of NS1 antigen in 198 cases and the presence of dengue specific IgM antibodies /with or without NS1 Ag in 40 cases indicated the primary infection (84.6%). The presence of dengue specific IgG antibodies with or without any other parameter 43 (15.3 %) patients further categorized cases in to secondary infection (Figure 3).

4. Discussion

Dengue is an important emerging disease of the tropical and subtropical regions today. Dengue infection has been known to be endemic in many parts of India for over two centuries as a benign and self limited disease. Epidemics of
dengue are increasing in frequency. Detection of all four dengue serotypes in India has now rendered the India hyperendemic.5

The identification of dengue cases is possible by distinct clinical features but the usual presentation is with varied manifestations. The present study focused the status of dengue fever cases in rural Western Maharashtra. Till this year we were reported very few dengue seropositive cases.

The prevalence of dengue seropositivity among clinically suspected cases during this period was 30.6%. The prevalence of dengue vector and silent circulation of dengue viruses may possibly be the cause of rise in this period. The male to female ratio in present study was 1.3:1 showing male predominance as reported by various authors.11,12 The study revealed the most affected age group as adults (15-44yr) followed by older children (5-14yr) which is comparable to Kumar et al.3 Some authors reported the vulnerability of children to dengue infection.13,14 Paediatric study by Narayan et al concluded that age group affected by dengue is lower and DF is becoming more prevalent in Chennai.15

The transmission of dengue infection increases in post monsoon period as was also observed in the study. The presence of stagnant water after rain fall favors the mosquito breeding which leads in an increased occurrence of dengue.16-18 We also noted rise of cases in month of May. This may be due to severe drought in the area this year and people have tendency to store the water for long period.

Former studies by authors demonstrated a high circulating level of NS1antigen in dengue infections by enzyme immunoassay.19,20 We used the rapid ICT kit which detects Dengue specific antigen and antibodies that is why we could differentiate between primary and secondary infection. Combination of the NS1 antigen and antibody tests increases the diagnostic efficiency for early diagnosis of dengue infection which has been earlier reported.8 Kassim et al has revealed rather similar detection rate of DENV infection between the PCR with antibody (65.9%) and NS1 antigen with antibody (62.0%) combinations.21

The present study discovered the primary infection was significantly higher than secondary infection in study population. Rathod et al study reported secondary infection significantly higher than primary infection (72.4% Vs 37.6%).2 True endemicity will be reached when the adult infection declines and only the new entrants in to the population, that is, children, are affected more by the disease. During secondary dengue infections, preexisting antibodies form complexes with the dengue virus. Recovery from infection by one serotype provides lifelong immunity against that particular serotype but imparts only partial immunity against subsequent infection by other three serotypes.

Arya et al reported the advantage of ‘Dengue Package’ where comprehensive detection of dengue virus non-structural protein 1 (NS1), anti-dengue IgM, anti-dengue IgG and platelet enumeration to the patients, clinicians and public health officials.22

Use of molecular techniques such as RT-PCR has been implied by many researchers to confirm the cases and to know coexisting infection by different dengue serotypes which may be useful for emerging genotypes. This is also to alert public health authorities before or during early phase of outbreak.11,23

The present study points towards presence of dengue viral illnesses in rural areas of western Maharashtra. Study showed the primary infection significantly higher than secondary infection. The involvement of adults followed by older children was mainly observed. Methods such as virus isolation and genomic RNA detection (PCR), need a specialized laboratory, well trained laboratory personnel, which are not usually available in hospital settings but rapid screening method like immune-chromatography test (ICT) was found to be valuable in our study. These are results of eight months study which can be taken as preliminary report from our area. Our study results call attention to the need for continuous surveillance and individual and community action for dengue control.

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