A GIS ANALYSIS OF THE DISTRIBUTION OF DENGUE EPIDEMIC IN KARAITIVU FROM 2013 TO 2017

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ABSTRACT

Dengue fever is a common viral infection in tropical and subtropical regions that is carried and spread by mosquitoes. Sri Lanka is facing an unprecedented outbreak of dengue fever, which has resulted in more than 100,000 cases and claimed almost 300 lives so far this year. The major objective of this study is to plot the dengue severity map using previous dengue events. The gathered sample data were mapped using model and distance analysis tool in GIS application. The finding of the study are the highest people around 37 affected by dengue fever in 2016 and the lowest around 4 in 2014. Severity level was very high within 100m of breeding zone approximately 413878.6 Sq. m. in 2013, between 100m and 200m also very high sensitivity region around 702119.0 Sq. m. and between 200m to 300m zone too very effective region around 819407.2 Sq. m. as dengue spreading zone. To minimize the spreading level has to take necessary action through the dengue prevention unit.

Keywords: *Viral infection, Severity level, Breeding zone, Mosquitoes.*

1. INTRODUCTION

Dengue is the systemic viral infection transmitted between humans by Aedes mosquitoes. Severe dengue was first recognized in the 1950s during dengue epidemics in the Philippines and Thailand [8]. Symptoms of infection usually begin 4-7 days after the mosquito bite and typically last 3 to 10 days.

After entering the mosquito in the blood meal, the virus will requires an additional 8-12 days incubations before it can then be transmitted to another human [11]. Major global demographic changes have resulted in uncontrolled urbanization and population growth in some regions. This has to lead to a relative storage of good quality housing that results in poor sanitations and inadequate sewer and waste management system [9].

There is no specific treatment for dengue or severe dengue. But early detection and access to proper medical care lowers fatality rates below 1% [8]. The populous Western Province — including Colombo, the country's capital city — is the worst hit, with more than 46,000 cases reported so far, making up around 44% of the country's total [10].

5295 suspected dengue cases have been reported to epidemiology unit all over the Sri Lanka during January 2017. The number of cases reported approximately 8931 in 2002 was increased by 32063 in 2013 in the island [7].

2. STUDY AREA

The study area is a coastal village located in Ampara District of the Eastern coast of Sri Lanka. This village has 4km long continuous boundary on the East and contains paddy land on the West Kalmunai is a commercial town bordered on the North and Nintavur village is on its South [12].

Its population approximately19000 peoples of 5200 families. Most of people engaged in farming related activities and the rest shares trickling government opportunities, fishing, casual jobs in neighbouring towns and hundreds of unemployed families relying on extended families for their survival [12].

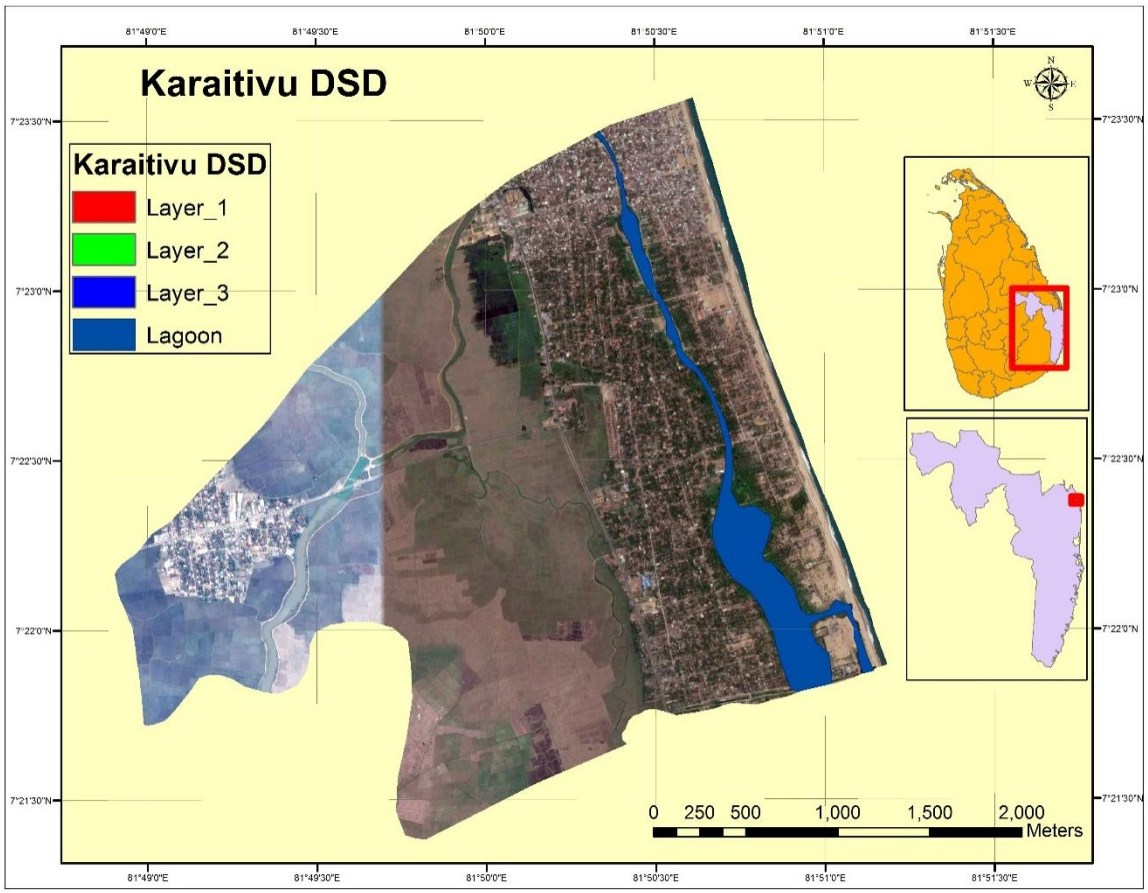


Fig-1: Study Area

3. OBJECTIVES

i. To find the distribution of dengue epidemic in the study area.

ii. To identify the causes for dengue in current situation.

iii. To plot the dengue severity zone in the study area.

iv. To propose the solution for controlling the vector.

4. METHODOLOGY

Methods which used for the data collection are most important tool to accomplish the study. Samples locations for the affected people were gathered x, y coordination of the selected zone using GPS technology was used to plot the severity map. Direct observation and Discussion with selected people were the primary data and Dengue reports for 2013 to 2017, Reports of DS Division Karaitivu, MOH Reports, previous researches and documents, maps and internet are secondary data.

4.1 Data analysis

The gathered data on dengue was categorized according to months and locations. The gathered samples were pointed using GIS application according to the coordinate system. Those data were plotted the severity zones of the study area. Arc GIS 10.4.1 was utilized to prepare the map and the severity spreading level was mapped by using multiple ring buffer analysis. Monthly affected people data were plotted by charts using MS excel application.

5. RESULTS AND DISCUSSION

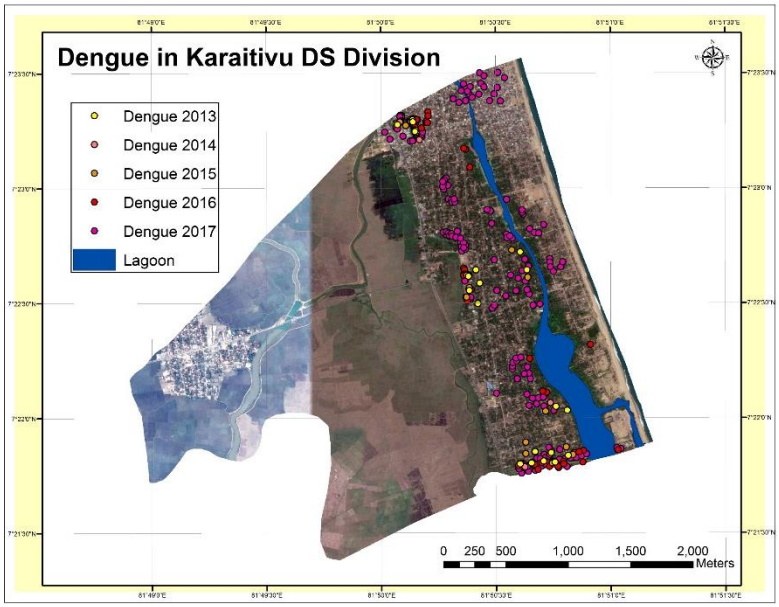


Fig-2: Dengue Distribution on Karaitivu DSD

Monthly dengue effects were categorized as four groups having three months in each. According to this plotted chart, the effects were very high during January to March however, it was low around 1 person affected during 2014 period. When we compare the effects in October to December, the number of affected people were very high in 2017. Almost 11 people suffered by the dengue during this months.

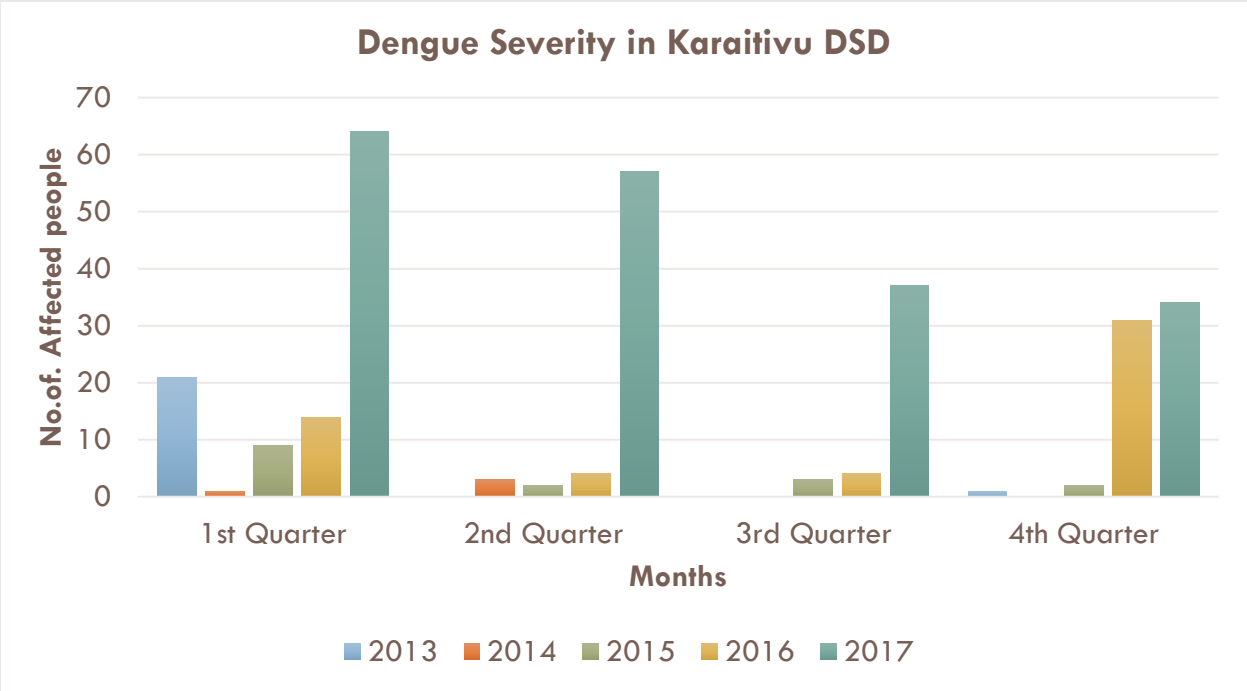


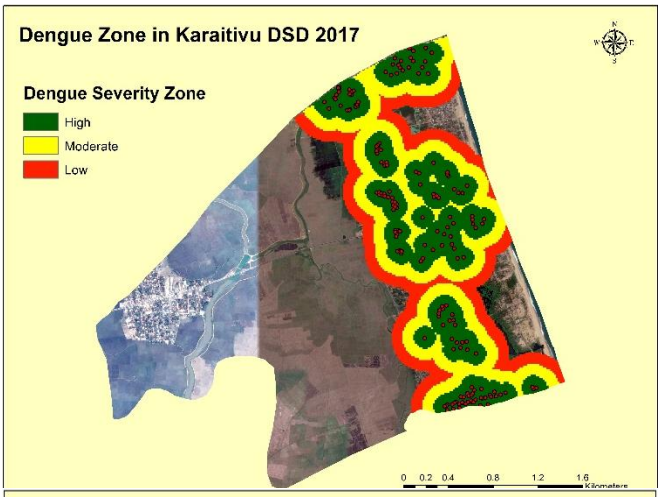
Fig-3: Dengue Severity on Karaitivu DSD

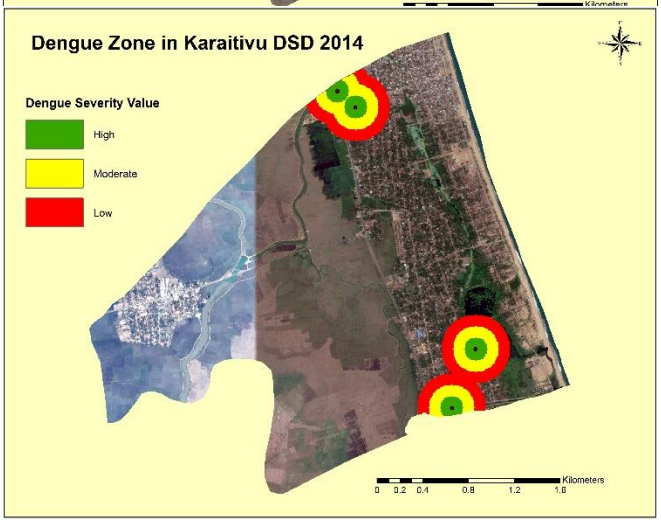
Further, the affected people during April to September were in average level when compare with other periods. It is understandable the dengue epidemic highly spreading during the rainy season of this area.

The dengue severity level was categorized into three zone such as highly severity zone, moderately severity zone and lowly severity zone. Those zones within 100m taken as high severity zone, 100m to 200m taken as moderate severity zone and 200m to 300m taken as low severity zone of the study area.

According to the analysis in 2013, the region within 100m approximately 413878.6 Sq. m. got danger zone, between 100m and 200m region around 702119.0 Sq. m. danger zone and between 200m to 300m 819407.2 Sq. m. as spreading zone.

In 2014, the result of the analysis was within 100m nearly 125663.7 Sq. m. difficult zone, 100m to 200m approximately 331923.4 Sq. m. effect zone and 200m to 300m about 507647.8 Sq. m. mosquito spreading zone.


Dengue Zone in Karaitivu DSD 2017
Dengue Severity Zone
High
Moderate
Low
0 0.2 0.4 0.8 1.2 1.6
Kilometers


Dengue Zone in Karaitivu DSD 2014
Dengue Severity Value
High
Moderate
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Kilometers
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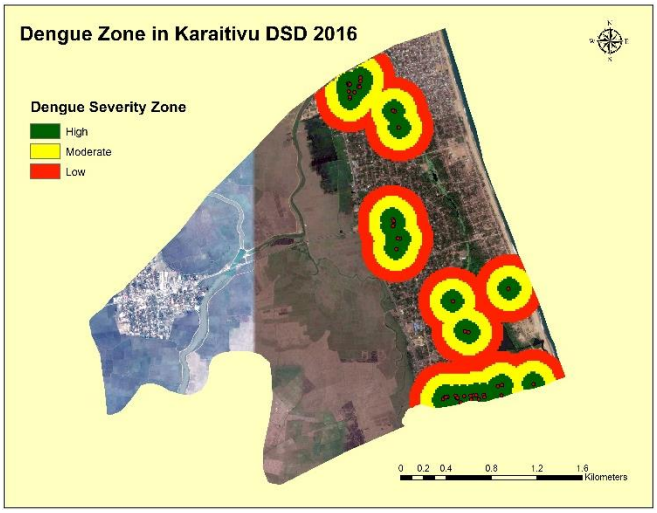
Dengue Zone in Karaitivu DSD 2016
Dengue Severity Zone
High
Moderate
Low
0 0.2 0.4 0.8 1.2 1.6
Kilometers

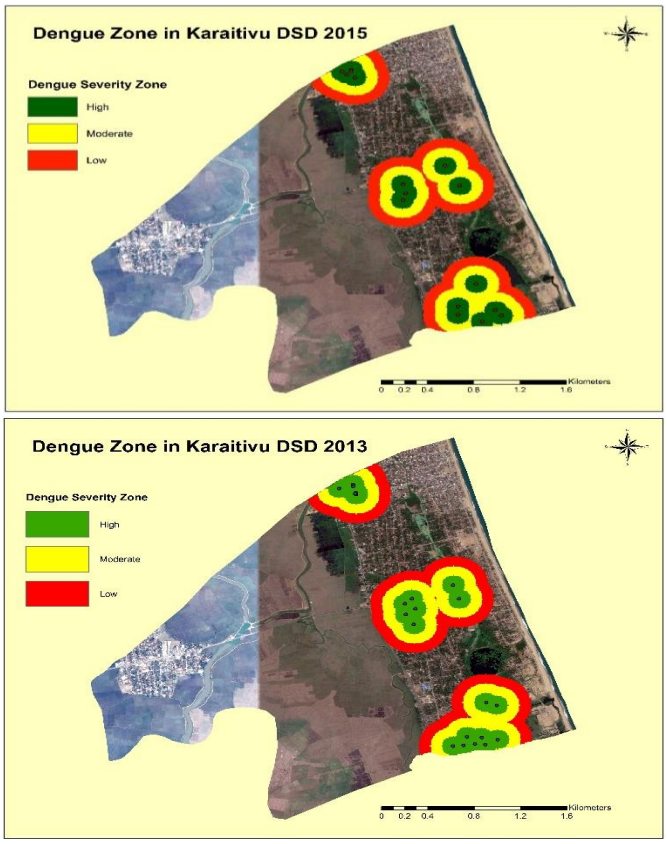

Fig-4: Dengue zone

In 2015, it was found as within 100m nearly 349828.6 Sq. m danger zone, 100m to 200m around 687006.9 Sq. m. spreading zone and 200m to 300m approximately 804939.8 Sq. m. dengue sensitive zone in this area.

In 2016, it was calculated as within the 100m region around 532971 Sq. m. area in the danger zone, 100m to 200m region approximately 964391 Sq. m. area in the spreading region and 200m to 300m area around 1182840 Sq. m. mosquito spreading zone.

Table 1: Dengue Severity Zone (sq.m.)

Year	High	Moderate	Low
2013	413878.6	702119.0	819407.2
2014	125663.7	331923.4	507647.8
2015	349828.6	687006.9	804939.8
2016	532971.0	964391.0	1182840.0
2017	1571890.0	1472970.0	1287120.0

In 2017, the severity zone was analyzed within 100m area approximately 1571890 Sq. m. as highly difficult region, 100m to 200m zone around 1472970 Sq. m. vector prone area and 200m to 300m region about 1287120 Sq. m. dengue prone region.

5. Causes of Dengue Fever

5.1. Natural factors:

- Mostly dengue fever highly spreading in the heavy rainy season
- Dengue breading eggs laid on damp surfaces in areas likely to temporarily flood such as tree holes.
- Spreading by a lot of places where rain-water collects or stores.

5.2 Manmade factors:

- Dengue mostly possible to spread by man-made containers like barrels, drums, jars, pots, buckets, flower vases, plant saucers, tanks, discarded bottles, tins, tires, water cooler, etc.
- Unclear block drains caused to the spreading
- Dengue breeding eggs into unfrequented bathrooms.
- Discarded foot packets and coconut shells in the public places.
- Improper drainage patterns
- Braked drainage that contains wastage with stagnant water.
- Stagnant water in low land by flooding is possible to spread the dengue mosquitoes.

Dengue is the killing vector nowadays caused many effects to the human beings. The finding of the study was established the vector mostly spreading the dengue during the rainy season. However, many harmful activities created by human behaviors than natural factors.

Overall analysis, the highest people around 192 affected by dengue fever in 2017 and the lowest people around 4 affected in 2014. Severity level was very high within 100m in 2017. This was approximately 1571890.0 Sq. m. in this area, between 100m and 200m also very high sensitivity region around 1472970.0 Sq. m. and between 200m to 300m zone too very effective region around 1287120.0 Sq. m. as dengue spreading zone. This regions were highly observed by the dengue prevention unit. Therefore, the effects were dramatically reduced in later periods in this area.

Dengue Fever is spread through a mosquito. The best way to avoid dengue infection is to prevent mosquito bites. There is no any vaccine or preventive drug in our country. The dengue prevention unit has to take necessary action to minimize the effects. Therefore, the following advices are useful. They should avoid mosquito bites during day time by wearing protective clothing and use mosquito nets when sleeping (both day and night)

Get rid of mosquito breeding sites regularly in and around your household. Fine the people who has been keeping unclean environment like indispose tin, yogurt cups, discarded tyres, plastic containers, coconut shells, leaf axils, blocked roof gutters, bird baths flower vases, or any other place where rain water collect, once a month or between two months should observe the severity zone and other regions.

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