Epidemiological scenario of Dengue in the state of Manipur during the last 3 years

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Background. In recent years, Dengue has been emerging as a global health problem with approximately 2.5 billion people being affected by it .In the last 50 years, the incidence of dengue infection has increased 30-fold, and the World Health Organization (WHO) has estimated that 96 million cases of dengue occur annually. The epidemiology of dengue fever (DF) is complex in the Indian subcontinent as all the four serotypes are circulating. And there is no systematic epidemiological study done on dengue cases in Manipur, a north-eastern state of India. This study is therefore done to report observations on dengue cases from a virus diagnostic and research laboratory of Manipur to present an epidemiological scenario of the state for the last three years. **Method**. We used the dengue data extracted from the laboratory register of Viral Research and Diagnostic Laboratory (VRDL) from 2016 to 2018. All suspected outpatient and inpatients dengue cases from public and private health services are included in the VRDL database whose informed consent were obtained. We evaluated the overall features of the data for generating seasonal pattern, geographical pattern, gender wise distribution, age wise distribution and seroprevelance pattern of dengue cases for the study period from 2016 to 2018. **Results.** A total of 1689 cases of suspected patients of dengue virus infection were tested for dengue ELISA test and 272(16.10%) samples were found to be seropositive. The month wise distribution of dengue cases is quite an interesting as the three years of study shows variant pattern in observation. In all the three years dengue seropositive cases were seen higher in male population. But there is no significant value to the positivity of dengue seropositive towards male than female (The chi-square statistic is 2.1314.The p-value is .344481. The result is *not* significant at $p < .05$.). **Conclusion.** Our study presents a comparative epidemiological study on seroprevelance of dengue in the state of Manipur from the year 2016 to 2018. The findings in the present study extend the knowledge of the geographical distribution and seroprevelance of dengue in the state of Manipur for the last three years. This is an attempt to present epidemiological dengue seroprevelance in the

state of Manipur which in future would be a reference from public health concerns for taking up necessary action plan to curtail the spread of dengue.

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Abstract

Background. In recent years, Dengue has been emerging as a global health problem with approximately 2.5 billion people being affected by it .In the last 50 years, the incidence of dengue infection has increased 30-fold, and the World Health Organization (WHO) has estimated that 96 million cases of dengue occur annually. The epidemiology of dengue fever (DF) is complex in the Indian subcontinent as all the four serotypes are circulating. And there is no systematic epidemiological study done on dengue cases in Manipur, a north-eastern state of India. This study is therefore done to report observations on dengue cases from a virus diagnostic and research laboratory of Manipur to present an epidemiological scenario of the state for the last three years.

Method. We used the dengue data extracted from the laboratory register of Viral Research and Diagnostic Laboratory (VRDL) from 2016 to 2018. All suspected outpatient and inpatients dengue cases from public and private health services are included in the VRDL database whose informed consent were obtained. We evaluated the overall features of the data for generating seasonal pattern, geographical pattern, gender wise distribution, age wise distribution and seroprevelance pattern of dengue cases for the study period from 2016 to 2018.

Results. A total of 1689 cases of suspected patients of dengue virus infection were tested for dengue ELISA test and 272(16.10%) samples were found to be seropositive. The month wise distribution of dengue cases is quite an interesting as the three years of study shows variant pattern in observation. In all the three years dengue seropositive cases were seen higher in male population. But there is no significant value to the positivity of dengue seropositive towards male

than female (The chi-square statistic is 2.1314.The *p*-value is .344481. The result is *not* significant at $p < .05$.).

Conclusion. Our study presents a comparative epidemiological study on seroprevelance of dengue in the state of Manipur from the year 2016 to 2018. The findings in the present study extend the knowledge of the geographical distribution and seroprevelance of dengue in the state of Manipur for the last three years. This is an attempt to present epidemiological dengue seroprevelance in the state of Manipur which in future would be a reference from public health concerns for taking up necessary action plan to curtail the spread of dengue.

Keywords: Dengue, epidemiological, ELISA, Manipur

Introduction

Dengue is an arboviral disease which WHO reported as one of the 8 neglected tropical diseases [1].It is of global public health concern causing higher morbidness in most of the endemic regions of the world with approximately 2.5 billion people being affected [2,3].Mostly the urban dwellers in tropical and subtropical regions has higher risk of contracting dengue infection as compare to other regions.[4].According to WHO report dengue cases has increased 30 fold in the last 50 years and estimated that 96 million cases of dengue occur annually [5,6].About 75% of the world's total disease burden arising die to dengue comes mainly from South –East Asian Region and Western Pacific regions [7].Falling in the South East Asian region , India has high reporting of dengue fever outbreaks leading to its complexity in health care management[8].

Early detection of dengue virus infection (DVI) routinely done by serological test is very essential. IgM antibodies against dengue infection appears by 3rd day and remains circulating in blood for about 3 months which IgM-capture enzyme-linked immunosorbent assay (ELISA) can detect easily. This procedure is used as a standard method for detecting IgM [9].

The epidemiology of dengue fever is complex and remains poorly understood due to involvement of status of host, viral and vector which are dependent on demographic, economic, behavioural and varied societal factors. Numerous observations have raised concerns against widely accepted epidemiological characteristics of dengue [10, 11]. Understanding the evolving pattern and trend of dengue fever epidemiology is very crucial in determining the success of prevention and control programmes. The present study was done focussing on various epidemiological factors and also for the sero-prevalence pattern of dengue infection over the past 3 (years) in state of Manipur.

Material and Methods

The present retrospective study was carried out at Viral Research and Diagnostic Laboratory (VRDL), Department of Microbiology, JNIMS, Porompat, Imphal East, Manipur during a period of three (3) years from January 2016 to December 2018. Dengue suspected cases were

retrospectively identified from the register at the VRDL. We used the dengue data extracted from the laboratory register of VRDL from 2016 to 2018. All suspected outpatient and inpatients dengue cases from public and private health services are included in the VRDL database whose informed consent were obtained.

The data extracted includes demographic, days since onset of symptoms, clinical findings, serologic tests (IgM antibodies, NS1 detection). We explored the temporal patterns of dengue cases by plotting monthly incidence for the study period. We evaluated the overall features of the data for generating seasonal pattern, geographical pattern, gender wise distribution, age wise distribution and seroprevelance pattern of dengue cases for the study period from 2016 to 2018.

Results

A total of 1689 cases of suspected patients of dengue virus infection were referred to the VRDL for confirmation of diagnosis of dengue over a period of three years, from January 2016 to December 2018, out of which 272(16.10%) cases were found to seropositive. Maximum cases were enrolled in the year 2017, 1286 cases while the least was seen in the year 2018 with 152 cases while in the year 2016 a total of 251 cases were enrolled (**Table 1** and Figure 1).

The decrease of percentage of seropositivity is seen from 2016 to 2018 which is a positive sign in connection with public health issues caused by spread of dengue in the state of Manipur. But the suspected cases of dengue enrolled for diagnosis was highest in the year 2017 and least was seen in the year 2018.

Though the percentage of positivity was highest in the year 2016 the maximum numbers of positive cases were observed in the year 2017 (Table 1 & **Figure 1**).

The month wise distribution of dengue cases is quite an interesting as the three years of study shows different observation. In the year 2016 the dengue cases began from the month of September and peaked during October and sharply decreased with fall of temperature. In the year 2017 the dengue case started reporting from the month of May and abruptly rises till the month of August. July and August had maximum dengue positive cases of the same year. Unlike previous year the decline in dengue cases were seen starting from the month of September. The year 2018 has all together a different scenario, the dengue cases were seen sparsely distributed throughout the year except in the month of February, May and June with no dengue positive cases (**Table 2 & Figure 2**).

Maximum dengue seropositive cases were observed from the month of September to December for the year 2016,and from the month of May to December for the year 2017 while three small peaks were seen in the case of 2018 (Table 2, Figure 2).

In all the three years dengue seropositive cases were seen higher in male population. But there is no significant value to the positivity of dengue seropositive towards male than female (The chi-square statistic is 2.1314.The *p*-value is .344481. The result is *not* significant at $p < .05$.).

Even though in our study for the period of three years the male population had higher seropositive as compared to that of female the significant value of this comparison shows no significant at p value 0.05 indicating the dengue cases are not gender specific and there is equal chances of both the gender being infected by dengue virus (**Table 3 & Figure 3**).

The age wise distribution of seropositive dengue cases in three years is quite different from each other. In 2016 almost all the age group were found to be equally infected by dengue except age group of upto 10 years showing least positive cases. For the year 2017 highest positive cases were observed in the age groups of 21-30 followed by upto 10 age groups and least was seen in the case of 41-50 age groups. In the year 2018 the highest positive cases were observed in the age group of 11-20 years followed by 21-30 age groups while least was seen in the age group of 31-40 and 41-50. There was no positive case detected in the age group of upto 10 years (**Table 4 & Figure 4**).

The dengue positive cases were seen distributed in 6 districts in the year 2016.Imphal West district showing the highest positivity followed by Imphal East. In the year 2017 distribution of dengue positive cases were seen in all the districts of Manipur with Churachandpur district having highest positivity followed by Imphal East, Imphal West. While the least positive cases were observed in Tamenglong district. In the case of 2018 the highest positive cases were from Imphal East district and Thoubal district. While three district namely Bishnupur, Chandel and Tamenglong did not have any positive cases. **(Table-5, Figure 5).**

Overall the most positive cases were seen in Churachandpur district followed by Imphal West, Imphal East, Senapati, Thoubal, Chandel. While Bishnupur, Ukhrul and Tamenglong districts had least positive cases till the year 2018.

Discussion

Due to progressive improper urbanization, lack of proper sanitation, poor drainage system in many places of India, the *Aedes* mosquitos' breeding ground has expanded favouring higher rate of breeding and multiplication leading to several periodic raise of dengue infection in the past decade.

Spread of awareness of dengue infection among health care workers and public has paved the way of increased serological tests leading to higher rate of detection of dengue cases over the past few years (3).

In our study a total of 1689 dengue cases were analysed out of which 272 cases were positive for dengue virus infection. This positivity is higher than the study done by Atul et al., 2011 with

time span of 5 years. The proportion of males was found to be higher than females in our study (1.37:1).This finding of high preponderance of males in dengue fever than females was similarly reported in the studies done by Jimmy et al., 2014; Atul et al., 2011 and Mohan et al.,2013.

Comparatively in the three years of studies highest dengue infection was seen in the age group of 21yrs to 30yrs which is in accordance with the findings of the study done by Sodani S et al., 2015 and Rubina et al., 2018.

To identify the seasonal variation of the disease, analysis of the data on monthly basis were done. A gradual increase in cases was noticed from September with a peak in October, in the year 2016 which is quite close to finding by Atul et al.,2011 but in the year 2017 the dengue cases started to increase from the month of May with a peak in July, August .However, the seasonal variation in the year 2018 seems quite different with low level of dengue cases and uneven distribution pattern throughout the year. Such uneven pattern of seasonal variation yearly is quite different from the studies done by Mohan et al.,2013 and Atul et al.,2011.

The probable reason of uneven pattern of seasonal distribution might be due to changing pattern of rainy season in the state of Manipur and also may be due to change in climatic changes due to deep deforestation and rapid construction for development in the state.

Conclusion

Although dengue infection has been shown to correlate with rainy season the pattern of variation seems quite different geographically. Our study presents a comparative epidemiological study on seroprevelance of dengue in the state of Manipur from the year 2016 to 2018 on the basis ELISA diagnosis done at VRDL, Microbiology Department, JNIMS, Imphal, Manipur. The findings in the present study extend the knowledge of the geographical distribution and seroprevelance of dengue in the state of Manipur for the last three years.

Laboratory-based active surveillance systems are needed to complement the current passive surveillance and control programs. Regular sentinel surveillance and sample surveys during interepidemic periods are also necessary to detect and monitor sudden increases in the numbers of dengue cases or changes in the predominant serotypes which usually precede major outbreaks.

The tropical climate makes Manipur susceptive to co-circulation of different arboviruses, such as DENV, CHIKV, and JEV, already reported in the state. These viral infections are oligosymptomatic and clinically similar, hampering the differential diagnosis. Furthermore, there is still a need of improvement of laboratory diagnosis for dengue, since serologic tests available often take several days to be completed and present high cross-reactivity among DENV serotypes. Beyond the differentiation between the arboviruses co-circulating, efficient diagnosis allows appropriate patient care, generation of accurate epidemiological data, and implementation of effective public health interventions. This is an attempt to present epidemiological dengue

seroprevelance in the state of Manipur which in future would be a reference from public health concerns for taking up necessary action plan to curtail the spread of dengue.

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Figure 1(on next page)

Year-wise distribution of dengue sero-positive cases

Blue clour bar represents total dengue cases and red represents dengue positive cases in a particular year.

Figure 1. Year-wise distribution of dengue sero-positive cases

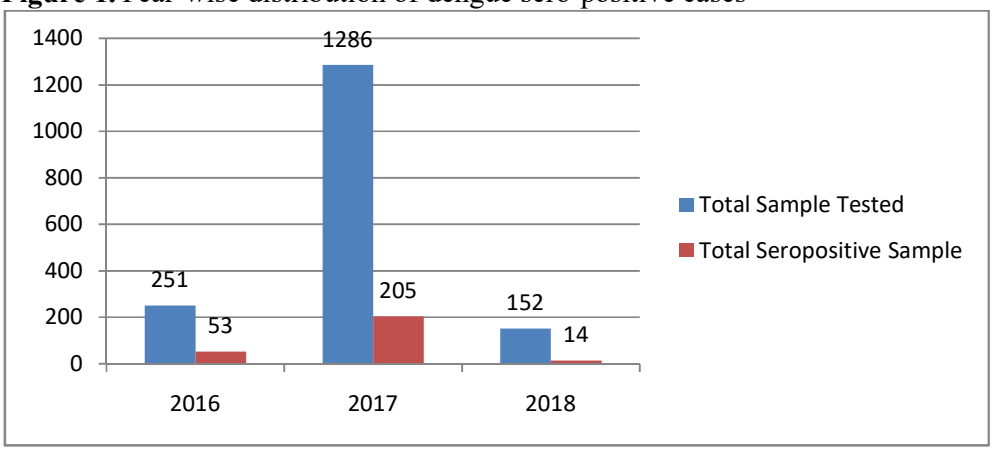

Figure 2(on next page)

Dengue positive cases distribution month wise over three year's period

The blue line indicated the number of dengue positive in the year 2016, the red line indicates the same for the year 2017 and the green for the year 2018

Figure 2. Dengue positive cases distribution month wise over three year's period

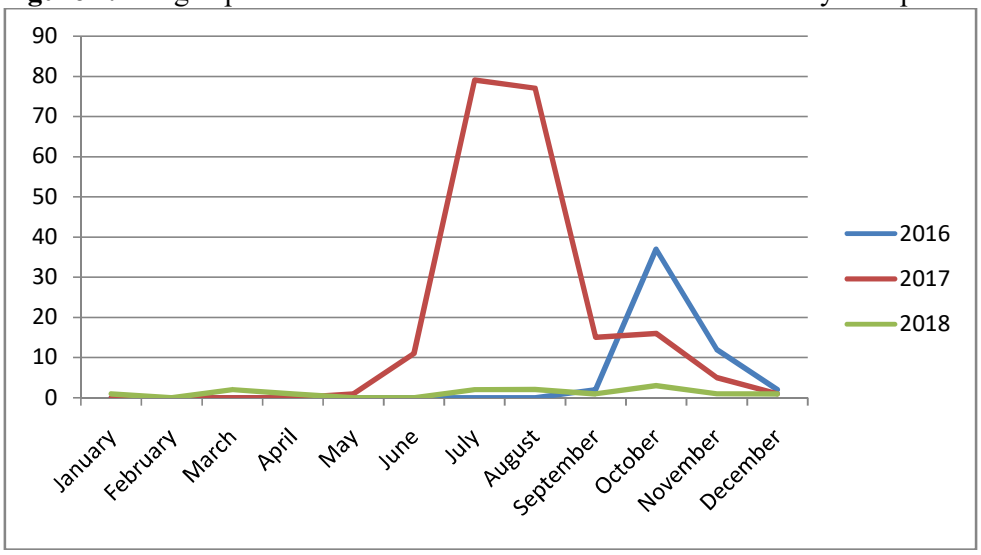

Figure 3(on next page)

Dengue positive cases among male and female

The first set of blue, red and green bar represents the total number of seropositive dengue cases in the year 2016,2017 and 2018. The second set and third set indicates the total number of dengue positive male and females respectively.

Figure 3. Dengue positive cases among male and female

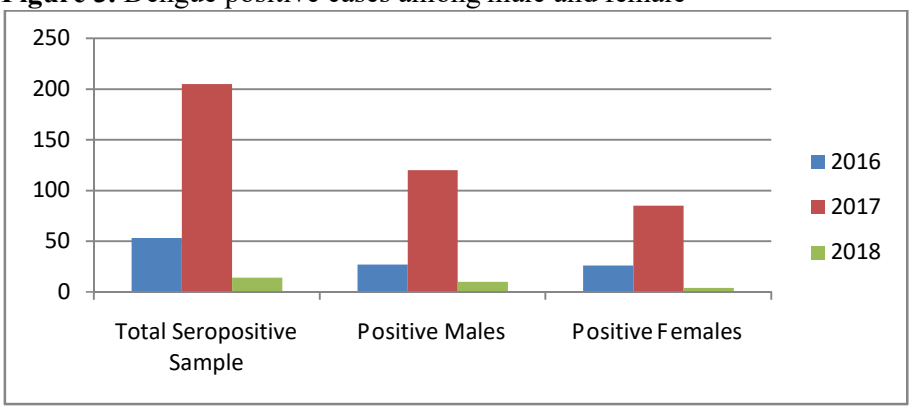

Figure 4(on next page)

Age Wise Distribution of Dengue Positive Cases from the year 2016-2019

Blue,red and green bars indicates the number of dengue positive cases accordingly with agewise grouping.

Figure 4. Age Wise Distribution of Dengue Positive Cases from the year 2016-2019

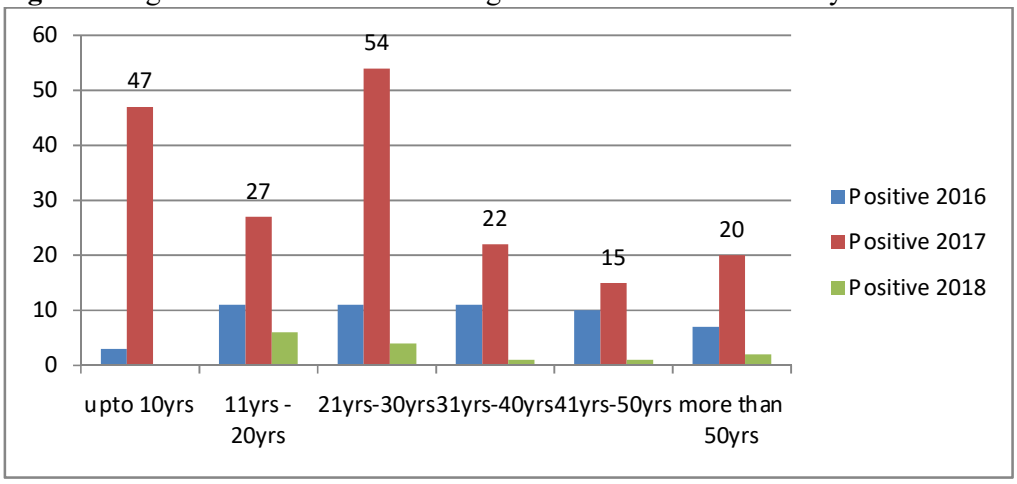

Figure 5(on next page)

District wise distribution of dengue positive cases

Blue, red and green horizontal bar indicates the total number of dengue positive cases distributed district wise.

Figure 5. District wise distribution of dengue positive cases

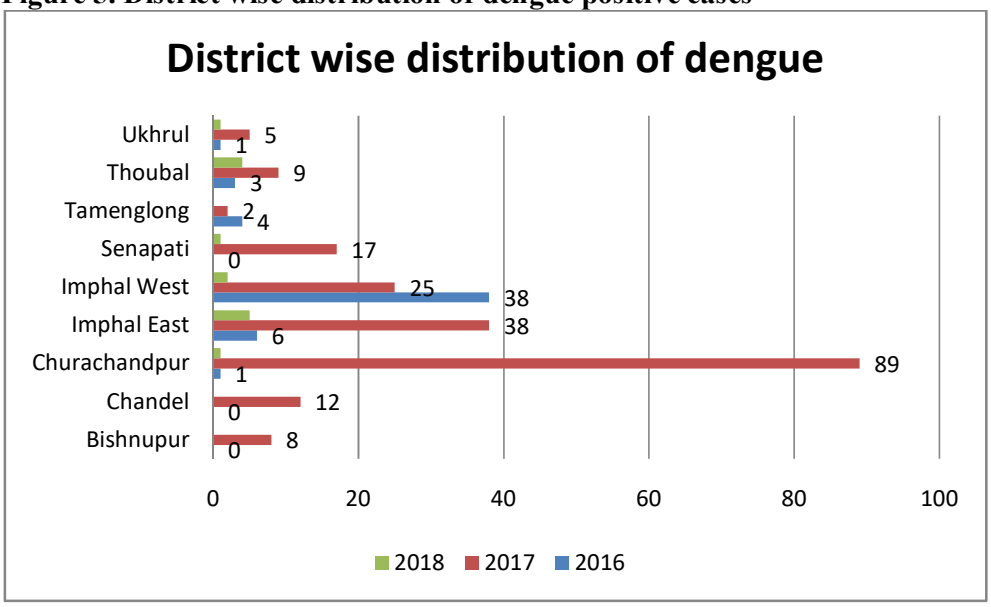

Table 1(on next page)

Year wise distribution of positive dengue cases

The data gives the number of dengue cases, dengue positive cases year wise.

Year	Total Sample Tested	NSI Positive	IgM Positive	Total
2016	251	35 (13.94%)	18 (7.17%)	53(21.11%)
2017	1286	24(1.87%)	181(14.07%)	205 (15.94%)
2018	152	4(2.63%)	10(6.58%)	14(9.21%)
Total	**1689**	**63(3.73%)**	**209(12.37%)**	**272(16.10%)**
The chi-square statistic is 94.9796. The *p*-value is < 0.00001. The result is significant at $p < .05$.				

Table 1. Year wise distribution of positive dengue cases

Table 2(on next page)

Month wise/season wise distribution of sero-positive dengue cases

Each data represents the total number of dengue positive cases in a particular month for the particular year.

Name of the Month	Seropositive (2016)	Seropositive (2017)	Seropositive (2018)
January	0	0	1
February	0	0	0
March	0	0	2
April	0	0	1
May	0	1	0
June	0	11	0
July	0	79	2
August	0	77	2
September	2	15	1
October	37	16	3
November	12	5	1
December	2	1	1
Total	**53**	**205**	**14**

Table 2.Monthwise/season wise distribution of sero-positive dengue cases

Table 3(on next page)

Gender wise dengue sero-positive distribution

The data shows male and female dengue positive cases from the year 2016 to 2018

Year	Total Sero-positive Sample	Positive Males	Positive Females
2016	53	27	26
2017	205	120	85
2018	14	10	4

Table 3.Gender wise dengue sero-positive distribution

Table 4(on next page)

Age wise sero-positive cases

The data shows the distribution of dengue positive cases accordingly with age groups.

Age	Positive 2016	Positive 2017	Positive 2018	Total
upto 10	3	47	0	50(18.38%)
11-20	11	27	6	64(23.53%)
21-30	11	54	4	69(25.37%)
31-40	11	22	1	34(12.5%)
41-50	10	15	1	26(9.56%)
more than 50	7	20	2	29(10.66%)
				272

Table 4. Age wise sero-positive cases

Table 5(on next page)

District wise distribution of dengue positive cases

The data indicated the districts with number of dengue positive cases from the year 2016-2018

Name of District	2016	2017	2018	Total
Bishnupur	0	8	0	8
Chandel	0	12	0	12
Churachandpur	1	89	1	91
Imphal East	6	38	5	49
Imphal West	38	25	2	65
Senapati	0	17	1	18
Tamenglong	4	2	0	6
Thoubal	3	9	4	16
Ukhrul	1	5	1	7

1 **Table 5.**District wise distribution of dengue positive cases

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