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Original Research Article

Epidemiological and demographic characteristics of dengue at a tertiary care center in Kutch region during the year 2019

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ABSTRACT

Background and Aim: Dengue is the most rapidly spreading mosquito borne viral disease of mankind, with a 30 fold increase in global incidence over the last five decades. It is a major public health concern throughout the tropical and subtropical regions of the world. The present study was conducted with objective to study epidemiological and demographic characteristics of dengue infection during the year 2019 in Kutch region, Gujarat, India.

Materials and Methods: The study was carried out from January 2019 to December 2019 at Department of Microbiology, Gujarat Adani Institute of Medical Sciences, G.K. General Hospital, Bhuj. The patients having suspected dengue fever was based on standard criteria like presentation of febrile illness of 2-7 days duration were included in this study.A total of 1509 blood samples were collected during study period and serologically tested for dengue NS1 antigen and IgM antibody by capture ELISA testing method.

Results: Total 1509 blood samples were tested by ELISA for NS1 antigen and/or IgM antibody as per the protocols and personal, demographic and clinical details of each patient was recorded. Out of 1509 cases 761 tested positive for dengue. Amongst all positive cases 533(47%) were tested positive for NS1 antigen which helped in early diagnosis of dengue. Rise of dengue cases started after the month of October and falls down by the end of December. Analysis of this data revealed that age group 00-10 years had maximum dengue cases. Male cases 418(55%) were more than females 343(45%). Dengue cases were high in urban area.

Conclusion: The present study reported that dengue mainly affected children, males and urban population. Perennial occurrence with seasonal increase during monsoon and post monsoon moths was reported. Effective implementation of vector control measures through efforts toward vector breeding source reduction and with the use of personal prophylactic measures against mosquito bites will help in reducing the dengue prevalence in the community.

1. Introduction

The dengue virus is widely distributed throughout the tropics and subtropics (in Swahili, Ki dengapepo means a sudden seizure by a demon). The term 'break-bone fever 'was coined during the Philadelphia epidemic in 1780.[1]

Dengue virus is the most common arbovirus found in India. Four types of dengue virus exist: DEN 1 first isolated from Hawaii in 1944, DEN 2 from New Guinea in 1944 and DEN 3 and DEN 4 from the Philippines in 1956. A fifth serotype dengue 5(DEN 5) was discovered in 2013 from Bangkok, Thailand.[2]

Dengue is characterized by fever of sudden onset, headache, retro bulbar pain, conjunctiva infection, pain in

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the back and joints, lymphadenopathy and maculopapular rash. It is endemic and often epidemic in the tropics and subtropics, particularly in Asia, Caribbean, Pacific and some areas of West Africa. In India, dengue is common in the East coast.[3]

Dengue has been increasing worldwide over the last few decades and today ranks as the most important vector-borne disease, with about 2.5 billion people in 200 countries at risk. Dengue in India has dramatically expanded over the last few decades, with rapidly changing epidemiology. The first confirmed outbreak occurred in Kolkata in 1963-1964. It took almost 30 years for dengue to eventually spread throughout the entire country, resulting in the first major nationwide outbreak of DHF in the year 1996. Following this, gradual dengue virus expansion started in the entire nation and northern parts of India faced yet another outbreak in 2003. A dramatic increase in the number and frequency of followed and at present, in most of the states of India, all four serotypes are prevalent.[3–7]

Kutch is the largest district of India which has a very special and diverse ecological system. Literature search suggests that there is scarcity of specific & exclusive data on prevalence of Dengue in Kutch region.[8] The present study was carried out to find out data on Dengue specific serological markers like NS1 antigen, IgM antibody and epidemiological characteristics of dengue infections during the year 2019 in Kutch region of Gujarat State, India.

2. Materials and Methods

The study was conducted at tertiary care teaching institute and hospital, Department of Microbiology, Gujarat Adani Institute of Medical Sciences and G.K. General Hospital in from January 2019 to December 2019 after taking the approval from IEC committee.

As a designated sentinel surveillance center by National Vector Borne Disease Control Program (NVBDCP), department is receiving serum samples from Primary and Community Health centers. Patients with acute onset of illness, high grade fever, severe headache, backache, musculoskeletal pain or retro-bulbar pain with or without rashes were considered as clinically suspected case of dengue virus infection.

There was standard laboratory requisition form with personal, demographic and clinical details which were recorded in same forms. The date of onset of fever and the date of blood sample collection were also recorded in the data entry form. Onset of fever was taken as Day 0 and accordingly sample age was defined as the gap between the date of onset of fever and the date of collection of blood sample.

Serum was separated and then according to the gap between onset of fever and sample collection type of ELISA test was decided. If the gap was 0 to 4 days then Dengue NS1 Ag ELISA was performed and if it was more than 6 days then IgM capture ELISA was performed. For the samples having 5 to 6 days of fever both IgM& NS1 Ag ELISA were performed. The dengue IgM capture Kits were supplied from NIV, Pune under NVBDCP and for NS1 Ag detection Platelia dengue NS1 Ag(Bio-Rad) ELISA kits were used. If any of these test came positive by ELISA it was considered as confirmed case and notified to the concerned government authorities.

3. Results

Total 1509 blood samples were received at Microbiology department for diagnosis of dengue fever during the year 2019.

Table 1 shows the dengue prevalence rate was 50 % from January 2019 to December 2019.

Table 2 shows the Dengue NS1 antigen positivity rate was47%.

Table 3 shows the dengue IgM antigen positivity rate was 46 %.

Table 4 shows the number of dengue NS1Ag, Dengue IgMAb and NS1 Ag&IgMAb positive cases.

Table 5 shows month-wise distribution of dengue NS1 antigen & dengue IgM antibody tested by ELISA method.

Table 6 shows age-wise distribution of dengue positive cases

Table 7 shows Gender-wise distribution of dengue positive cases: Male (55%) and Female (45%).

Table 8 shows demographic distribution of dengue positive cases in which Urban (70%) and Rural (30%).

4. Discussion

Dengue has been increasingly recognized as an emerging infectious disease. The high prevalence of dengue cases at Kutch in the recent years makes it necessary to evaluate the incidence of dengue and to find out the seropositivity and serotypes of dengue cases. The study was done with 1509 serum samples from patients with clinical symptoms suggestive of dengue.

The prevalence rate in the present study was 50%. Due to dengue epidemic from October to December 2019 the prevalent rate is high in present study. (Table 1)

Out of 761 positive dengue cases, 490(64%) cases are tested within 1 to 4 days of onset of fever in the present study. More number of cases are diagnosed between 1 to 4 days by Dengue NS1 antigen by ELISA tests. Followed by 228(30%) cases are tested positive after 5 days of fever by Dengue IgM antibody test ELISA tests &43(6%) cases are tested positive on 5^{th} day of fever by both Dengue NS1 antigen & Dengue IgM ELISA methods.

It was observed that the majority of dengue cases were detected by NS1 antigen as compared to IgM antibodies in patient's sera. Early detection of dengue infection by NS1 assay help in diagnosis and confirmation of cases.

Table 1: Dengue prevalence rate

Total no. of Suspected cases	Dengue positive cases	Prevalence rate (%)
1509	761	50 %

Table 2: Dengue NS1 antigen positive cases by ELISA

Total no. of Dengue NS1 antigen tested	Total No of Dengue NS1 antigen positive	Percentage (%)
1124	533	47 %

Table 3: Dengue IgM antibody positive cases by ELISA

Total no. of dengue IgM antibody Tested	Total no. dengue IgM antibody positive	Positivity rate (%)
592	271	46 %

Table 4: Dengue NS1 & IgM positive cases by ELISA tests

Dengue NS1 antigen positive	Dengue NS1antigen & IgM antibody positive	Dengue IgM antibody positive	Total
490(64%)	43(6%)	228(30%)	761

Table 5: Month wise distribution- 2019

S.No.	Month	No of Total Serum Tested	Total NS1 Performed	Total IgM Performed	No of NS1 Positive	No of IgM Positive
1	January	27	14	16	0	2
2	February	21	10	16	0	2
3	March	13	7	12	0	2
4	April	9	7	2	0	0
5	May	12	9	5	1	0
6	June	8	7	1	1	0
7	July	5	4	1	0	0
8	August	8	5	6	1	2
9	September	45	33	21	10	6
10	October	234	173	92	76	44
11	November	781	577	286	317	158
12	December	346	275	134	127	55
13	Total	1509	1121	592	533	271

Table 6: Age-wise distribution of dengue positive cases

Age (in years)	No. of Patients	Percentage (%)
00 - 10	217	29 %
11 - 20	198	26%
21 - 30	176	23%
31 - 40	86	11%
41 - 50	45	6%
51 - 60	22	3%
61 -70	9	1%
71 - 80	8	1%
Total	761	

Table 7: Gender-wise distribution of dengue positive case

Gender	No. of Patients	Percentage (%)
Male	418	55 %
Female	343	45 %

Table 8: Demographic distribution of dengue positive cases

Region	No. of Patients	Percentage (%)
Urban	530	70 %
Rural	231	30 %
Total	761	100%

Table 9: Comparative study of dengue prevalence rate

Study Year	Author	Name City, State & Country	Total no of samples	No of Dengue positive samples	Prevalence rate (%)
2013	Madhulika Mistry et al[5]	Rajkot Gujarat	4366	1802	41%
2014	JigarGusani et al[8]	Bhuj,Kutch Gujarat	765	331	43%
2015	Madhulika Mistry et al[6]	Rajkot Gujarat	3312	1107	33%
2016	Shraddha Tiwari et al[9]	Madhya Pradesh	268	135	50%
2017	Racherla RG et al[10]	Andra Pradesh	398	150	38%
2019	Pooja Rao et al[11]	Karnataka	3801	991	26%
2019	Present Study	Bhuj, Kutch Gujarat Kutch	1509	761	50%

Table 10: Comparative study of dengue positive cases by ELISA tests

Year	Author	NS1 antigen positive cases	IgM antibody positive cases	NS1 antigen + IgM antibody positive cases	Total Dengue positive cases
2013	Madhulika Mistry et al[5]	970 (53.85)	356 (19.7%)	476 (26.4)	1802
2014	JigarGusani et al[8]	181 (54.6%)	118 (35.6%)	32 (9.6)	331
2015	Madhulika Mistry et al[6]	367 (33.1)	739 (66.7)	1 (0.09)	1107
2019	Present Study	490 (64%)	228 (30%)	43 (6%)	761

Viral antigen detection in particularly useful during the first five days of illness with NS1 assays. Supporting clinical symptoms along with early detection of viral NS1 antigen can help to speed up diagnosis of dengue cases. The IgM antibody testing will show a positive report only when tested after 5 days.

As a tertiary care centre, the blood samples of suspected dengue cases were received throughout the year and so present study reports the continuous occurrence of dengue cases with varying severity. Number of positive cases reported was low from January to August. As the rainy season started, Present study reported increase in cases from October to December.

Present study reports seasonal occurrence of dengue cases during monsoon and post monsoon season. Similar findings have been reported by various other studies. As the monsoon season favors breeding of Aedes mosquitoes, effective preventive and control measures need to be taken prior to and with beginning of monsoon to reduce the occurrence of dengue in the community. A long term serosurveillance study may help to provide more information about the intensity, seasonal incidence and seasonal effect.

Suspected dengue cases were reported in all age groups. Majority of samples were tested positive in age group 0-10 years was 217/761 – 29 % in 2019. Followed by the age group 11 to 20 years. Present study result shows more dengue positive cases were reported from age group 0-10 years. It shows children were more infected. Dengue fever was typically acknowledged to be a disease of early childhood in SEAR countries.

In present study the proportion of male cases (55%) was higher than female cases(45%). These findings are in accordance to other studies. Males have more outdoor activities compare to females results in more exposure to mosquito bite during day time and that may be the reason for high prevalence among them. Low prevalence among females may be due to lower reporting rate and indoor/household activities making them less exposed to risk of vector-borne infection.

In present study 70 % confirmed dengue cases were from urban area as also reported by other studies. Dengue is a disease of urban areas where solid wastes, air conditioners, air coolers, flower pots, and so forth are the major contributors in the growth of A.aegypti mosquito, the principal urban vector of dengue.

5. Conclusion

The present study reported that dengue mainly affected children, males and urban population. Perennial occurrence with seasonal increase during monsoon and post monsoon

Table 11: Comparative study of age wise distribution

Study year	Author	Age group (more infected)	No. of positive cases reported	Percentage (%)
2012	Manish Patankar et al	18-35 years	534/927	58
2014	JigarGusani et al[8]	21-30 years	118/331	36
2015	Madhulika Mistry et al[6]	15-24 years	454/1107	41
2019	Present Study	0 –10 years	217/761	28

Table 12: Comparative study of gender wise distribution

Study year	Author	Male	Female	Total no. of dengue positive cases
2012	Manish Patankar et al	600(65%)	327(35%)	927
2014	JigarGusani et al[8]	202(61%)	129(38.9%)	331
2015	Madhulika Mistry et al[6]	760(68.6%)	347(31.3%)	1107
2019	Present Study	418(55%)	343(45%)	761

Table 13: Comparative study of demographic area

Study year	Author	Urban	Rural	Total no of dengue positive cases
2014	JigarGusani et al[8]	188(56.7%)	143(43.2%)	331
2015	Madhulika Mistry et al[6]	727(65.6%)	380(34.3%)	1107
2019	Present Study	530(70%)	231(30%)	761

moths was reported. Effective implementation of vector control measures through efforts toward vector breeding source reduction and with the use of personal prophylactic measures against mosquito bites will help in reducing the dengue prevalence in the community. It is concluded that this study has just opened the first door for analysis of Dengue serotype in kutch region.

6. Source of Funding

None.

7. Conflicts of interest

There are no conflicts of interest.

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