

A Retrospective Assessment of the Seroprevalence and Changing Trend of Dengue in a Tertiary Care Hospital

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Received: 15-08-2022 / Revised: 23-09-2022 / Accepted: 04-10-2022

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Conflict of interest: Nil

Abstract

Aim: The present study was undertaken to find out the seroprevalence of dengue in a tertiary care hospital in Bihar region over the past 2 years and to analyze the changing trends of this infection – essential for planning necessary control and preventive measures in the forthcoming years.

Methods: The retrospective hospital-based study conducted in the Department of Medicine, Vims, Pawapuri, Nalanda, Bihar, India over 2 years. All suspected case of dengue fever, which were either admitted or had visited OPD of Department of Medicine, Vims, Pawapuri, Nalanda, Bihar, India. A total of 1500 cases, with a clinical suspicion of dengue infection, 400 cases (26.66%) were found to be positive for either current or past Dengue infection.

Results: 1500 samples were tested in 2018 and 300 (350%) samples were seropositive for dengue; number of dengue cases detected by NS1 ELISA was 100 (16.66%) and by IgM ELISA were 200 (33.34%). 230 (46%) samples out of the 500 tested in 2019 were seropositive for dengue; 120 (24%) cases were detected as positive by NS1 ELISA and 200 (40%) by IgM ELISA. Of the 400 samples tested during 2020, 170 (42.5%) turned out to be positive for dengue; NS1 ELISA detected 80 (20%) and IgM ELISA detected 150 (37.5%).

Conclusion: Dengue is an emerging public health problem in India. High degree of suspicion, screening for Dengue in suspect cases and preventive measures during monsoon and water stagnation periods may help us in the fight against spread of dengue infection.

Keywords: Dengue fever, Dengue haemorrhagic fever, NS1 Ag, IgM, ELISA

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Introduction

Dengue virus is a positive-stranded RNA virus of the Flaviviridae family with 4 distinct serotypes (DV1-4) and is transmitted to humans by several species of the Aedes mosquito. [1] Dengue fever is a seasonal acute febrile arboviral illness with a spectrum of clinical manifestations ranging from asymptomatic infection to dengue fever (DF), the severe dengue

hemorrhagic fever (DHF) or dengue shock syndrome (DSS) which is strongly influenced by rainfall and temperature. [2] Dengue is emerging as an important mosquito-borne arboviral disease in the world. [3] India is one of the seven identified countries in the South-East Asian region regularly reporting incidence of dengue. [4]

There are five distinct closely related serotypes of Dengue virus (DENV-1, DENV-2, DENV-3, DENV-4 and DENV-5). Distinct genotypes have been identified within each serotype. Currently, three subtypes exist for DENV-1, six for DENV-2, four for DENV-3 and four for DENV-4. [5,6] It is transmitted by the bite of *Aedes* (*Stegomyia*) mosquito species such as *A. aegypti*, *A. albopictus* etc. [6] The viruses are maintained in a mosquito-human-mosquito cycle, with periodic epidemics occurring at 3-to-5-year intervals. After an incubation period of 4 -10 days, infection in humans produce a wide spectrum of illness. Dengue infection may be asymptomatic or may cause dengue fever (DF) or dengue haemorrhagic fever (DHF) including dengue shock syndrome (DSS). [5]

The estimated mortality rate is 2.5%, and the endemicity is spread across 128 countries. However, epidemic outbreaks are more common during the when the vector population is higher. [7] The two factors associated with the increased severity of dengue infection are secondary dengue infection and infection with a virulent viral strain. [8] Early diagnosis of dengue infection remains the cornerstone for treatment and prevention of dreadful complications such as DHF and DSS. [9]

India is one of the dengue prevalent countries. Studies had described dengue in terms of occurrence of these epidemics in India, annual numbers of reported cases with serotypes, and mechanism of pathogenicity, clinical presentation, and the role of the vectors. [10] Many times, the real number of cases could not be identified due to the under/over-reporting or misdiagnosis of cases. Due to lack of awareness, effective and early management, unavailability of the vaccine, dengue remains a challenge for public health authorities in India. [11]

Until mid-1990s, dengue was reported from only three of the four South Indian

states namely, Andhra Pradesh (including the present-day Telangana), Karnataka and Tamil Nadu. Several fatal forms of the disease have been reported in Indian cities of Kolkata, Delhi, and Chennai.4 Treated DHF/DSS is associated with 3% mortality whereas untreated is associated with 20% mortality. [3]

The present study was undertaken to find out the seroprevalence of dengue in a tertiary care hospital in Bihar region over the past 2 years and to analyze the changing trends of this infection – essential for planning necessary control and preventive measures in the forthcoming years

Materials and Methods

The retrospective hospital-based study conducted in the Department of Medicine, Vims, Pawapuri, Nalanda, Bihar, India over 2 years. All suspected case of dengue fever, which were either admitted or had visited OPD of Department of Medicine, Vims, Pawapuri, Nalanda, Bihar, India. A total of 1500 cases, with a clinical suspicion of dengue infection, 400 cases were found to be positive for either current or past Dengue infection. According to the month wise distribution of cases during the study period, there was an increase in the number of cases tested for Dengue from August to November with maximum number of cases being tested. This corresponds to the monsoon season of this place.

Universal safety precautions were followed while collecting and processing blood samples from patients. Blood samples (3 mL) taken from patients under clinical suspicion of dengue viral infection with a short history and duration of fever on the day of presentation in the hospital was submitted to the Microbiology Department.

Results

Table 1: Year wise distribution of positive dengue cases

Year	Total samples tested	NS1 positive	IgM positive	Total
2018	600	100 (16.66%)	200 (33.34%)	300 (50%)
2019	500	120 (24%)	200 (40%)	230 (46%)
2020	400	80 (20%)	150 (37.5%)	170 (42.5%)
Total	1500	300	600	700 (46.66%)

1500 samples were tested in 2018 and 300 (350%) samples were seropositive for dengue; number of dengue cases detected by NS1 ELISA was 100 (16.66%) and by IgM ELISA were 200 (33.34%). 230 (46%) samples out of the 500 tested in 2019 were seropositive for dengue; 120

(24%) cases were detected as positive by NS1 ELISA and 200 (40%) by IgM ELISA. Of the 400 samples tested during 2020, 170 (42.5%) turned out to be positive for dengue; NS1 ELISA detected 80 (20%) and IgM ELISA detected 150 (37.5%).

Table 2: Age wise distribution of dengue positive cases

Age	2018	2019	2020
<12 years	200	100	110
>12 years	100	130	60
Total	300 (50%)	230 (46%)	170 (42.5%)

On looking at the age distribution of the seropositive cases (Table 2), we observed that in 2018, dengue was slightly more prevalent in patients less than 12 years of age whereas during 2019 and 2020, this trend saw a reversal in the proportion with more number of patients seen in age group of more than 12 years.

Table 3: Gender wise distribution of dengue positive cases

Gender	2018	2019	2020
Male	180	120	90
Female	120	110	80
Total	300 (50%)	230 (46%)	170 (42.5%)

Over the study period of 3 years, dengue was consistently more prevalent in males. 180, 120 and 90 samples were from male patients as compared to 120, 110 and 80 samples from female patients during 2018, 2019 and 2020 respectively (Table 3).

Discussion

Dengue fever is an acute febrile viral infection, which has become a significant public health problem in tropical and subtropical regions of the world. In India, the first epidemic of clinical dengue-like illness was recorded in Madras (Chennai) in 1780, and the first virologically proven epidemic of dengue fever occurred in Calcutta (Kolkata) in 1963-1964, wherein 200 people died of it. [12,13]

The world-wide large-scale reappearance of dengue for the past few decades has turned this disease into a serious public health problem, especially in the tropical and subtropical countries. [14] The dramatic increase in the global dengue burden has promoted social interest in improving dengue diagnosis.[15] The precise diagnosis is achieved either by isolating the virus, identifying viral RNA through RT-PCR or by serodiagnosis by detecting dengue-specific IgM and IgG antibodies. Both virus isolation and RT-PCR are time-consuming and costly laboratory methods. Thus, in a majority of cases, the only feasible diagnosis is based on the detection of dengue antigens or antibodies. [16]

Seropositive dengue cases during the study period were 700 (46.66%). Year-wise distribution of the study population showed a steady decrease in the incidence of dengue. This may be partially attributed to alertness and maintenance and practice of good personal and environmental hygiene and protection following the upsurge of dengue cases in 2018.

Dengue positivity was observed mostly in the age group of <12 years during 2018 which is correlating with a study done in North India [3] and other studies from South India [17]. This affliction of the virus towards the younger population could be possibly due to the resurgence of an old serotype which was, until now, dormant. In the following couple of years, however, seropositive cases were higher in the adult (>12 years) age group as also evidenced in other studies. [4, 17-19]

Our observation of male preponderance, with high to marginal difference between the prevalence in males and females over three years is in consort with the results of studies done in Udipi, [4] Surat, [19] and Jaipur. [20] Over the last 10 to 15 years, DF has been the major cause of hospitalization and mortality after acute respiratory and diarrheal infections among children. [21] The present study saw a total of 15 (1.52%) deaths in 3 years, mortality being highest in the paediatric age group. Concordant observations were made by other studies. [3,4]

Although this work has its shortcomings in terms of correlating the patients' clinical histories and symptomatology with the occurrence of dengue seropositivity, further studies can be pursued on the lines of serotyping the prevalent strain/s of the virus in this particular geographical area [22].

Conclusion

Dengue is an emerging public health problem in India. High degree of suspicion, screening for Dengue in suspect

cases and preventive measures during monsoon and water stagnation periods may help us in the fight against spread of dengue infection. As soon as clinical features are an indicator of a possible etiological agent, newer molecular diagnostic techniques, such as reverse transcription-polymerase chain reaction, is needed to detect rapid increment of viral circulation or changes in predominant serotypes. Besides early recognition and prompt management, one has to concentrate on vector surveillance and control strategies. In the absence of a vaccine, dengue prevention currently relies on public health and community-based *A. aegypti* control programs to remove and destroy mosquito breeding sites. Future vaccination, public awareness, and a better understanding of the role of the mortality determinants in disease severity would definitely help to implicate the planning and implementation of effective public health measures.

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