

The Basic Reproduction Number for Dengue fever in Tamil Nadu (2012) Epidemic

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Abstract: *Dengue is known in India since 1940's but the disease is very limited in its spread. Dengue is becoming rampant in many states of southern India. As of now no specific treatments or vaccines are available against the disease. The people of Tamil Nadu and Puducherry, where the dengue incidences are increasing, perceive this spurt as due to poor rainfall and power supply. A Case study, using data of the outbreak that occurred in 2012 in Tamil Nadu is presented [1]. There are different methods for calculation of basic reproductive number. The aim of this study is to evaluate the reproductive number using data from dengue cases in Tamil Nadu.*

Keywords: Dengue, Reproductive Number, Tamil Nadu.

1. Introduction

The first recognized dengue epidemic occurred almost simultaneously in Asia, Africa and North America in the 1780's, shortly after the identification and naming of the disease in 1779. It has spread especially in the tropical and subtropical regions around the world, and now a days is a disease widely found in urban and semi urban areas[2].

2. Dengue in Tamil Nadu

In 2012, outbreak of dengue illness with severe clinical manifestations were reported from several districts of Tamil Nadu, such as Tirunelveli, Virudunagar, Theni, Madurai, Thiruvallur, Vellore and Dharmapuri. Although the exact number of fever cases or number of fatalities is not available, approximately few hundred thousand people were affected [3,4].

Over the last 5 years (2008-2012) 22,584 dengue cases were reported from Tamil Nadu region by NVBDCP and the number of reported cases varied from year to year[1].

The highest dengue incidence were reported in 2012 (n = 15,770) and lowest in 2008 (n = 565) [1]. 4443, cases were reported in the year 2012 and a total number of 40 deaths in Tamil Nadu as in Table 1 and the Figure 1 [1].

3. Basic Reproduction Number

The transmissibility of the disease can be shown quantitatively by calculating basic reproductive number and epidemic curves of the disease.

Basic reproduction number is the average number of individuals directly infected by a primary infected case during his or her infectious period without any preventive measure during the epidemic and when the infected person enters a totally susceptible population. This index (R_0) is useful in assessing the past preventive measures and needs assessment for prevention prediction for future. If R_0 is less than 1, the disease will eventually die out. If R_0 is equal to 1,

the disease is endemic and when R_0 is about 1 there will be an epidemic and increasing number of infected persons.

There are different methods to find the reproductive number R_0 , which is the simplest methods as following,

$$R_0 = \frac{\beta}{\gamma} \quad (1)$$

Here β is the probability of the disease transmission from an infected person to a healthy person (force of infection). Using Favier method, it can be calculated by epidemic data [5]. γ is recovery rate or one divided by average period of infection. The average period of infection has been reported as 10 – 14 days [6]. Another method for calculation of R_0 is as follows

$$R_0 = \left(1 + \frac{\beta}{\gamma}\right) \quad (2)$$

β shows the probability of the transmission from an infected person to a healthy person. γ is recovery rate or one divided by average period of infection.

According to the data obtained in the dengue fever in TamilNadu 2012, it is found that the probability of the disease transmission from an infected person to a healthy person is 0.2817. The recovery rate or one divided by average period of infection is $\frac{1}{14}$ days and the reproduction number is 3.9453.

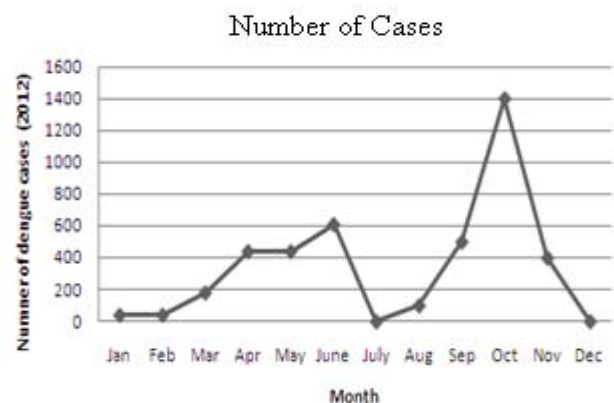


Figure 1

Table 1

District	Infected cases	Death cases
Cuddalore	47	
Dharmapuri	103	
Dindigul	58	
Erode	20	
Karur	17	
Krishnagiri	11	
Madurai	79	5
Perambalur	22	
Pudukkottai	166	1
Ramanathapuram	224	2
Salem	106	
Thanjavur	132	
Theni	35	
Thiruvarur	55	
Thoothukkudi	80	
Thiruchirappalli	156	
Tirunelveli	1365	32
Thiruvannamalai	67	
Viluppuram	67	
Virudhunagar	33	
Puducherry	1600	
Total	4443	40

4. Conclusion

Dengue is one of the major international public health concerns. Although progress is underway, developing a vaccine against the disease is challenging. Thus the main approach to fight the disease is vector control. From our calculation of R_0 , we see that dengue is epidemic in TamilNadu ($R_0 > 1$) during monsoon period. Hence the disease is able to invade the susceptible population.

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