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Original Article

Dengue fever in Saidapet Health Unit District in Tamil Nadu: Trends from 2004 to 2011

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ABSTRACT

Introduction: Dengue fever is an endemic disease in some districts of Tamil Nadu and State Public Health Department is tracking the dengue scenario carefully. We did secondary data analysis of dengue fever (DF) cases that occurred between 2004 and 2011 in Saidapet Health Unit District (HUD) in Kancheepuram district of Tamil Nadu.

Methods: A case of dengue was defined as having acute fever of 2–7 days duration with ≥ 2 symptoms of DF and confirmed by demonstration of dengue specific IgM antibodies using data collected between 2004 and 2011. We did descriptive analysis by place and person and calculated incidence of DF in various age groups, by gender and blocks of HUD in 2011 and analyzed incidence trends between 2004 and 2011.

Results: In 2011, 144 DF cases were reported and incidence of DF was 7/100,000 population. The incidence rates of DF in the age group 0 to 4 and 5 to 14 years were 19/100,000 and 14/100,000 and among females and males were 7/100,000 and 6/100,000 respectively. The incidence of DF in urban and rural blocks were 8/100,000 and 6/100,000 respectively. Total 89 cases (62%) were reported from private sector in 2011. Line graph of monthly trend of dengue from 2004 to 2011 showed that following a steady increase in DF cases from July, the peak was reached in October followed by decrease thereafter. Nearly 81%–100% of the cases occurred during the months of July to December in the above-mentioned period.

Conclusions: The Pediatric age group was most affected. Blocks with both urban and rural populations were most affected than primarily rural blocks. Almost all the cases occurred between July and December which is the monsoon season in Tamil Nadu.

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1. Introduction

The greatest burden of dengue in most countries is among children and they are at risk of severe form of dengue fever.¹ Globally, 500,000 people with severe dengue fever (DF) require hospitalization each year including a large proportion of children and the reported case fatality rate (CFR) is 2.5%.² In the last 50 years, there has been a 30-fold increase in incidence of dengue fever with geographic spread into new countries including India and in the present decade the disease has spread from urban to rural settings.¹ Dengue is predominantly found in tropical and sub-tropical climates worldwide, mostly in urban and semi-urban areas.² It is estimated that 52% of the global population that is at the risk of DF infection lives in the South East Asian Region.³ The increasing trends in population growth and uncontrolled urbanization have been suggested to be some of the major contributing factors for the recent dengue occurrences in endemic areas in Asia Pacific region.³ Cases of dengue vary throughout the year and assume a regular seasonal pattern, normally in association with changes of temperature and rainfall.⁴ Pools of stagnant rain water provide maximum breeding opportunity for the vector while the humid environment and steady mid 30 °C temperature contribute to the increasing vector population.^{5,6} The spectrum of DF ranges from inapparent infection, mild undifferentiated fever, classical DF to very severe forms like Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) which have been associated with high rates of morbidity and mortality.⁷ The diagnostic and ambulatory costs can exceed USD 300 per case while hospital charges can also mount up to USD 200 in Indian subcontinent.⁵

The epidemiology of dengue fever in India has been complex and has substantially changed over the past six decades in terms of prevalent serotypes, affected areas and severity of disease.⁸ Dengue is known to be endemic in many parts of India.⁹ All the four dengue virus serotypes were reported during different epidemics in different regions of the Indian subcontinent.⁸ Dengue virus type 2 and Dengue virus type 3 serotypes are often associated with the most severe and fatal haemorrhagic disease.^{5,10} Rain, temperature and relative humidity are the important climatic factors, which could alone or collectively be responsible for DF outbreaks in India.¹¹ The first outbreak of DHF was reported from India in 1963 and since then many outbreaks of DF/DHF have been reported from various States and Union Territories in India.¹² Following the DHF outbreak in 1996, passive surveillance system has been implemented by the Indian government and data is centralized by the National Vector Borne Disease Control Program (NVBDCP).¹³ An Integrated Disease Surveillance Program (IDSP), in addition to NVBDCP was set up in 1999 which covers 18% districts in the country.¹³ The incidence rates of DF including DHF in India were 1.10, 1.31, 2.38 per 100,000 in the years 2008, 2009 and 2010 respectively.¹⁴ Studies from India show that children are more commonly affected than adults.^{7,15}

Several outbreaks of dengue fever have been reported in Tamil Nadu between 1998 and 2005 and laboratory-based surveillance has been extended up to the Primary Health Centre level since 1998.¹⁶ Dengue cases have been on the rise

from 2009.¹⁷ In the year 2011, 14,203 cases were suspected, 13308 cases were tested, 18% of the tested samples were found to be positive for DF and there were 9 deaths.¹⁷ As per the NVBDCP, dengue is endemic in 17 Health Unit Districts (HUD) in Tamil Nadu, including Saidapet HUD in Kancheepuram district.¹⁷ Kancheepuram district is divided into two health districts, one has Kancheepuram and another has Saidapet as the headquarters for effective administration and implementation of public health programs. Saidapet HUD is located near Chennai, the capital of Tamil Nadu. There are six blocks (rural areas) and five municipalities (urban areas) in Saidapet HUD and it has both urban and rural areas. In Tamil Nadu, information regarding 20 diseases is being collected in an ongoing manner through Integrated Disease Surveillance Program (IDSP). We performed secondary data analysis of DF cases collected through IDSP in Saidapet HUD between 2004 and 2011 with the objective of estimating the incidence of DF by age, gender and by blocks in 2011 and analyze the trend of DF cases in Saidapet HUD between 2004 and 2011.

2. Methods

2.1. Study design

We did a descriptive analysis by place and person of DF cases in 2011 and analyzed time trends of DF incidence between 2004 and 2011 in Saidapet HUD in Kancheepuram district of Tamil Nadu in various sub populations.

2.2. Case definition

A case of dengue was defined as an acute febrile illness of 2–7 days duration with two or more of the following: headache, retro-orbital pain, myalgia, arthralgia, rash, hemorrhagic manifestations, leucopenia and confirmation by demonstration of dengue specific IgM antibodies with antibody capture enzyme linked immunosorbent assay (ELISA) (Panbio Elisa or MAC Elisa kits) (Adapted from Probable case definition of dengue in IDSP).

2.3. Data collection

We collected data on cases of DF between 2004 and 2011 from the IDSP in Saidapet HUD. A register for DF cases has been maintained based on the information received from government and private sectors in the HUD and a monthly report is routinely generated from the data collected. From this resource, we did a line listing of all the cases of DF to extract information on age, sex, date of report, name of the PHC, block to which the case belonged and laboratory and hospital from where the cases were reported.

2.4. Data analysis

We used the 2011 population of Saidapet HUD (source: DHAP Saidapet HUD 2011–2012) as a denominator to calculate the incidence of dengue cases for 2011.¹⁸ For analyzing the time trend of incidence of DF, we used the 2001 midyear population estimate for the projecting the population for the years 2004 to

Table 1 – Incidence of dengue fever in urban and rural blocks of Saidapet HUD, Kancheepuram district 2011.

Characteristics	Cases	Population	Incidence/100,000
Sex			
Females	73	1,066,761	7
Males	71	1,105,520	6
Age			
0–4 years	37	193,333	19
5–14 years	52	375,805	14
15–19 years	9	202,022	4
20–44 years	32	873,257	4
>45 + years	14	527,864	3
Total	144	2,172,281	7
Urban blocks			
St. Thomas Mount	41	533,496	8
Kattankulathur	7	68,893	10
Thiruporur	0	0	0
Thirukalukundram	0	0	0
Chitamur	0	0	0
Lathur	0	0	0
Total	48	602,389	8
Rural blocks			
St. Thomas Mount	66	726,642	9
Kattankulathur	17	301,579	6
Thiruporur	7	157,136	4
Thirukalukundram	4	170,559	2
Chitamur	2	124,328	2
Lathur	0	89,648	0
Total	96	1,569,892	6

2011.¹⁹ We calculated the number of cases and incidence in the various age groups, by gender and blocks of HUD (urban and rural blocks) in 2011. We determined the time trend of DF incidence and cases from 2004 to 2011. We calculated the seasonal indices for the four quarters of a year from 2004 to 2011.

3. Results

In all, 144 cases of DF were reported in 2011 in Saidapet HUD of Tamil Nadu. Among them 36% ($N = 52$) were in the age group of 5–14 years and 51% ($N = 73$) were females. The incidence of DF in the HUD was 7/100,000 population. The minimum age at which a DF case reported was below 1 year and the maximum age was 69 years. Mean age of people affected was 10 years. The incidence of DF in the age group 0–4 years and 5–14 years was 19/100,000 and 14/100,000 respectively. The incidence of dengue among females and males was 7/100,000 and 6/100,000 respectively (Table 1). St. Thomas Mount and Kattankulathur had 74% ($N = 107$) and 17% ($N = 24$) of cases respectively. There were no cases reported from Lathur block. Incidence of DF by blocks was two, two, four, six and eight per 100,000 in Chitamur, Thirukazhukundram, Thiruporur, Kattankulathur and St. Thomas Mount respectively (Table 1). Among the cases, 33% ($N = 48$) and 67% ($N = 96$) were from urban and rural blocks of the HUD. The incidence rates of DF in the urban and rural blocks in Saidapet HUD were 8/100,000 and 6/100,000 respectively. Cases were reported from the private sector to IDSP since 2007 in Saidapet HUD. Out of 144 cases reported in 2011, 89 cases (62%) were reported from the

private sector. No case fatality was reported in the year 2010 and 2011.

From 2004 to 2006, the data was received primarily from the Government hospitals in the HUD. There was a decreasing trend of DF incidence from 2004 (2.2) to 2006 (1.0) (Fig. 1). The private sector started reporting to IDSP in the HUD from 2007. There was a steady increase in the incidence of DF from 2007 (0.8) to 2011 (5.6) (Fig. 1). The time trend of dengue fever cases reported only from Government sector showed a decrease in the number of cases reported from 2004 to 2008, followed by an increase, slight decrease in 2010 and followed by a sharp raise. In terms of seasonal variation, a steady increase in number of DF cases from July was noted reaching a peak in October followed by decrease (Fig. 2). Almost all the cases occurred between July and December and this pattern was observed from 2004 to 2011 (Fig. 2). The DF cases reported during July to December contributed from 81% to 100% of the cases recorded each year from 2004 to 2011.

The seasonal index for the four quarters of the year from the year 2004–2011 was Ist Quarter 21.8, IInd Quarter 19.2, IIInd Quarter 114.1 and IVth Quarter 244.9.

4. Discussion

Dengue fever has established itself firmly in Saidapet HUD of Tamil Nadu. Cases were recorded each year from 2004 to 2011. Females were affected more than males. However, dengue fever epidemics with male preponderance or with no gender difference have also been reported in different studies in the Indian subcontinent.¹³ Children in the age group 1 to 4 were most commonly affected followed by children in the age group of 5–14 years. Studies from north India and Chennai have shown that children below the age of 14 were commonly affected,^{6,7} but dengue cases in young adults have also been reported from India.¹³ The dataset used for this study did not have consistent records of severe cases of dengue fever. Severe forms of DF like DHF/DSS have been principally reported among children less than 15 years.²⁰ Early diagnosis and treatment of dengue fever especially among children has proved to be an effective intervention to reduce the morbidity and mortality due to DF.²¹ Epidemiological surveillance in this

Fig. 1 – Trend of dengue fever incidence and cases reported from Government sector in Saidapet HUD 2004–2011.

Fig. 2 – Trend of mean dengue fever cases per month from the year 2004–2011 in Saidapet Health Unit District, Tamil Nadu.

context plays an important role in prevention and control of dengue fever.⁹ Three fourth of the cases were reported from St. Thomas Mount block. St. Thomas Mount and Kattankulathur blocks, which have both urban as well as rural population, recorded more number of cases than other blocks. Although dengue fever incidence is higher in urban blocks, the disease is also prevalent in rural areas.²² Urbanization favors vector breeding and therefore DF is more common in urban areas.²³ Rapid urbanization and improved transportation facilities in our country have significantly influenced our environment.⁹ Socio economic and manmade ecological changes also have resulted in invasion of *Aedes aegypti* mosquitoes into the rural areas, which have tremendously increased the chances of spread of the disease to rural areas.²³ Prevention measures should be focused not only in urban blocks but also in rural areas. More number of cases were reported from private sector in 2011 in Saidapet HUD. In India, outpatient curative care is primarily provided by the private sector with greater than 80% of all medical visits taking place in the private sector.²⁴ From 2007, private sectors have actively contributed to the IDSP data in Saidapet HUD and actually number of cases being reported from the private sector than from the Government sector in 2011. Surveillance covering all government and private sectors in the district will help to effectively plan prevention and control measures. Since private health sector is also highly accessed in Tamil Nadu, involvement of private sectors with the Government sectors in prevention measures and management of the cases is a strategy of prime importance in the control of this infection. Regular reporting of DF cases in IDSP and the completeness and full coverage of case reporting from all concerned will be a very crucial factor in prevention and control of dengue fever.

There was an increasing trend in the cases reported from 2009 in the HUD. The typical pattern observed was that of gradual build-up of cases from July–August every year, reaching a peak in October and steadily decreasing till the end of the year. Most of the annual rainfall received in Tamil Nadu is from October to December and the rest is during the southwest monsoon season from June to September.²⁵ Increase in the number of cases every year from July to October overlaps with the rainy season. Similar seasonal trend has been documented from other parts of India.^{7,16,26} A retrospective analysis done at King Institute of Preventive

Medicine, Chennai from 2006 to 2008, showed a similar trend.⁶ Rain during the monsoon brings down the temperature, which leads to increase in the relative humidity and decrease in the evaporation rate and thus helps to maintain secondary reservoirs containing rain water.¹¹ During the rainy season interaction between rainfall, temperature and relative humidity leads to distribution of dengue fever, which peaks at the end of the monsoon season during the months of October and November. Effective planning and implementation of prevention and control measures in the pre-monsoon and monsoon periods is also of utmost importance as majority of the cases occur during this period.

The limitations of our analysis include lack of information on the severity of the DF, its complications such as DSS and DHF, primary or secondary infection, various DF serotypes and entomological indicators and their linkage to clinical and epidemiological data that were not analyzed due to paucity of information. Although the most reliable confirmatory tests for dengue infection would be either virus isolation or nucleic acid detection, in a programmatic setting and especially during outbreaks, the diagnosis is essentially clinical which may or may not be supported by documentation of IgM positive ELISA for DF. This might have led to some level of misclassification bias and over-reporting of dengue fever cases. In this secondary dataset, there were concerns about completeness of the data which could lead to underestimation of the DF incidence. Nevertheless, this data has provided insights and information such as children being commonly affected, incidence being higher in the urban blocks and occurrence of during the monsoon season and these are useful in designing appropriate programmatic response and strategies.

To control DF infection in Saidapet HUD, the three-pronged strategy of early case detection and management, integrated vector control and behavior change communication has been intensively implemented by NVBDCP to control dengue fever in the HUD. The reasons for higher incidence among females and in the age group of 1–4 years in the study area can be investigated in a well-planned analytical study, preferably a prospective study. Efforts should be made to improve the data quality as well as depth of information in Health Management Information System in case of diseases like dengue fever having epidemic potential which will enable the program managers to plan effective interventions and researchers to do a more thorough analysis. It is important to carefully monitor DF cases and DF etiology in fever cases in Saidapet HUD and Tamil Nadu to assess the impact of dengue prevention and control measures in an ongoing manner.

Conflicts of interest

All authors have none to declare.

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