

SPATIAL AND TEMPORAL STUDY ON DENGUE DISEASE IN VISAKHAPATNAM DISTRICT WITH EMPHASIS ON VISAKHAPATNAM CITY (GVMC), A. P, INDIA.

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Abstract: Dengue, which is transmitted by *Aedes* mosquitoes, has been endemic in Visakhapatnam for over a decade. However, there are no proper vector-control strategies that have led to a significant increase in the disease burden and are inadequate to prevent. However, dengue data derived by sex and age are not usually reported or analyzed. Year wise data on Dengue Cases by sex and age was collected for the Visakhapatnam district and also for Visakhapatnam City (GVMC) (2012- 2019) to investigate whether large-scale dengue outbreaks and demographic factors such as age and sex may be related to the probability of exposure to dengue vector *Aedes aegypti* in Visakhapatnam from 2012 to 2019. The findings will be helpful to DM&HO, Visakhapatnam for the implementation of health care facilities according to the season and zone. In this context, an attempt is made in this paper to identify Dengue cases according to sex, age and period in the Visakhapatnam district and also according to zones in Visakhapatnam City (GVMC).

IndexTerms - *Aedes aegypti*, Age, Sex, Dengue, Cases, GVMC, Zone.

I. INTRODUCTION

Dengue fever is break bone fever and also known as yellow fever (Clarke and Tom. 2002). It is a mosquito-vectored viral disease and it is transmitted by the infective bite of *Aedes Aegypti* mosquito variety. A mosquito becomes infected only if it bites the dengue patient during the first 3 days of illness. After biting, the mosquito incubates the virus for 9 to 12 days before it becomes a carrier of the disease. Once infected, the mosquito remains infected for the whole of its life. Man develops disease after 5-6 days of being bitten by an infective mosquito and the diseases are called as 1. Dengue Fever and 2. Dengue Hemorrhagic Fever (DHF). Dengue Fever is a severe, flu-like illness; Dengue Hemorrhagic Fever (DHF) is a more severe form of disease, which may cause death. The dengue mosquito grows in tropical and subtropical climates (Morens 2009). According to a recent report released by the World Health Organization (W.H.O) shows that the dengue is noticed in 128 countries in the world with 390 million infections per year endangering 3.97 billion people (Kwan 2018). Thus the number of dengue cases has increased tremendously during the last five years. Dengue fever is a major problem in Andhra Pradesh and India. In recent years, the dengue outbreaks are gradually increasing year by year in various districts of Andhra Pradesh. The dengue cases recorded in India were 99919,129166,188401,101192,157315 cases in 2015, 16, 17,18, 2019 respectively, Particularly its distribution can be seen in Rajasthan, Panjab, South Gujarat, North West part of India and all states of Southern India and also in West Bengal whereas in Andhra Pradesh 3159,3417,4925,4011, 5286 cases were recorded in 2015,16,17,18 2019 respectively. Most of the dengue cases were recorded in Andhra Pradesh were from urban areas of Visakhapatnam, Guntur, Kakinada in 2019. Visakhapatnam district reported about 1201 dengue cases, Guntur district 894 cases and East Godavari district 557 cases in 2019. As per the official statistics, the areas falling under the urban limits of the GVMC reported more than 940 dengue cases in 2019. The rise of these dengue cases are driven by complex interactions between hosts, vectors and viruses that are influenced by environmental, climatic, demographic and socio-economic factors and also human population growth, accelerated urbanization, increased international transport, lack of proper public health infrastructure as well as a lack of effective vector control and disease surveillance system (Rigau-Pérez et al., 1998, Gubler, 2002b, Hales et al., 2002, Mackenzie et al., 2004, Chaturvedi and Nagar, 2008). *Aedes aegypti* mosquito mainly a type of urban mosquito is well suited to specific environments such as water storage common areas and areas where waste disposal services are inadequate (Chinery 2004). The favored breeding places are Desert coolers, Drums, Jars, Pots, Buckets, flower vases, Plant saucers, Tanks, Cisterns, Bottles, Tins, Tyres, Roof Gutters, Refrigerator Drip pans, Cement blocks, Cemetery urns, Bamboo stumps, Coconut shells, Tree holes and many more places where rainwater collects or is Stored (NVBDCP 2020). Susceptibility to such environments may be related to specific statistical factors such as age and sex whereas sex-specific dengue data is scarce because surveillance systems usually do not report or analyze sex based dengue data. Some studies from Singapore showed that male dengue patients are outnumbered female dengue patients. About concerning to gender roles and changes in human life expectancy, it is necessary to examine dengue patients by both sex and age. In this context, this study examines the number of dengue patients according to age, sex and temporal changes in Visakhapatnam district and also in Visakhapatnam City (GVMC) according to Zones. The study is divided into two sections. Section –I deals with study on dengue disease at district level where as section –II deals with study at Visakhapatnam City level (GVMC).

II. DATA AND METHODOLOGY

The study mostly depends upon secondary data and it was collected from the DM&HO (District Medical and Health Office) Visakhapatnam, District Malaria Controlling Office and Primary health care centres regarding numbers of dengue cases from 2012 to 2019 period for 8 years and also Rainfall data from 2012 to 2019 was collected from the CPO (Chief Planning

Officer) Visakhapatnam district. In this study, SPSS has been used for descriptive analysis and GIS for generating location Map of Visakhapatnam.

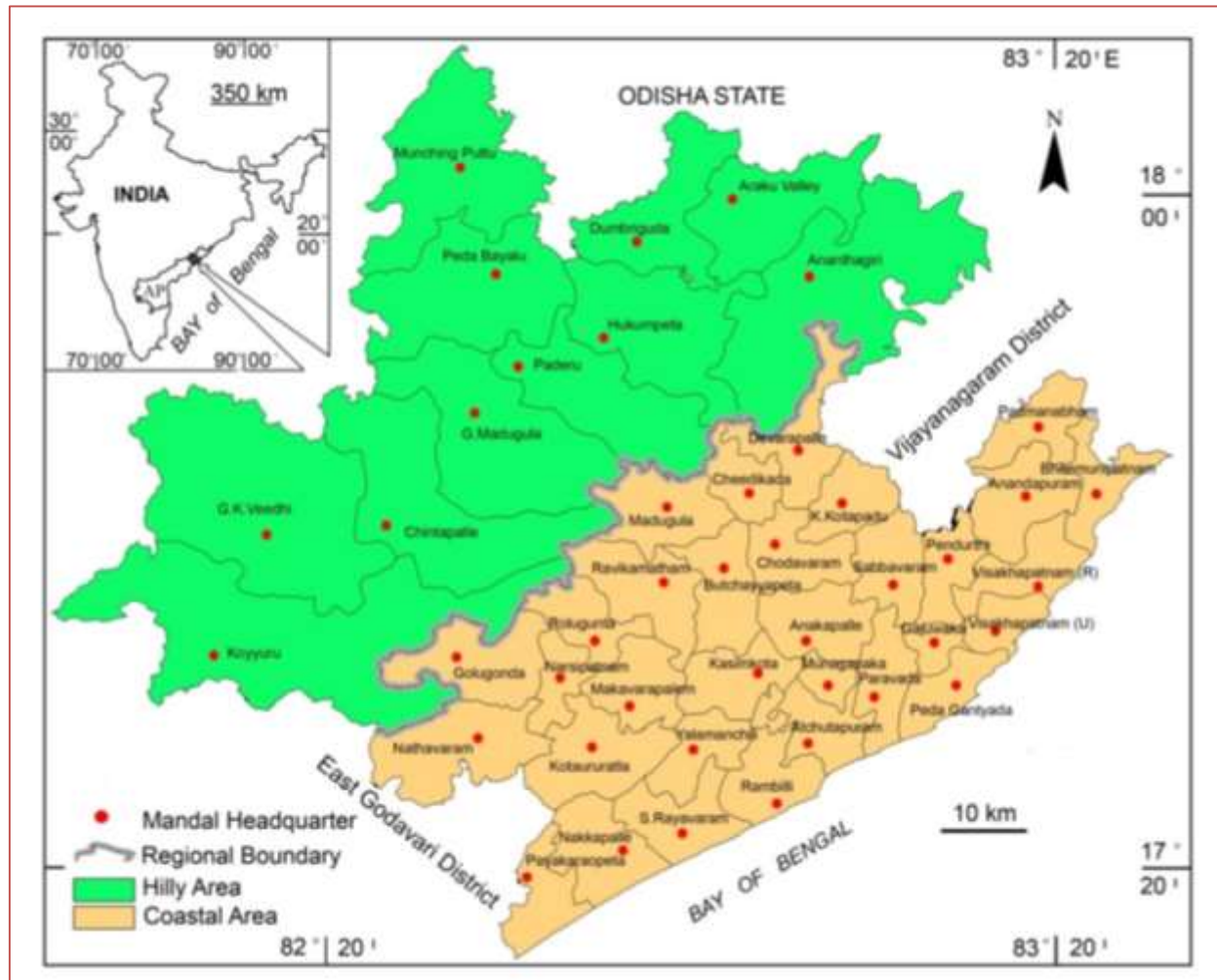
I. OBJECTIVES

1. To examine, temporal variations of Dengue fever cases recorded according to years and months.
2. To find out which sex group and age group people are more affected by dengue fever.
3. To assesses the temporal variations of Dengue disease in Visakhapatnam City at Zonal level (GVMC).

II. STUDY AREA

SECTION –I (VISAKHAPATNAM DISTRICT)

LOCATION MAP OF THE STUDY AREA

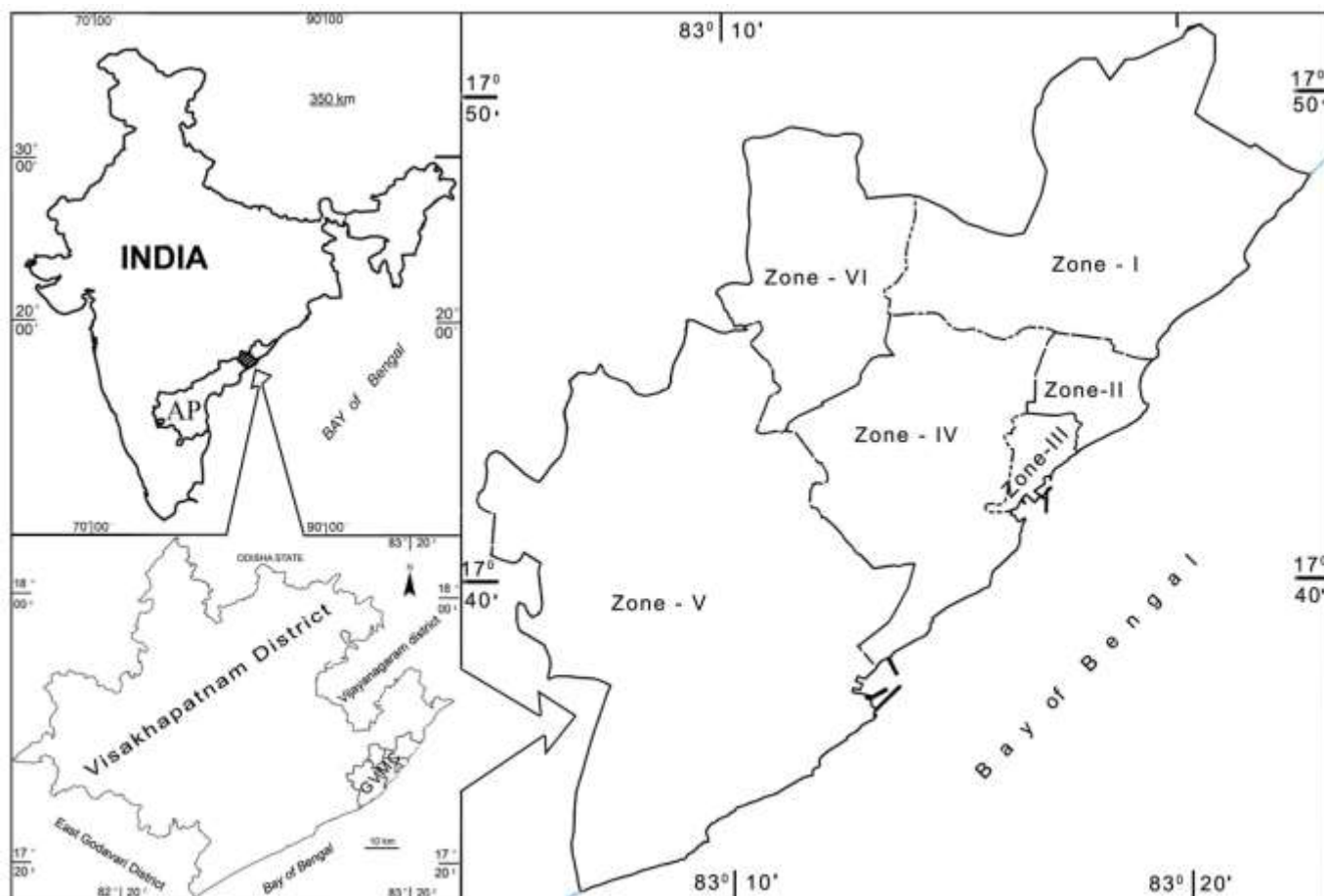


Visakhapatnam district of Andhra Pradesh lies between $17^{\circ} 69'N$ latitude, $83^{\circ}22'E$ longitude. The district encompasses an area of 11,161 sq km. and it is bounded by Vijayanagaram district on the North, East Godavari district on the South, the Bay of Bengal on the East and East Godavari district of Andhra Pradesh and Koraput district of Orissa on the west.

The District presents two distinct Geographic regions. The strip of the land along the coast and interior plains division and hilly region of the Eastern Ghats region. The Agency region consists of the hilly regions covered by the Eastern Ghats with an altitude of about 900 metres. The district comes under subtropical region and receiving about 945 mm rainfall per annum with an average close to $23^{\circ} C$. According to 2011 census, the total population of the district was 42, 90,589 with a density of 384 persons per Sq.km. Government is providing medical and health facilities to the Public through 22 hospitals and 86 PHC's and 584 Sub centres.

SECTION –II (VISAKHAPATNAM CITY- GVMC)

LOCATIN OF MAP OF GVMC- VISAKHAPATNAM CITY



Visakhapatnam city (Greater Visakhapatnam Municipal Corporation) is one of the fastest growing cities in the state as well as in the country. Administratively the city (GVMC) is divided into six administrative zones by Corporation (GVMC). GVMC is divided into 6 zones and each zone contains wards. Zone-I contain 6 wards. The Zone-II has 12 wards, The Zone-III contains 12 wards, Zone-IV has 19 wards, The Zone-V contains 15 wards and the zone-VI contains 7. In 1991 Visakhapatnam city has only 52 wards later they were increased to 72 wards.

RESULTS AND DISCUSSION:

SECTION –I (VISAKHAPATNAM DISTRICT)

(1). TEMPORAL CHANGES IN DENGUE CASES IN THE STUDY REGION:

Figure- I Shows that year wise total dengue cases during 2012 to 2019 period. It can be observed from the figure that, dengue fever cases were recorded continuously from 2012 and the study area became endemic to dengue disease. Regarding dengue cases, maximum numbers of cases (2418) were recorded in 2018 whereas minimum numbers of cases (168) were recorded in 2012 in the study region.

Further, it is observed from the figure that, about 163 cases recorded in 2012, decreased to 159 cases in 2013 and increased to 381 cases in 2014 again decreased to 265 cases in 2015. Whereas about 1127 cases recorded in 2016 and decreased to 983 cases in 2017 and increased to 2418 cases which is the highest recorded cases in the study period and again decreased to 1275 cases in 2019. It is observed that the highest numbers of dengue cases were recorded in 2012,14,16,18 years and the lowest numbers of cases were recorded in 2013,15,17,19 years and following an alternatively increasing and decreasing pattern in recorded cases.

It can be understood from the above discussion that when more number of dengue cases reported then the concerned authorities took some temporary preventive measures by which the number of cases were reduced in the next year and due to little interest shown towards dengue prevention again, more number of dengue cases were recorded in the subsequent year in the study region. Due to this reason dengue cases showing alternatively increasing and decreasing pattern.

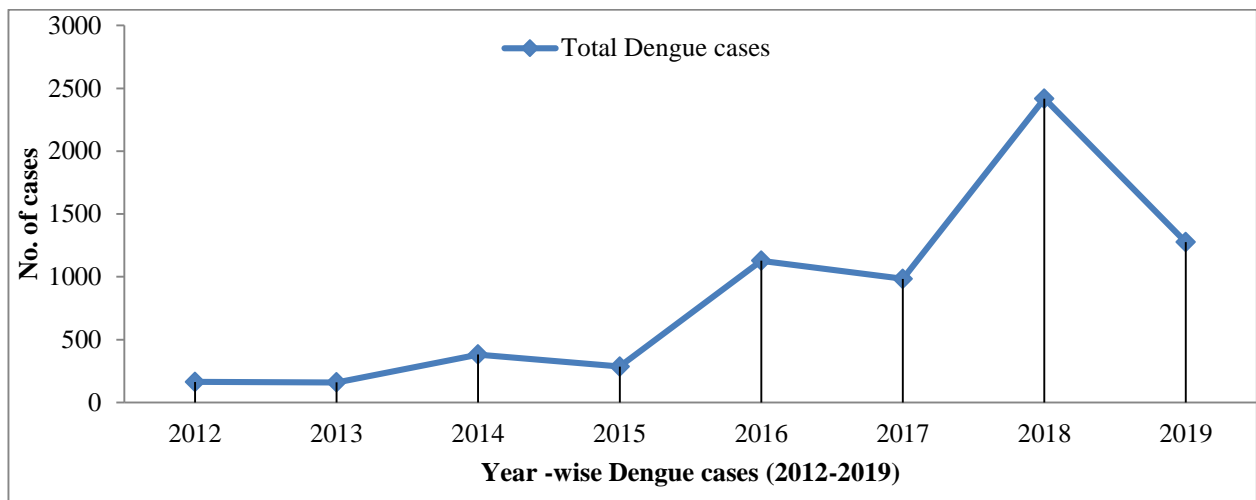


Figure1. Year-wise total Dengue cases during the period of 2012 to 2019.

(2). Changes in Dengue Cases according to months in the study region:

Figure.2. Showing monthly reported Dengue cases during 2012 to 2019 period. It can be observed from the figure that, April month recorded the lowest number of cases and September month recorded the highest number of cases. It is also observed that more number of dengue cases recorded in July, August, September, October and November months, From the above discussion, it is observed that, as January to May months receiving a low amount of rainfall very low number of dengue cases were reported whereas during July to November months the study area receiving a very high amount of rainfall and consequently more number of dengue cases were reported.

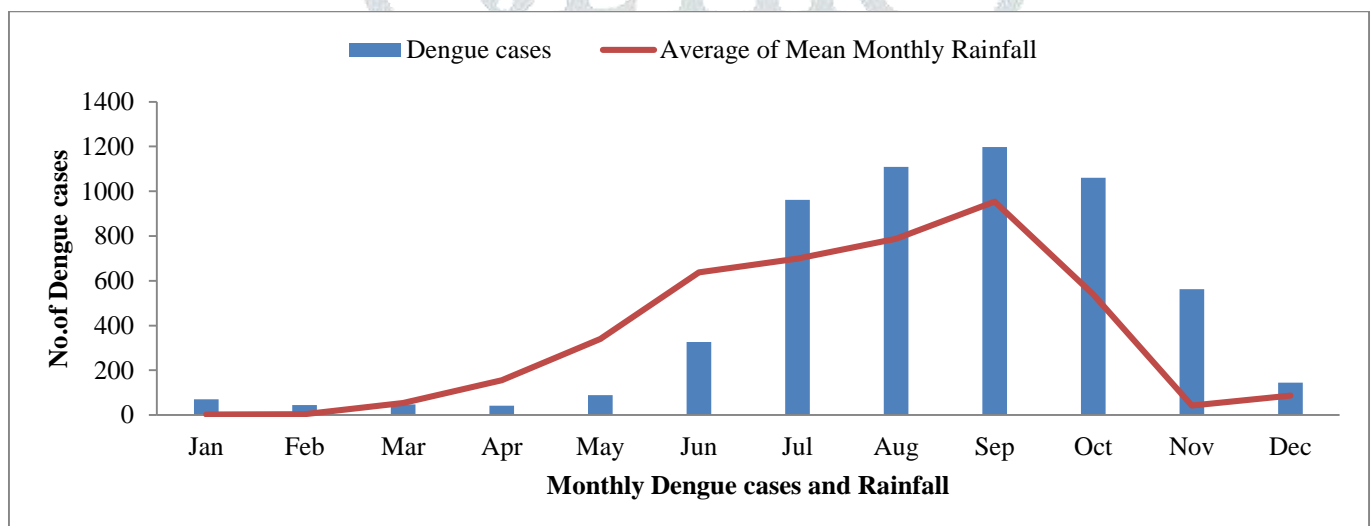


Figure2. Month-wise recorded Dengue cases and Rainfall from the year of 2012 to 2019.

(3) Changes in Dengue cases based on sex in the study region:

Figure (3) showing the total Dengue cases by sex between 2012 and 2019 period. According to 2011 census, the study area recorded 49.9 % of male population and 50% of female population. The lowest male cases were recorded in the year 2013 with 53% and the highest male cases were recorded in the year 2015 with 62%. The lowest female cases were recorded in the year 2015 with 38% and the highest female cases of dengue disease were recorded in the year 2013 with 47%. Likewise, the second lowest female cases of dengue cases were recorded in the year 2012 with 39% and the second highest female cases of dengue disease were recorded in the year 2019 with 46%. The second highest male cases of dengue disease were recorded in the year 2012 with 61% and the second lowest male cases of dengue disease were recorded in the year 2019 with 54%. From the above discussion, it is observed that more dengue fever cases can be seen in the male population than the female population. 2012 -2019 total male cases were 57% and female cases were 43%.

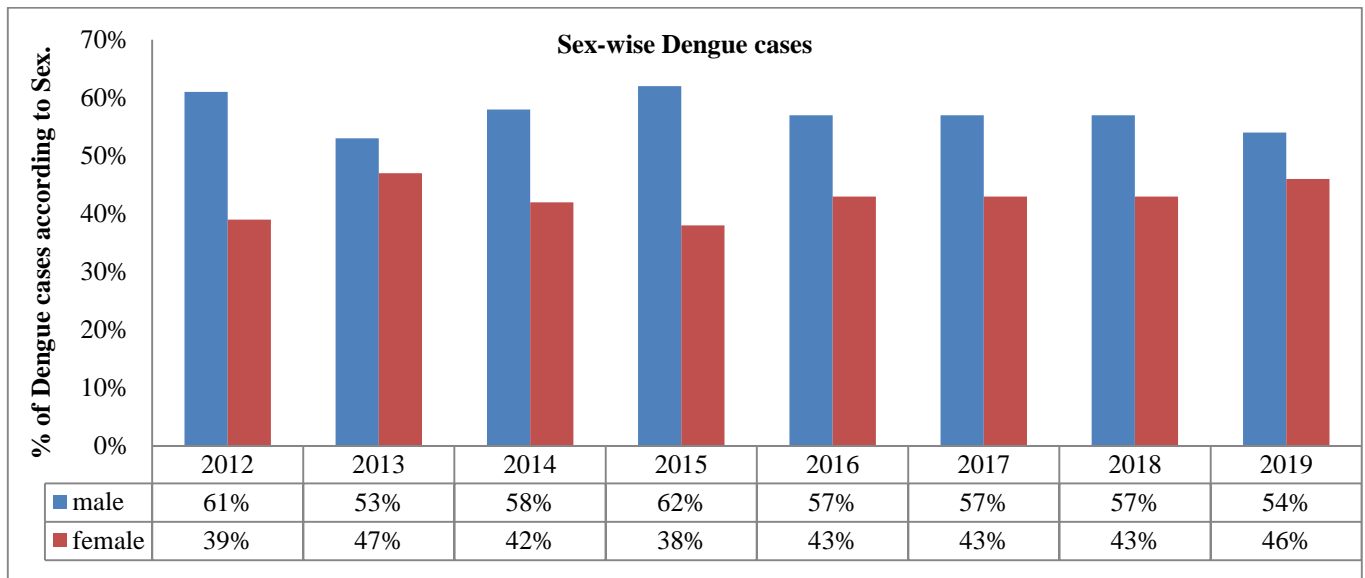


Fig.3. Dengue cases according to sex during 2012 -2013 period.

(4) Dengue cases based on Age in the study area

Figure 4. It shows that about 52% of the total dengue cases were recorded in the age group of 15 to 45 years about 26% of the total dengue cases were recorded in the age group of 0 to 8 years whereas 16% of the total cases reported in 9 to 14 years and very less 6% of cases were recorded in more than 45 years age group. It is observed that children and young age people are more prone to this dengue disease.

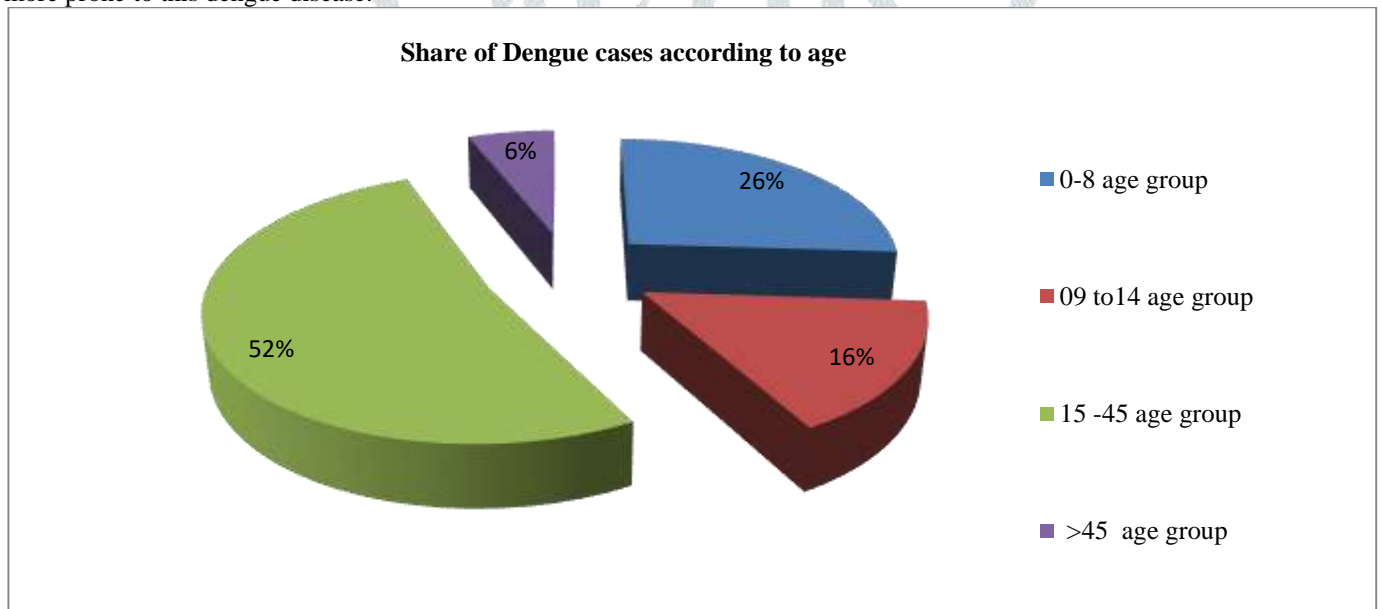


Fig. 4. Dengue cases according to age for the period of 2012 to 2019.

SECTION –II (VISAKHAPATNAM CITY- GVMC)

(5) Changes in Dengue Cases according to years in the Visakhapatnam City (GVMC):

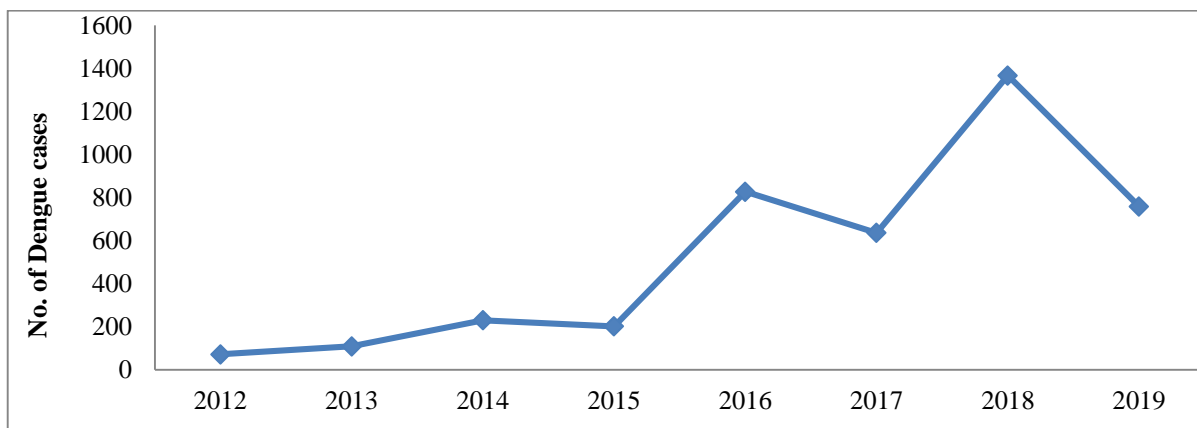


Fig.5 the year wise Dengue cases in GSVMC for the period of 2012 to 2019.

It can be observed from the figure 5 that, lowest no. of dengue cases (72) recorded in 2012 and the no. of dengue cases reported cases were around 200 only up to 2015. After 2015, highest no. of dengue cases reported up to 2019 and the no. of reported cases were between 636 and 1367 in the study region. Highest number of Dengue cases (1367) reported in 2018 and second highest number of cases (867) recorded in 2016. Further the graph is showing alternatively increasing cases and decreasing cases over the study period in the study region.

(6) CHANGES IN DENGUE CASES ACCORDING TO ZONES IN VISAKHAPATNAM CITY (GVMC)

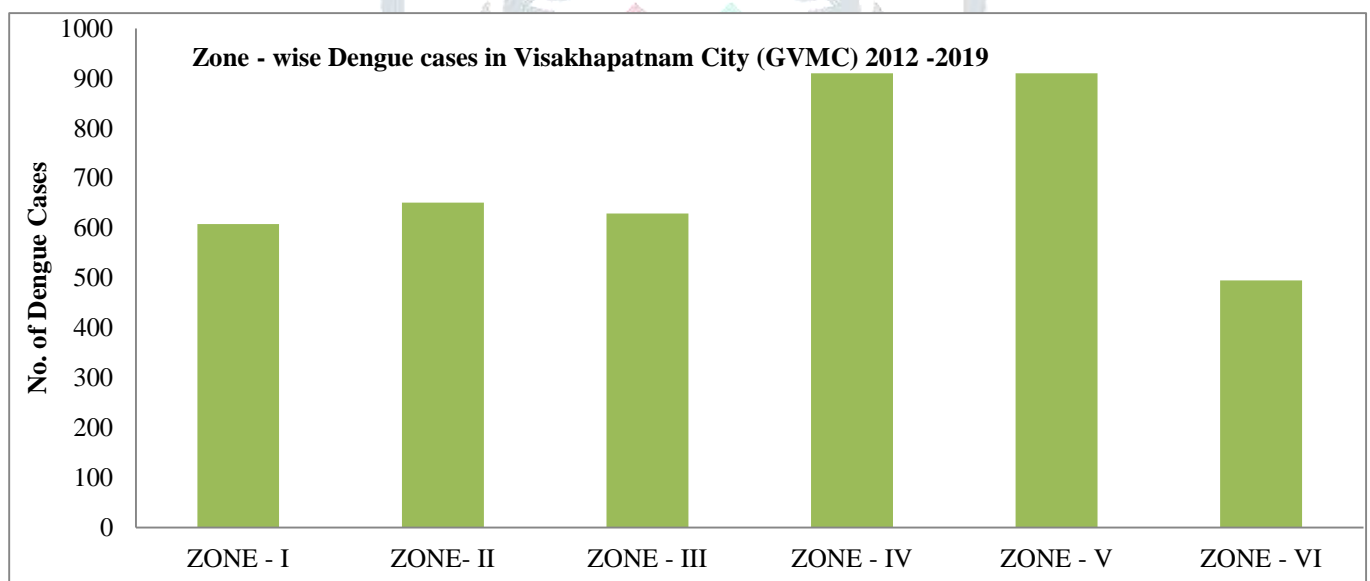
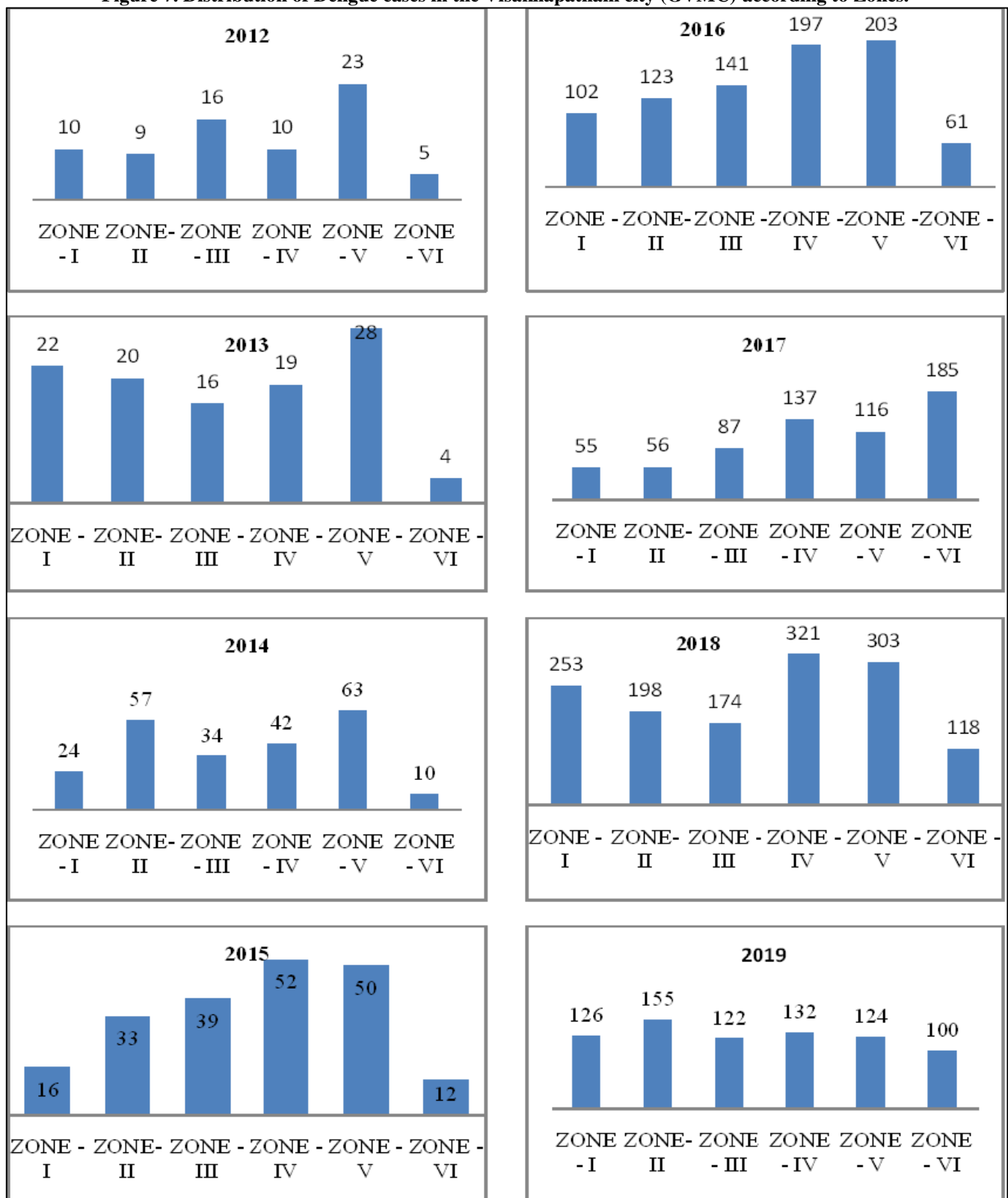


Fig. 6 Zone wise Dengue cases in Visakhapatnam City (GVMC) for the period of 2012 to 2019.

In this figure 5, highest cases were recorded in the Zone-IV and Zone -V with 910 cases and Very lowest cases were recorded in the Zone-VI with 495 cases. Second highest cases were recorded in the Zone- II with 651 cases and Second lowest cases were recorded in the Zone-I with 608 cases. And medium cases were recorded in the Zone- III with 629 cases.

(7) YEAR- WISE DISTRIBUTION OF DENGUE CASES IN THE VISAKHAPATNAM CITY (GVMC)

Figure 7. Distribution of Dengue cases in the Visakhapatnam city (GVMC) according to Zones.



It can be observed from the fig. 7 that, all zones of the City from 2012 to 2019 reported dengue cases.

Conclusion:

From the above discussion, it is observed that the Dengue cases in Visakhapatnam district were recorded in alternatively increasing and decreasing pattern. Further, more number of cases can be seen between July to November months. Male population, Children and young age group people are more vulnerable to this disease.

Regarding zones in Visakhapatnam city (GVMC) the maximum no. of Dengue cases were recorded in the year of 2018 and the high risk Zones are Zone- IV and Zone -V and Very low risk Zone is Zone- VI in Visakhapatnam (GVMC). Further half of the total cases were recorded in Zone-IV and Zone-V.

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