Prevalence of Dengue and Chikungunya,a Hospital Based Study in District Bardhaman, West Bengal, India

Writuparna Ghosh[1], Kuntal Das[2], Suraj Mondal[3], Soumik Bhattacharjee[4], Yudhajit Guha[5], Suman Paul[6]

[1,2,3,4,5]Virus Research and Diagnostic Laboratory (VRDL), Burdwan Medical College and Hospital (BMCH), Burdwan- 713104, West Bengal, India.
[6]Department of Microbiology, Burdwan Medical College and Hospital (BMCH), Burdwan- 713104, West Bengal, India.

ABSTRACT:

Dengue and Chikungunya are the vector-borne diseases,spread by mosquito vectors *Aedes aegypti*. Studies show that these have become the major health problems nowadays. World wide spread of these diseases especially in tropical and subtropical regions leads to recurrent outbreaks. This Article highlights the prevalence of these viruses in district Bardhaman, South Western region of West Bengal. A volume of 2 to 3 ml of blood was collected from each patients suspected with the symptoms of Dengue or Chikungunya in clot vials under aseptic conditions and centrifuged at 5000 rpm for 5 minutes for separating the serum. In case of Dengue testing, NS1 antigen or anti DENV IgM were detected. Dengue negative samples were sent for serological diagnosis of Chikungunya virus. From this study it was observed that prevalence was greater in individuals in the age group of 20-45 years followed by individuals below 20 years. This study showed that dengue infection peaked in the month of November with gradual rise in the month of October because of stagnant freshwater during post-rainy seasons (June to September), responsible for breeding of vector mosquitoes. In case of Dengue infected individuals, male prevalence is greater than females whereas female predominance was greater for Chikungunya. Our studies highpoint post Covid occurrence of Dengue and Chikungunya in the districts around East Bardhaman (West Bardhaman, Purulia, Birbhum,Hooghly, West Midnapore).

KEYWORDS: Prevalence, DengueIgM, Dengue NS1,Chikungunya IgM, Bardhaman

1. INTRODUCTION

Dengue and Chikungunya are caused by an Arbovirus (named Dengue virus (DENV) and Chikungunya virus (CHIKV)(2), which belong to the genus Flavivirus and Alphavirus respectively [1]. Both viruses are made up of single positive sense RNA genomes and spread by mosquito vectors *Aedes aegypti* [2]. Both viruses can be transmitted horizontally (e.g from human to human via mosquito vector) and vertically (e.g. maternal-fetal transmission) [3]. Recent studies show the worldwide spread of these diseases, especially in tropical and subtropical regions because of recurrent outbreaks [4]. Dengue viruses have four serotypes DENV-1,2,3 and 4 [2] which share similar clinical symptoms like

fever,chills,headache,nausea,vomiting,aches,pain,rash,etc.Fibrility is the most common symptom. Although, there are several distinguishing features which include hemorrhagic conditions and platelet depletion in Dengue and severe arthralgia in Chikungunya[5,6].The incubation period of these two is 5-7 days and 2-3 days respectively [1]. The course of Dengue fever follows 3 phases:febrile, critical and convalescent [7]. Due to similar nature of symptoms for Dengue and Chikungunya and overlapping endemicity, misdiagnosis of dual infection as mono infection is a real possibility. Poor countries and resource poor settings are also contributory [8]. Clinicians mainly rely on supportive therapy as no vaccine or drug is available for either of these two [6,9]. Our study is based on the prevalence of Dengue and Chikungunya in and around districts of Barddhaman like Purulia,Hooghly,West Midnapore,etc as there are many rural areas in and around Bardhaman districts, which are surrounded by paddy fields, which is a breeding ground of mosquito vectors.WHO,2023 claims that Urbanisation,climatechange, problems with water and sanitation, increased precipitation, higher temperature,developing rural areas adjacent to railway stations, National Highways, different rice mills, stagnant water of fountains, poor drainage systems, illegal dumping of roadside garbage, improper maintenance of ponds,are popular larval habitats of quite a few variants of mosquitoes [10]. Reports claim that there is a high correlation between container habitats and spreading of mosquitos, causing Dengue and Chikungunya [11]. During acute Chikungunya infections,skin lesions and neurological involvement are often seen,though, Chikungunya is not a neurotropic virus.Conjunctivitis has also been recorded in few patients [12]. Both CHIKV and DENV use humans and mosquitoes for their propagation. Co-circulation of DENV and CHIKV viruses were reported from many earlier studies [13]. In this study we are targeting an area where temperature ranging around 30-40°C during the time of March to October with moderate humidity,seasonal monsoon rain and thunderstorms in the months of April and May as these conditions favor the breeding of mosquitoes.

OBJECTIVE

To study prevalence of Dengue and Chikungunya in district Bardhaman (West Bengal, India) with respect to associated factor age, gender and seasons.

II. MATERIALS AND METHODS

Study area and it's geo-climatic environment

The study area is mostly confined to the districts around East Bardhaman which mainly include West Bardhaman,Purulia, Birbhum, Hooghly and West Midnapore.The climate is generally tropical in nature with environmental temperatures ranging between 35-40 ∘C in summers and in the winters it ranges between 5-25 ∘C.

Study design and duration

This observational study was conducted in the Virology unit and Virus Diagnostic and Research Laboratory at Microbiology department of Burdwan Medical College for the samples collected during the year 2022 after the post COVID-19 peak.

Study participants

All the individuals who visited the Burdwan Medical College and Hospital with dengue or chikungunya like symptoms and were prescribed by the doctors for the respective tests were included in this study. A total of 7259 dengue and 1682 Chikungunya samples were tested in the year 2022.

ETHICAL CONSIDERATIONS: Approval for the study was granted by Human Ethical Committee of the Institution according to guidelines of Indian Council of Medical Research (ICMR), New Delhi.

Laboratory investigation

Approximately 2 to 3 ml of blood was collected in clot vials from each individual patient with fever and chikungunya/dengue-like symptoms strictly following aseptic conditions. Centrifugation of each sample was done at 5000 rpm for 5 mins for separating the serum and tests were performed immediately. In case of delay in processing, sera were stored at 4° C.

Laboratory Tests

For Dengue,NS1 antigen or anti DENV IgM antibodies detection was performed by Dengue NS1 ELISA kit (Oscar medicare Pvt. Ltd., New Delhi, India). Anti-Dengue IgM antibody from serum was detected using Dengue IgM capture ELISA kit (SD Biosensor, Healthcare Pvt. Ltd.). Both the assays were performed following the respective manufacturer's protocol and for Chikungunya,negative samples of dengue test were subjected for serological diagnosis of chikungunya virus using NIV CHIK IgM capture ELISA kits (provided by NIV, Pune, India) using the manufacturer's instructions.

III. RESULTS

Prevalence in terms of gender distribution

During the period of January to December, 2022; a total of 7259 samples were tested for dengue.Total number of positive samples were 534 tested for IgM or NS1 or both. Positivity rate was 7.35%. Positivity rate was higher for Dengue IgM(58.42%)than Dengue NS1(19.66%).21.91% induviduals were positive for both Dengue IgM and NS1.Males were predominantly positive 368 (68.90% of total positive cases) were detected with dengue whereas 31.08% females (166 individuals) were dengue positive. Total chikungunya sample tested during this period was 1682, among which 788 were males and 894 were females. Positivity rate for chikungunya was quite low as only 16 individuals were tested positive (7 males and 9 females)(Table 3 and 4)

Prevalence in terms of age structure

For the convenience of the study, the age structure was distributed into individuals having age less than 20 years, individuals with age between 20 to 45 years and above 45 years. It is being observed, prevalence of positivity is highest within the age group of 20-45 years (56.36% for Dengue and 43.75% for Chikungunya among positive cases) followed by individuals having age within 20 years (24.91% for Dengue and 31.25% for Chikungunya among positive cases) (Table 5 and 6)

Seasonal pattern of prevalence

There was a significant seasonal pattern in appearance of the disease as there was a gradual increase in positive cases in October (23.59% among dengue positive cases)which peaked during the month of November(34.08% among dengue positive cases)(Table 7).

IV. DISCUSSION

Dengue and Chikungunya are becoming a major health concern globally, leading to socio economic burden [14].According to study,it is reported that the first outbreak of Dengue occurred in Chennai in 1780 [15] whereas the first outbreak of Chikungunya occurred in Kolkata in 1963 [16]. Diagnosis of these diseases in resource poor settings is a challenge [17]. As they present similar clinical symptoms,it's very challenging to diagnose. Diagnosis of virus type is very important,so that it will help the clinician for proper diagnosis and management of the patients against complications like

hemorrhages, ARDS, renal failure and arthritis [18].Hepatic dysfunction ,the most common complication in dengue patients [19]. Anemia,Leukopenia and Thrombocytopenia was observed in dengue patients.Joint pain is mainly seen in chikungunya infected patients and it persists for long [20-22].Our study highlights age, gender, seasons wise variations of Dengue and Chikungunya in and around districts of East Bardhaman which includes West Bardhaman,Purulia,Birbhum,Hooghly,West Midnapore.Higher prevalence was seen among males than females for Dengue and female prevalence is more in case of Chikungunya. They attained their peak in the month of October and November,2022 with gradual rise in the month of September. Prevalence seen mostly in the age group ranging between 20-45 followed by below 20 age group. This seroprevalence study showed that Dengue is more prevalent than Chikungunya in Bardhaman district. This study also suggests the seasonal variations of occurrence of Dengue and Chikungunya. This study also supports the significant factors such as climate, seasons, temperature and humidity affecting the spread of arboviral diseases such as Dengue and Chikungunya. The maximum number of positive cases was found in the age group of 20-45 which suggest that this age group is more exposed to outdoor activities. Many areas have stagnant water, improper sanitization, poor hygiene, overcrowding, etc. may lead to spread of these variants of mosquito, which leads to infections.In 2016, 64,057 cases were reported compared to 27553 cases in 2015 according to National Vector Borne Disease Control Programme (NVBDCP) data [23]. Clinical symptoms like respiratory and cardiovascular failure ,meningoencephalitis ,other problems of central nervous system, severe acute hepatitis, severe cutaneous effects and kidney failure was identified in La Reunion Island [24].Studies from Ethiopia, showed that stored water for domestic use is also responsible for breeding of Aedes mosquito [25]. Cumulative water retention solid wastes and plastic containers are considered as the preferred breeding site for Aedes in Delhi. According to WHO 2023, 2.8 million dengue cases will be reported in America ,2022 compared to 1.2 million cases in 2021. Whereas ,higher incidence of meningoencephalitis possibly associated with Chikungunya was reported by Paraguay. Reports from WHO claims that a total of 31283 Dengue cases including 50 deaths and 593 cases of Chikungunya were reported from Bolivia between 1st January to 11th February,2023 whereas 686 Dengue cases were reported from Paraguay from 1st January to 4th March, 2023 and 40,984 cases of Chikungunya were reported from 2nd October,2022 to 4th March,2023 from Paraguay. Total 20017 dengue cases and 7 cases of Chikungunya were reported from Peru from 1st January to 4th March, 2023.The outcome of this study will be helpful in determining the upcoming outbreak of Dengue and Chikungunya in Bardhaman district and this will be helpful in focusing on existing surveillance system of such vector borne diseases.

V. CONCLUSION

Dengue and Chikungunya have become endemic in many areas as they cause millions of cases per year. Aedes mosquito is responsible for their recurrence.Dengue and Chikungunya affect mainly the age group between 20-45 years,prevalence is greater above 45 years.Although their clinical symptoms are more or less same,so,it is very difficult for the clinician to differentiate them. Our studies highlight Post Covid prevalence of Dengue and Chikungunya in the districts around East Bardhaman which include West Bardhaman,Purulia,Birbhum,Hooghly,West Midnapore.Studies show greater prevalence in males than females.

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TABLE 1:PREVALENCE OF DENGUE IGM OR NS1		
DENGUE ELISA RESULT	**FREQUENCY(n=7259)**	**PERCENTAGE**
POSITIVE	534	7.36%
NEGATIVE	6725	92.64%
TOTAL SAMPLES TESTED	7259	100%

TABLE 2:PREVALENCE OF CHIKUNGUNYA IGM

CHIKUNGUNYA IgM ELISA RESULT	FREQUENCY(n=1682)	PERCENTAGE
POSITIVE	16	0.95%
NEGATIVE	1666	99.05%
TOTAL SAMPLES TESTED	1682	100%

TABLE 3:GENDERWISE PREVALENCE OF DENGUE AMONG POSITIVE CASES

GENDER	FREQUENCY(n=534)	PERCENTAGE(%)
MALE	368	68.91%
FEMALE	166	31.08%
TOTAL POSITIVE CASES	534	100%

TABLE 4:GENDERWISE PREVALENCE OF CHIKUNGUNYA AMONG POSITIVE CASES

GENDER	FREQUENCY(n=16)	PERCENTAGE(%)
MALE	7	43.75%
FEMALE	9	56.25%
TOTAL POSITIVE CASES	16	100%

TABLE 5:AGE WISE PREVALENCE OF DENGUE AMONG POSITIVE CASES

AGE	FREQUENCY(n=534)	PERCENTAGE(%)
BELOW 20	133	24.91%
20-45	301	56.36%
ABOVE 45	100	18.72%

TABLE 6:AGE WISE PREVALENCE OF CHIKUNGUNYA AMONG POSITIVE CASES

AGE	FREQUENCY(n=16)	PERCENTAGE(%)
BELOW 20	5	31.25%
20-45	7	43.75%
ABOVE 45	4	25%

TABLE 7:SEASON WISE PREVALENCE OF DENGUE AMONG POSITIVE CASES

SEASONS	FREQUENCY(n=534)	PERCENTAGE(%)
WINTER	66	12.36%
SUMMER	33	6.18%
MONSOON	127	23.78%

POST MONSOON/AUTUMN	308	57.67%

GRAPHS FOR DENGUE POSITIVE CASES
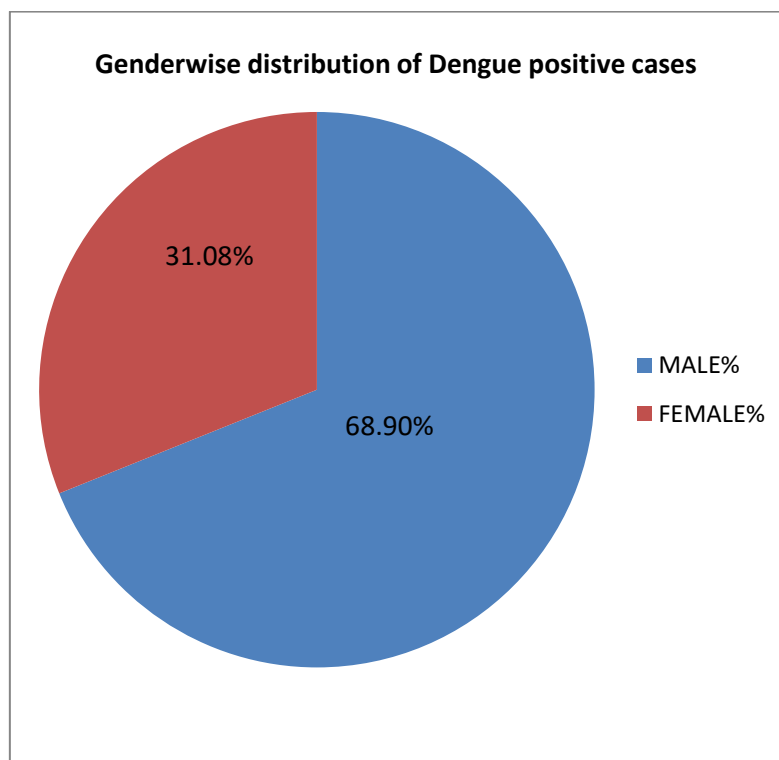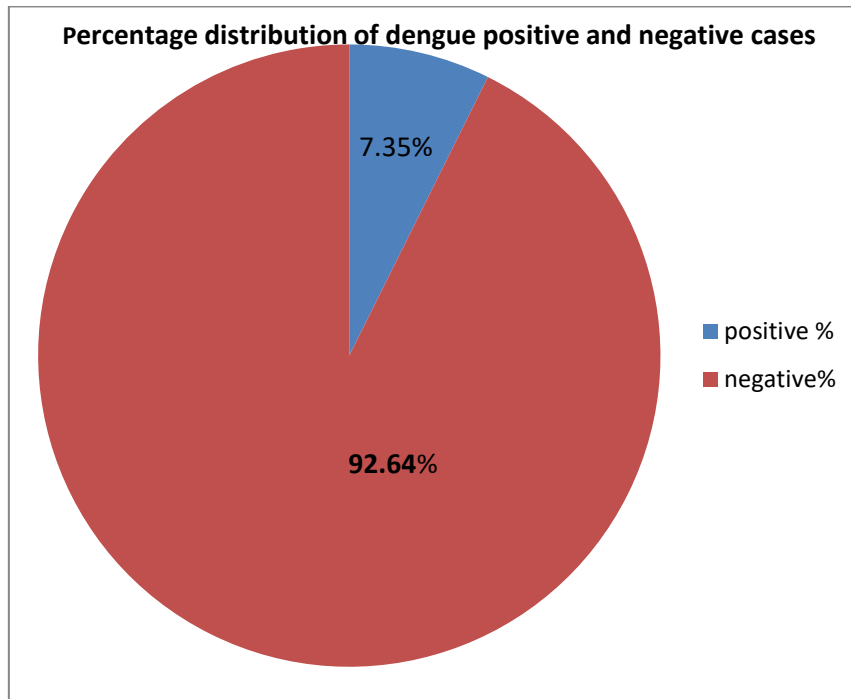
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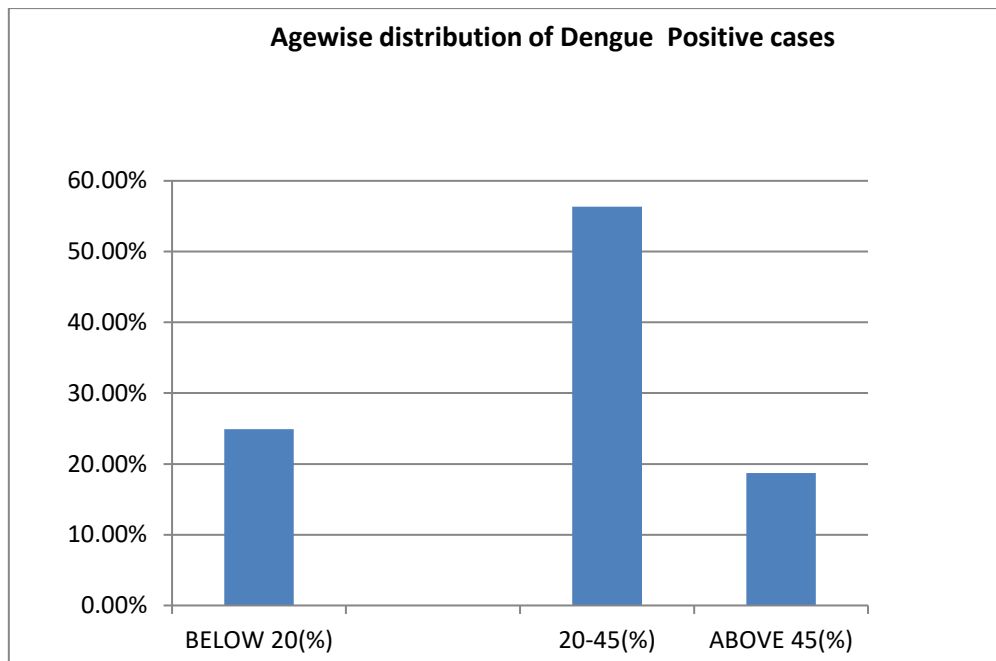
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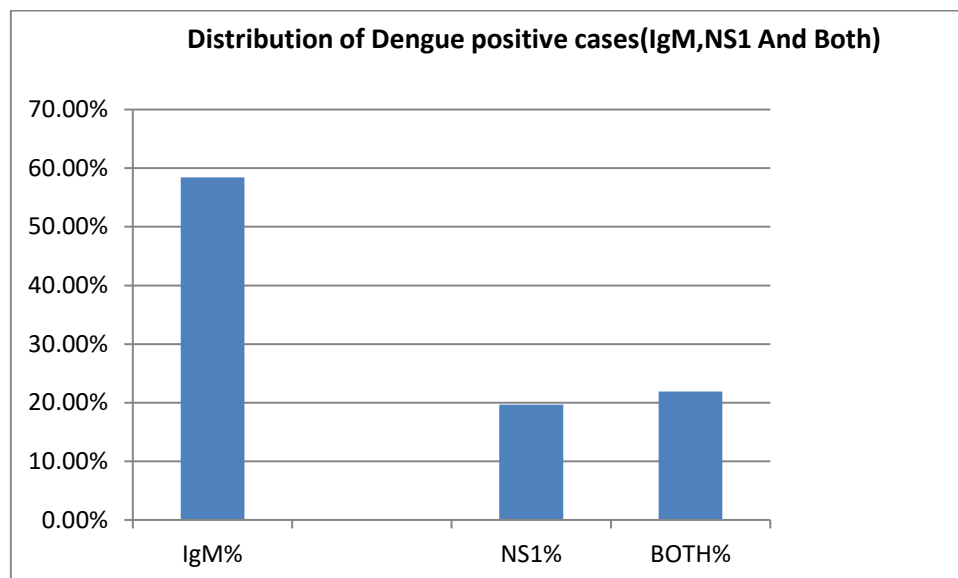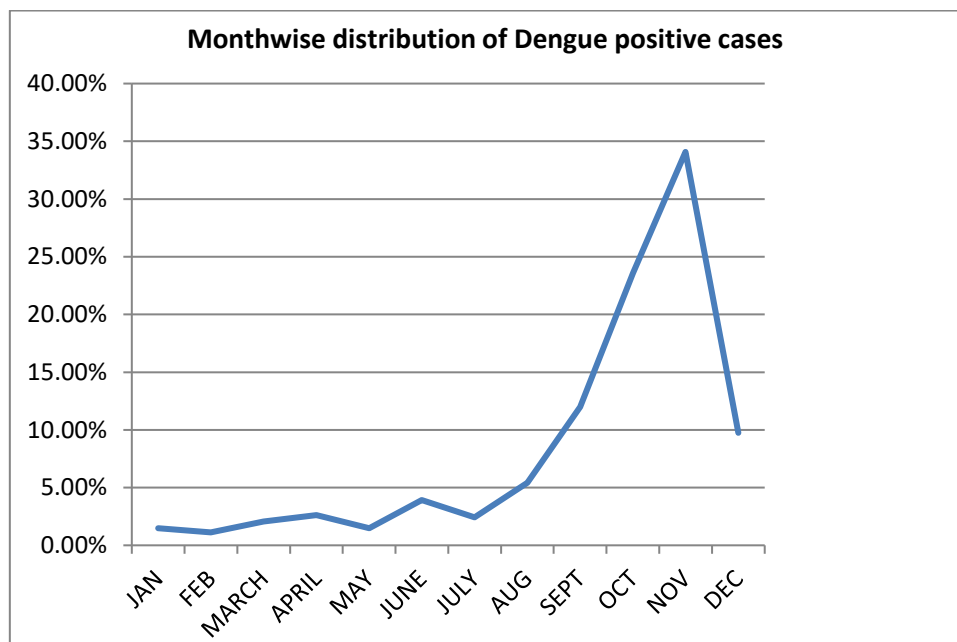

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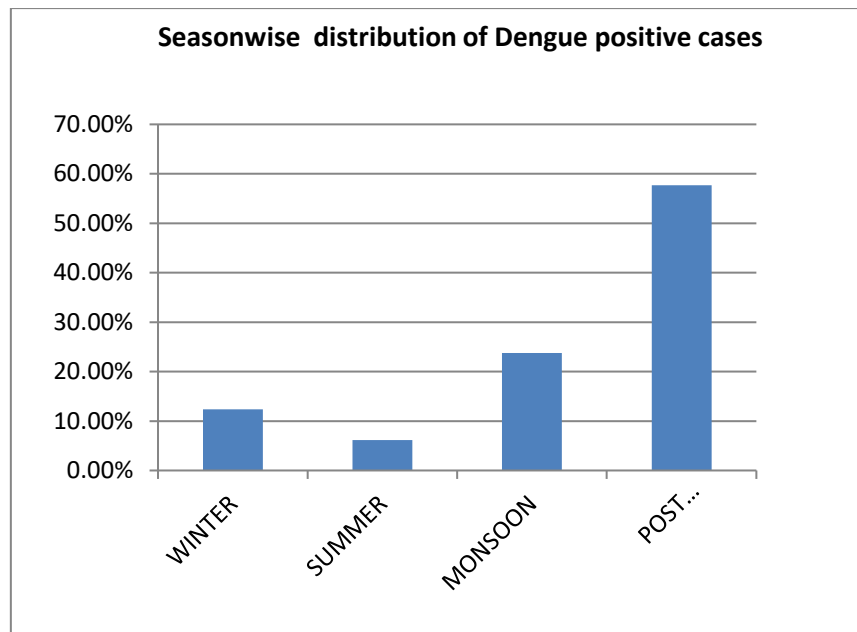
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Figure 6

GRAPHS FOR CHIKUNGUNYA POSITIVE CASES
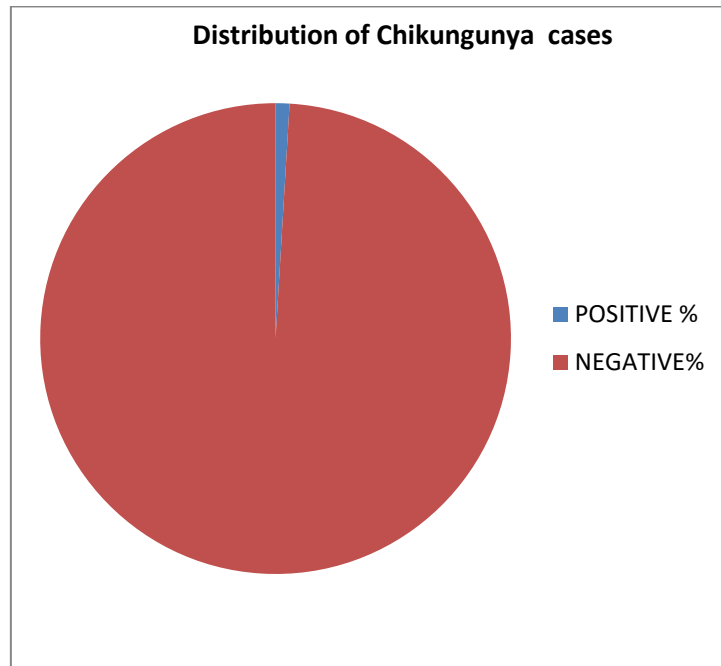
Figure 7

Figure 8

Figure 9