



Original Research Article

Analysis of epidemiological and demographic component of dengue in rural Puducherry - A hospital based study



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ABSTRACT

Introduction: Dengue Fever (DF) is caused by dengue virus (DENV) which is transmitted by the bite of *Aedes aegypti* mosquito. Incidence of DF is more rampant in tropical and subtropical areas with severe complications. This hospital based study is the analysis of surveillance data on the prevalence of dengue among the rural population of Puducherry, India.

Materials and Methods: All patients admitted in our institution with the suspicion of dengue during the period of January 2017 to February 2018 were included in this study irrespective of age and sex. A total of 1880 patients were subjected for dengue screening by tests for NS1 antigen and IgM antibody by ELISA method and IgG antibody detection was done by rapid card test.

Results: Out of 1880 included in this study, 32.2% (607) were diagnosed as positive for dengue. Among them 58.2% (353) were male. The mostly affected persons were from the category 21-30yrs (9.57%) followed by 31-40 yrs (6.48 %). A total of 48.3% (293) were found to be reactive for dengue NS1 antigen alone whereas 22.6% (137) and 2.9% (18) are reactive for IgM and IgG respectively. A peak in the number of incidence was observed during the month of October (N=256) followed by September (N=124) and minimum was observed during January and February (N=5).

Conclusion: About 32.2% of the suspected cases were reactive for dengue by serology, which was a considerable increase in incidence when compared to the previous study in this region. The increased rate of incidence in male/active working age group shows that outdoor activities may be associated with high risk for the acquisition of dengue. Vector control measures and awareness campaigns explaining the inherent features of the disease and preventive measures shall be helpful in downsizing the incidence.

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1. Introduction

Dengue fever (DF) is the most common mosquito -borne tropical viral illness in humans. It is caused by dengue virus (DENV), which is a positive sense single, stranded RNA virus belonging to the family Flaviviridae. The clinical spectrum of dengue can vary from classical dengue fever to severe and life threatening conditions like dengue hemorrhagic fever (DHF) and dengue shock syndrome (DSS). There is an increasing trend in the incidence of dengue with in the past two decades affecting 40- 50% of the world's population. With early diagnosis and appropriate

treatment, the mortality rate of dengue is as less as 1% whereas the mortality rate rises to 20% when left untreated.

The genome of the virus is cleaved into three structural proteins, namely, C, prM, E and seven nonstructural proteins, NS1, NS2a, NS2b, NS3, NS4a, NS4b and NS5. The tests currently available for diagnosis of early dengue infections are dengue NS1 antigen detection and RT-PCR.

During acute dengue infections when IgM is not readily detectable, NS1 antigen based ELISA shall be considered as an important diagnostic tool. In endemic as well as non-endemic countries several commercial NS1 antigen detection kits are available for the diagnostic purposes. The sensitivity of tests available for dengue diagnosis varies between 63% and 94% based on various factors like the time

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and type of tests performed, DENV serotype and whether the infection is primary or secondary.^{1–4}

Apart from the problem of ever increasing incidence of dengue, the spread to new areas and explosive outbreaks poses a greater threat to public health. The objective of this study is to determine the epidemiological and demographic factors of dengue in a rural area of Puducherry to improve the localized dengue surveillance and early warning system.

2. Materials and Methods

At the Department of Microbiology in a tertiary care hospital of Puducherry this hospital based retrospective study was carried out between January 2017 and February 2018. All patients irrespective of age with clinical suspicion of dengue/DHF/DSS with manifestations like headache, retro orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, and leucopenia, as described by World Health Organization (WHO)⁵ were included in this study. A total of 1880 patients were screened for dengue NS1 antigen, IgM and IgG antibodies. NS1 antigen and IgM antibodies were detected using ELISA KITS supplied by INBIOS & JM Ithra respectively, whereas IgG antibodies were detected using lateral flow assay (J.Mithra) following the manufacturer's instructions.

3. Results

Patient's sample reactive for either of dengue NS1 antigen, IgM or IgG antibody was considered as positive. Out of 1880 samples collected from dengue suspected cases 607 (32.2%) were reactive to any one of the tests. Among the dengue positive cases 58.2% (353) were males and 41.8% (254) were females. The most commonly affected age group was 21–30 yrs (9.6%) followed by 31–40 yrs (6.5%). Figure 1 Maximum cases occurred in the months of September (124) and October (256) Figure 2. Positivity for NS1, IgM & IgG alone were found to be 48.3% (293), 22.6% (137) and 2.9% (18) respectively whereas 20.1% (122) were positive for both NS1 and IgM, 0.8% (05) were positive for both NS1 and IgG, 2.3% (14) were positive for both IgM and IgG and 2.9% (18) were positive for all three. Figure 3.

4. Discussion

The incidence of dengue was found to be increasing for past two decades all over the world. The actual numbers of cases were under reported due to various reasons like under diagnosis / lack of confirmation of dengue / non availability of laboratory tests. It was recently estimated that 390 million dengue infections occur per year (95% credible interval 284 – 528 million), of which only 96 million (67–136 million) manifest as clinical disease.⁶ Brady et al., reported at 2012 that an estimate of 3.9 billion people, in 128 countries, are at risk of infection with dengue viruses.⁷

According to the data from National Vector Borne Disease Control Programme (NVBDCP) and National Health Profile 2018, From less than 60,000 cases in 2009, cases increased to 188,401 in 2017 — more than a 300 per cent spike. When compared to 75,808 cases in 2013, it is more than a 250 per cent spike. In our previous study conducted in the year 2016 the prevalence rate was 13.9%.⁸ The prevalence rate (32.2%) has increased by two folds for the year 2017 in this study. Dengue incidence rate varies from time to time in a given location due to complex interactions among host, vector, virus and it is also proven that climatic factors also plays a role. We observed an increase in the incidence of dengue every month with maximum diagnosed in the months of September and October which coincides with the monsoon months of our locality. Majority of the people attending this hospital belong to rural areas may be due to unplanned urbanization, lack of awareness, poor sanitation and poor drainage systems, inadequate vector control are common leading to water logging and stagnation favoring breeding of mosquitoes and hence high prevalence rates.

Studies conducted in Brazil, Singapore, India and Saudi Arabia showed that dengue was predominantly seen in persons of age between 21–40 years.^{9–12} In our study also, we observed 49.7% (302) of dengue infection in age group of 21–40 yrs. A male preponderance was reported in studies from Cambodia, Malaysia, Sri Lanka, Singapore, Philippines and India.^{13,14} In our study also there was a male preponderance with 58.2% (353) being males. More outdoor activities in adults may be one of the reasons for increased probability of exposure to infected mosquitoes. Our current study showed the highest rate of infection during the month of September and October which is the end of monsoon and beginning of post monsoon period in this region (8). It was also observed that number of positivity increases during monsoon season and immediate post monsoon season, when the environmental condition was favorable for breeding of the vector, i.e., *Aedes aegypti*. Various studies conducted across India also substantiate this seasonality finding.^{15,16}

For the effective disease control precise diagnosis is very important. Among the 607 positive cases, 48.3% (293) were NS1 antigen positive which clearly indicates that they were viremic and suffering from a primary infection, i.e. they could effectively transmit the virus to the mosquito. 22.6% (137) were found to be positive only for IgM antibodies representing recent infection, 2.9% (18) were positive for only IgG which represents past infection. The IgG positivity may be due to subsequent infection with any one of the dengue serotypes during the previous outbreaks and this may have sensitized the individual to the tests.¹⁷ In this study, we reinforce the use of all three tests i.e. NS1 antigen and IgM, IgG antibody during the earlier phase of illness as secondary infections can be missed if only IgM antibody detection alone was done.

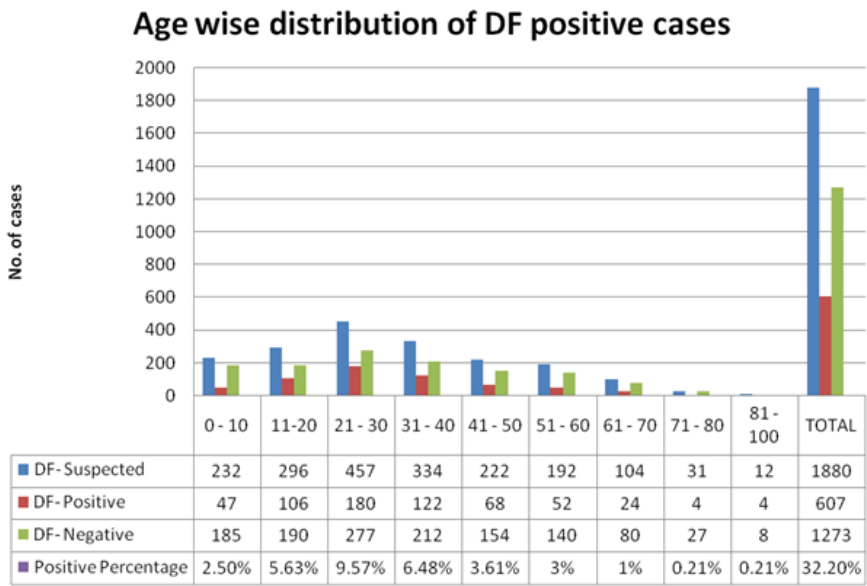


Fig. 1: Age wise distribution of DF positive cases

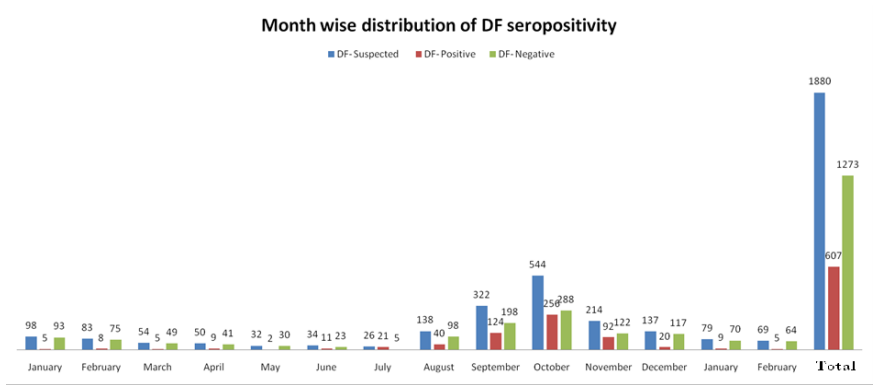


Fig. 2: Month wise distribution of DF seropositivity

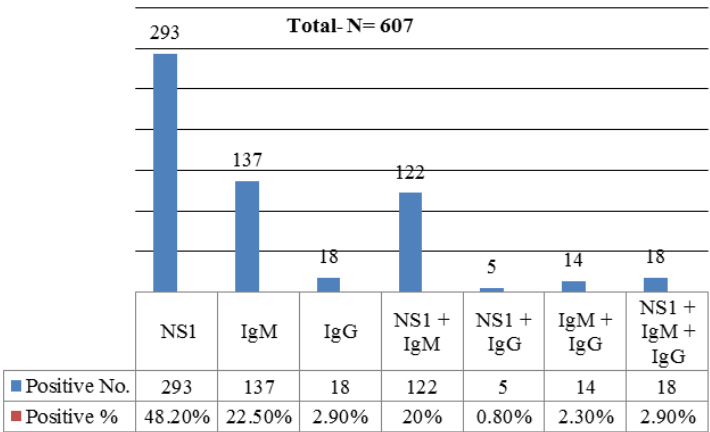


Fig. 3: Prevalence of NS1 antigen, IgM & IgG antibodies

The surveillance system we follow for dengue in India is a passive system, where the cases diagnosed and confirmed by health centers are reported to district health officer and then surveillance is carried out by the state government and the National Vector Borne Disease Control Program. All our cases have been reported to public health department for effective implementation of the preventive measures like conducting awareness program, draining of water filled ditches, advising to use personal mosquito nets, repellents etc.

5. Conclusion

Our study showed a seasonal trend in dengue infection commencing from the month of July, reaching its peak in September and starts decreasing from November onwards with a male preponderance. ELISA and rapid diagnostic tests for dengue have augmented our ability to detect new infections and to distinguish them into primary or secondary infections. Social awareness, personal protection and vector control measures plays a major role in controlling dengue epidemics and further improvements in the diagnostics with early treatment may prevent the complications of dengue.

6. Source of Funding

None.

7. Conflict of Interest

None.

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