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PREVALENCE AND TREND OF DENGUE VIRAL DISEASE IN TAMIL NADU DURING 2017 – 2021 – A RETROSPECTIVE STUDY

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Abstract

Background : Globally, Dengue is one of the most common vector borne disease. The actual burden of the disease is not quantified. Understanding the prevalence and trend of dengue can help to improve prevention and control strategies. Our study assessed the trend in prevalence of dengue in Tamil Nadu during 2017-2021.

Methodology : This study was conducted at Directorate of Public Health & Preventive Medicine (DPH&PM), Tamil Nadu using the data collected from January 2017 to December 2021. Patient data were received from all districts of Tamil Nadu utilizing the District Public Health Laboratory (DPHL) Network of DPH&PM. We analysed epidemiological trend, including age, gender and seasonal distribution.

Results : Among the 2,44,175 suspected cases, 29,096 confirmed Dengue cases (12%) were recorded during 2017 – 2021. Our results indicate males were affected slightly more than females by dengue viruses. The number of dengue cases incidence was found almost equal among 20 – 59 and 6-19 age groups. Our results report major proportion of positive cases in the post-monsoon period, more prominently between September and November. Higher incidence of dengue cases has been recorded in Northern and Southern TN zones. Central TN reported least number of dengue cases.

Conclusion : Our results highlight that dengue is an endemic disease and there is a necessity to increase dengue diagnosis among the population, especially in northern TN districts. Apart from enabling policy makers to implement effective interventional measures to reduce the case burden, early diagnosis of dengue among TN population will aid in treating them based on their needs ultimately reducing mortality and morbidity.

INTRODUCTION

Dengue Fever (DF) is caused by a virus belonging to Flaviviridae family and it is transmitted by Aedes mosquitoes particularly Aedes aegyptii. DF is an endemic disease frequently causing outbreaks in the Southeast Asia, Western Pacific, Latin America, Africa and Eastern Mediterranean regions.[1,2] According to the World Health Report (1996), the "re-emergence of infectious diseases is a warning that progress achieved so far towards global security in health and prosperity may be wasted".[3]

In India, the first confirmed Dengue outbreak was reported in 1963 in Kolkata.[4] A major outbreak was documented in 1996 involving areas around Delhi and Lucknow.[5] Dengue was considered as urban infection, but it has now penetrated into rural area as well due to population density.[6] Dengue occur throughout the year but the case numbers tend to reach the peak during monsoon and post monsoon season due to the high vector load.[7]

In India, the epidemiology of dengue has rapidly changed in the last few decades, which has led to a dramatic expansion.8 When compared to Japanese Encephalitis, upper respiratory tract infections and Hepatitis B, the burden of dengue is 17 times higher.[9] The state of Tamil Nadu comprises of total 38 districts and located at the latitude between 8°4' N to 13° 35' N and longitude between 76° 18' E to 80°20' E on the southern part of India. Weather of the state is highly influenced by Bay of Bengal Sea as it is a coastal state. Climate is tropical in nature resulting in very high environmental temperature ranging between 35 to 43°C during summer months of April and May and between 12 to 14 °C during the winter season. The state experiences South West Monsoon between June and September and North East Monsoon begins in October and lasts till December. An average rainfall of 987 mm is recorded in Tamil Nadu.

AIMS & OBJECTIVE

1. To estimate the trends in prevalence of Dengue in selected Districts of Tamil Nadu from 2017 to 2021..
2. To describe the characteristics of dengue trend in terms of Time, Place & Person.

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METHODOLOGY

STUDY DESIGN DURATION AND SOURCE OF THE DATA :

In this study the epidemiological trend of dengue from 2017 to 2021 in Tamil Nadu were analysed, with a focus on age, gender, district- and zone-wise dengue case burden.

This study was conducted at Directorate of Public Health & Preventive Medicine (DPH&PM), Tamil Nadu using the data collected from January 2017 to December 2021.

We included patient data received from all districts of Tamil Nadu utilizing the District Public Health Laboratory (DPHL) Network of DPH&PM. In each District Public Health Laboratory, detailed clinical history of the patients with travel history, if any, was collected in a predesigned questionnaire form. All the District Microbiologists were involved in testing the samples for dengue antigen and/ or antibody. A total of 244175 samples' data satisfying the inclusion criteria were incorporated in the study.

ETHICAL CONSIDERATIONS :

The study was approved by Institutional Ethical Committee, Directorate of Public Health & Preventive Medicine, Chennai (IEC No.:DPHPM/IEC/2022/004).

STATISTICAL ANALYSIS :

The epidemiological parameters were statistically analysed that included demography, clinical profile of the suspected patients and possible outcome. Data generated was analyzed using Microsoft Excel. The Chi-square test was used to compare the difference in gender distribution across different years.

RESULTS

Among the 2,44,175 suspected cases, 29,096 confirmed Dengue cases (12%) were recorded during the study period 2017 – 2021 (Table 1). 7% of the suspected cases were confirmed as Dengue cases during 2018 and 2021, whereas 2017 recorded the highest number of Dengue cases (19%) in the entire study period. On comparison, a sharp decline in the number of dengue cases was identified in 2018. In 2020 and 2021 there were reduced number of dengue cases on comparison with the previous years.

Of the total number of dengue cases, 16072 (55%) were males and 13024(45%) were females. There was no significant different in the male-to-female ratio across different years (Chi square =35.7509, p = 0.0000 (<0.001); Figure 1). There were more male cases than the female cases in all years. The highest number of dengue cases averaging 48% incidence was found in the age group of 20 – 59 as given in Table 1. A similar incidence was observed in age group of 6-19 years (41%). Least number of dengue cases i.e. 3 – 4% average were reported in >=60 years age group. 0-5 years age group showed an average of 9% incidence of dengue cases.

Table 1. Distribution of Confirmed Dengue Cases for study period 2017 - 2021

Year	No. of Suspected Cases	No. of Confirmed Cases (%)	Gender		Age Range (in years)									
			Male	Female	0-5		6-12		13-19		20-59		>=60	
					M	F	M	F	M	F	M	F	M	F
2017	74693	13934 (19%)	7474 (54%)	6460 (46%)	672 (9%)	663 (10%)	1524 (20%)	1498 (23%)	1647 (22%)	1189 (18%)	3457 (46%)	2892 (45%)	174 (2%)	218 (3%)
2018	34559	2261 (7%)	1292 (57%)	969 (43%)	106 (8%)	113 (12%)	201 (16%)	202 (21%)	216 (17%)	149 (15%)	732 (57%)	456 (47%)	37 (3%)	49 (5%)
2019	48300	6441 (13%)	3691 (57%)	2750 (43%)	287 (8%)	228 (8%)	624 (17%)	537 (20%)	734 (20%)	451 (16%)	1949 (53%)	1440 (52%)	97 (3%)	94 (3%)
2020	26100	1986 (8%)	1068 (54%)	918 (46%)	68 (6%)	75 (8%)	224 (21%)	231 (25%)	211 (20%)	139 (15%)	516 (48%)	434 (47%)	49 (5%)	39 (4%)
2021	60523	4474 (7%)	2547 (57%)	1927 (43%)	178 (7%)	137 (7%)	570 (22%)	445 (23%)	623 (24%)	377 (20%)	1089 (43%)	904 (47%)	87 (3%)	64 (3%)
Total					1311	1216	3143	2913	3431	2305	7743	6126	444	464
Grand Total	244175	29096 (12%)	16072 (55%)	13024 (45%)	2527 (9%)		6056 (21%)		5736 (20%)		13869 (48%)		908 (3%)	

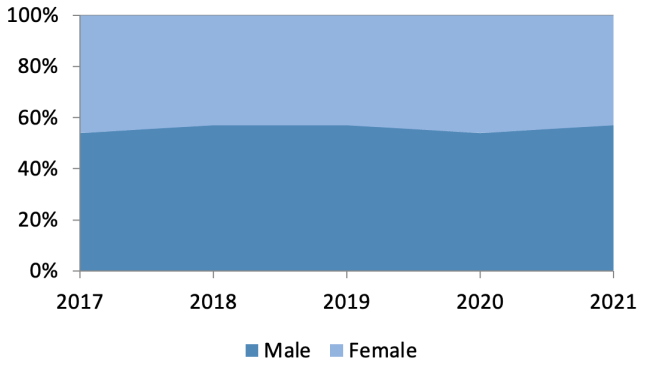

Figure 1. Gender Distribution of Dengue Cases in Tamil Nadu from 2017 – 2021

Dengue cases were reported nearly every month, but most dengue cases were reported between August and December, particularly in September and November (Figure 2).

Figure 3 displays zone-wise distribution of Dengue positive cases reported in TN between 2017 and 2021. Highest number of dengue cases (n = 9908) have been recorded from Northern Part of TN. Among the northern districts, Tiruvallur and Cuddalore contributed more than 65% of dengue cases in that region. The second highest dengue cases were found in Southern area of Tamil Nadu (n = 8279). Of the southern districts, four districts viz. Ramnathapuram, Tenkasi, Tirunelveli and Virudhunagar were the major regions with higher dengue cases.

More than 1000 positive dengue cases have been reported from Namakkal, Tiruppur and Erode districts of Western TN. However, Dharmapuri district was found to have least number of dengue cases (n=233). Central region reported least number of dengue cases (n = 3975).

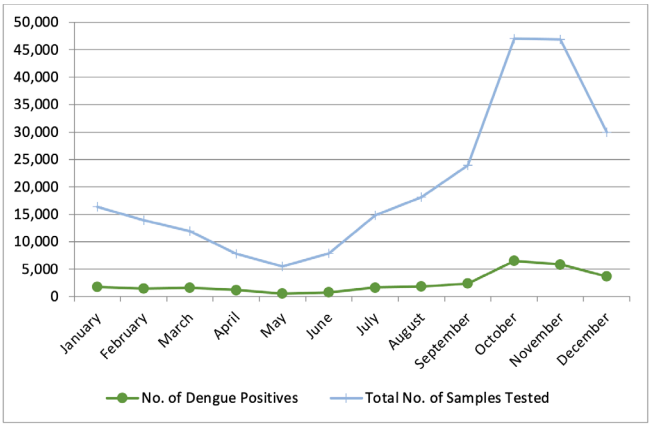

Figure 2 : .Seasonal Prevalence of Dengue in Tamil Nadu (2017 -2021)

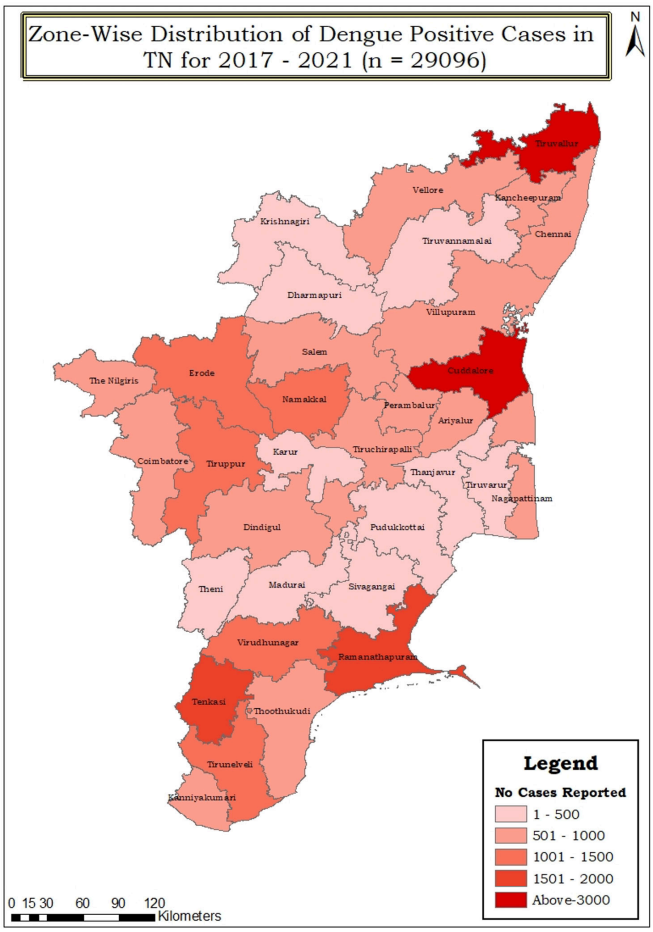

Figure 3 :Dengue positive cases distribution in Tamil Nadu (2017 -2021)

Distribution of dengue cases reported from top seven districts viz. Tiruvallur, Cuddalore, Ramnathapuram, Tenkasi, Namakkal, Tiruppur and Tirunelveli for the study period 2017 to 2021 clearly indicates high number of dengue cases occurred between September and December in all the years (Figure 4, Supplementary table 1). Tirunelveli had higher number of cases between February and May in each year.

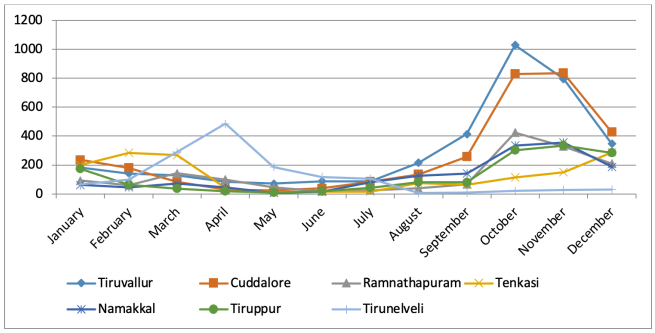

Figure : . Cumulative Distribution of Dengue Cases detected in Top Seven Districts of Tamil Nadu (2017 -2021)

DISCUSSION

Dengue has emerged as a major health problem both nationally and internationally. India with its tropical climate and distributed with urban and semiurban areas is prone to have vector-borne diseases, especially dengue (WHO bulletin, 10th January 2022).

In this study we assessed the trend in prevalence of dengue in Tamil Nadu (2017-2021). The real number of dengue cases might be higher than that reported due to unreported asymptomatic infection.[10,11] Data on dengue prevalence and its longitudinal trend will provide necessary information to understand as well as review the existing prevention and control strategies if needed, may even recommend to include any changes/improvements/updates to the existing strategies. Even though, several factors would have contributed to the increase in dengue cases, climate change is a vital factor that would have increased mosquito density resulting in expansion of the geographical and seasonal distribution of vector.[12] The trend is that major proportion of positive cases occur in the post-monsoon period (Figure 2). Thus, correlation between incidence of dengue infection and monsoon season is clearly evident and it has been also supported in previous studies from India and many parts of the world.[13, 14] The north and south regions of the state had major numbers and this could be (Figure 3) probably due to varied climatic conditions apart from having coastal areas being suitable for vector breeding[15,16].

Over the years more attention has been given to diagnose dengue as evidenced by the number of samples tested in 2021 in comparison to 2017 and thus, capacity to diagnose dengue clinically has improved significantly (Table 1). This will in turn help to act swiftly in effectively treating the patients based on their needs eventually reducing their mortality and morbidity. Incidence of dengue is still a matter of concern in TN (~12%) even though diagnostic capacity of the state has increased. A total of 74693 suspected samples were tested

in 2017, whereas this number reduced to 34559 and 48300 in 2018 and 2019, respectively. In 2020, only 26100 samples were tested for dengue virus. Reduction in the number of samples tested can be due to emergence of COVID-19 disease as a global pandemic. Nevertheless, 60523 suspected samples were analyzed in 2021 so as to enable early diagnosis of dengue during the ongoing COVID-19 pandemic (Table 1).

The trend reveals that males were affected slightly more than females by dengue viruses (Figure 1). Similar results are reported by other studies carried out in dengue endemic areas.[14,17] Males are prone to mosquito bites might be because of their mostly outdoor nature of activity. Thus, it is clearly evident that both genders are susceptible to dengue viruses.

Nearly 50% of population in the 20 – 59 age group are susceptible to dengue infection. However, only approximately 20% of population in the lower age groups i.e. 6-12 and 13-19 tend to be affected by dengue (Table 1). The possible reason might be attributed to young children spending most of the day time in closed environments, therefore are less likely to be exposed to the mosquitoes. Similar results are also recorded by other investigators.[18,19] In all the years of the study, dengue among the 5 or lesser age group recorded not more than 9%, much lesser than the earlier reports.[14] Parent willingness to carry kids suffering from fever to hospital for screening could be the possible reason behind such under reported case numbers in this age group.

This study has few limitations. Trends of imported cases and indigenous cases were not analyzed separately. Secondly, bias in data might be possible as it was gathered from DPHL network database. Also, if dengue-infected patients fail to visit clinics or other medical institutions, their information would not have been captured in the database.

CONCLUSION

Dengue is still an endemic disease in Tamil Nadu and poses a health threat in almost all districts of tropical and sub-tropical territories. Continous monitoring of data & intensive surveillance is required in all districts despite variations in trend over years across all geographical areas in the state. Surveillance and control strategies should be implemented not only in outbreak locations, but also in zones where Aedes spp mosquitoes are present. The observation of dengue epidemiology highlights the need to strengthen control of emerging and management in outbreak.

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