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Microbiology

CLINICAL AND EPIDEMIOLOGICAL PROFILE OF DENGUE FEVER

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ABSTRACT

Introduction: Dengue is the most common rapidly spreading mosquito-borne viral disease of humankind .it is a major public health concern throughout tropical and subtropical regions of the world. Dengue viruses have four serotypes designated as 1-4; and are transmittedmainly by bite of Aedes aegypti mosquito and also by Aedes albopictus. Aedes aegypti mosquitoes are common vectors for dengue virus (DENV) and CHIK virus (CHIKV). In areas where both viruses cocirculate, they can be transmitted together. **Materials and Methods:** In the present study, we have screened 3205 samples for dengue fever by NS1Ag ELISA and IgM ELISA and 1189 dengue positive samples were tested for chikungunya fever using Chikungunya IgM ELISA to know the co infection. **Results :** In this study, out of total 3205 suspected dengue fever cases,NS1 ELISA was positive in 455(14.19%) and IgM ELISA was positive in 506 (22.12%) cases, Total seropositivity of dengue was found in 789(34.49%) cases. All positive 789 samples were subjected for IgMCHIK ELISA to rule out coinfection of them, 69 (8.75%) samples were found to be positive for Chikungunya. coinfection (dengue and chikungunya) was found in 69 (8.75%) of cases. In 1082 patients having fever < 5 days of duration of them, NS1 ELISA was found to be positive in 163 (15.06%) patients. In 1205 patients having fever > 5 days of duration of them, NS1 ELISA was found to be positive in 120 (9.96%) patients. Females were affected more i.e 774 (65.1%) than males i.e 415 (34.90%) , urban areas were found to be affected more with 690 (58.03%) cases than rural area with 499 (41.97%) and it was maximally seen in the age group of 21-30 years i.e 173 (14.55%) followed by 11-20 yrs i.e 211 (17.74%) . In the present study dengue positivity in both the years 2019 and 2020 was found to be maximum in the month of september 164 (13.79%) and 154 (12.95%) followed by in october 105 (8.83%) and 112 (9.41%) and november 103(8.66%) and 96 (8.07%) respectively. Overall positivity in both the years was found to be maximum in the month of september 318 (26.74%) followed by in october 217 (18.24%) and november 199 (16.73%) respectively. All 1189 (100%) dengue positive cases had a history of fever as a chief-complaint followed by 1061 (89.23%) headache,984 (82.75%) myalgia, 385 (32.38%) arthralgia,198 (16.65%) skin rashes, 126 (10.59%) acute abdominal pain while 76 (0.88)and 9 (0.75%) bleeding manifestation and circulatory failure respectively. out of 1189 dengue positive cases,maximum i.e. 1157(97.30%) were of DF, 27 (2.27%) DHF and 5(0.42%) DSS respectively. Out of total 1189 dengue positive cases, 03 (0.25%) cases were reported death while rest 1186 (99.75%) cases recovered and discharged successfully. total mortality reported was 0.25% cases. **Conclusion:** Early recognition along with meticulous monitoring and targeted supportive care is the cornerstone of a successful outcome in dengue coinfections.

KEYWORDS : Aedes aegypti,DF: Dengue fever , DHF: Dengue haemorrhagic fever ,DSS: Dengue shock syndromedual infection, ELISA, virology research and diagnostic laboratory.

INTRODUCTION

Dengue virus is categorized under the genus Flavivirus. The virus contains single stranded RNA and is small in size (50nm). There are four dengue virus serotypes which are designated as DENV-1, DENV-2, DENV-3 and DENV-4 and are transmitted mainly by bite of Aedes aegypti mosquito and also by Aedes albopictus. it is the most common rapidly spreading mosquito-borne viral disease of humankind, with a 30-fold increase in global incidence over the last five decades. it is a major public health concern throughout tropical and subtropical regions of the world. [1]

Dengue has been identified as one of the 17 neglected tropical diseases by the World Health Organization, as mentioned in its first report on neglected tropical diseases (2010). [1] Dengue Fever was enlisted by the WHO as one of the ten threats to global health in 2019. According to WHO, a vast majority of cases are asymptomatic and, many are misclassified. The number of cases reported increased from 2.2 million in 2010 to over 4.2 million in 2019. The largest number of dengue cases ever reported globally was in 2019. [1]

MATERIALS AND METHODS

The present study was conducted in a tertiary care hospital in the department of Virology Research and Diagnostic Laboratory (VRDL) ,Nagpur during January 2019 to December 2020. which is also a sentinel surveillance centre under NVBDCP. Approximately, 2–5 ml of blood collected and serum was separated, and subjected to NS1 Ag MICROELISA (provided by J. Mitra and Co. Pvt. Ltd. India) , DEN IgM Capture ELISA kit and CHIKUNGUNYA IgM Capture ELISA kit (provided by NIV, Pune,) , all the three tests were performed as per manufacturer's instructions. IgM antibody capture (MAC) ELISA for dengue and Chikungunya and ELISA for (NS1 Ag) nonstructural protein antigen of dengue was performed on serum samples obtained from suspected patients. Aim of this study is to know the clinical and epidemiological profile of dengue fever .Objectives are 1) To know the prevalance of dengue fever in this region 2) To study the clinical profile of dengue positive cases 3) To study the epidemiological factors associated with dengue fever 4) To study the co-infection of dengue fever with Chikungunya fever.

RESULTS AND OBSERVATIONS

Total 3205 suspected fever cases were subjected for both the test NS1 and IgM ELISA for dengue of them, NS1 ELISA alone was found to be positive in 455(14.19%) cases and IgM ELISA alone was positive in 734 (22.90%) cases. Total positivity was found to be 1189 (37.09%) and 2016 (62.90%) were negative.

Table 1: - Dengue Test Positivity By NS1 & IgM Elisa

Sr.no	Tests	Total number of samples, n= 3205	
		No of positive	No. of negative
1.	NS1 ELISA	455 (14.19%)	916 (28.58%)
2.	IgM ELISA	734 (22.90%)	1100(34.32%)
3.	Total	1189 (37.09%)	2016 (62.90%)

Fig : Dengue Test Positivity By NS1 And IgM Elisa

Table 2:- Serological Tests Results, As Per Duration Of Fever

Sr. No	Serological test	Suspected patients with h/o fever <5 days, n = 1986 (%)		Suspected patients with h/o fever >5 days, n = 1219 (%)	
		Positive	Negative	Positive	Negative
1.	NS1	315 (15.86%)	511 (25.73%)	131 (10.74%)	321 (26.33%)
2.	IgM	486 (24.47%)	674 (33.93%)	235 (19.27%)	532 (43.64%)
3.	Total	801 (40.33%)	1185 (59.66%)	366 (30.02%)	853 (69.98%)

Table 3: Gender Wise Distribution Of Suspected Fever Cases And Dengue Positive Cases:

Sr. No	Gender	No. of suspected fever cases, n = 3205(%)	No. of dengue positive cases, n = 1189 (%)

1.	Male	1261 (39.34%)	415 (34.90%)
2.	Female	1944 (60.66%)	774 (65.10%)
3.	Total	3205 (100%)	1189 (100%)

Fig : Gender Wise Distribution Of Suspected Fever Cases And Dengue Positive Cases

Table 4: Areawise Distribution Of Cases And Dengue Positivity

Sr. No	Area	No. of suspected fever cases, n = 3205 (%)	No. of dengue positive cases, n = 1189 (%)
1.	Urban	2116 (66.02%)	690(58.03%)
2.	Rural	1089 (33.98%)	499(41.97%)
3.	Total	3205 (100%)	1189 (100%)

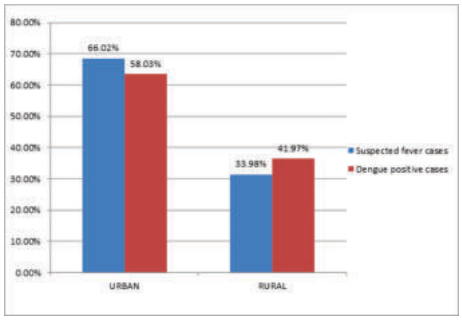

Fig : Areawise Distribution Of Cases And Dengue Positivity

Table 5: Age Wise Distribution Of Dengue Positive Cases:

Sr. No	Age groups (yrs)	No. of suspected fever cases, (%)	No. of dengue positive cases (%)
1.	0-10	456(14.23%)	102 (8.6%)
2.	11-20	736 (22.97%)	211 (17.74%)
3.	21-30	1121(34.98%)	392 (32.97%)
4.	31-40	511 (15.94%)	173 (14.55%)
5.	41-50	142(4.43%)	96 (8.07%)
6.	51-60	131 (4.09%)	80 (6.72%)
7.	61-70	62(1.93%)	74 (6.22%)
8.	71-80	46 (1.43%)	61 (5.13%)
9.	Total	3205 (100%)	1189 (100%)

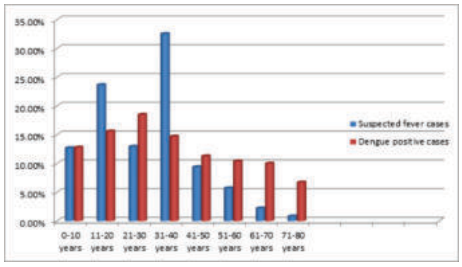

Fig : Age Wise Distribution Of Dengue Positive Cases:

Table 6: Month Wise Distribution Of Suspected Fever And Dengue Positivity

Sr. No	Months	No. of suspected fever cases , n= 3205 (%)	No. of dengue positive cases ,n = 1189 (%)
1.	January ,19	68	6(0.54%)
2.	Feburary,19	71	8 (0.67%)
3.	March,19	74	7(0.55%)
4.	April ,19	68	16(1.34%)
5.	May ,19	75	28(2.35%)
6.	June,19	121	45(3.78%)
7.	July,19	133	59 (4.96%)
8.	August,19	154	37 (3.11%)
9.	September,19	306	164 (13.79%)
10.	October,19	286	105 (8.83%)
11.	November,19	194	103(8.66%)
12.	December,19	158	12 (1.00%)
13.	January ,20	62	8 (0.67%)
14.	Feburary,20	78	9 (0.75%)
15.	March,20	86	12 (1.00%)
16.	April,20	72	23 (1.93%)
17.	May,20	88	55 (4.62%)
18.	June,20	92	46 (3.86%)
19.	July,20	98	25 (2.10%)
20	August,20	201	49 (4.12%)
21	September,20	301	154 (12.95%)
22.	October,20	211	112 (9.41%)
23.	November,20	116	96 (8.07%)
24.	December,20	92	10 (0.84%)
25.	Total	3205	1189

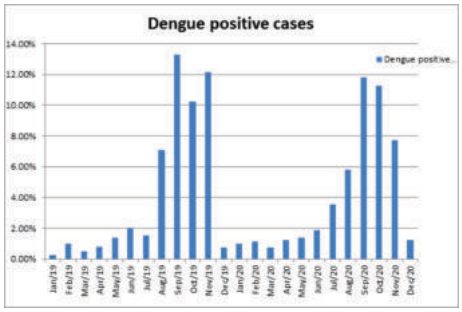

Fig : Month Wise Distribution Of Suspected Fever And Dengue Positivity

Table 7: Clinical Manifeststions In Dengue Positive Cases:

Sr. No	Clinical criteria	No. of suspected cases (%)	No. of dengue positivity (%)
1.	Fever	3205 (100%)	1189 (100%)
2.	Headache	2845 (82.76%)	1061(89.23%)
3.	Myalgia	2104 (65.64%)	984 (82.75%)
4.	Arthralgia	1986(61.96%)	385 (32.38%)
5.	Rash	1458 (45.49%)	198 (16.65%)
6.	Abdominal pain	455 (14.19%)	126(10.59%)
7.	Bleeding manifestation	118 (3.68%)	76 (6.39%)
8.	Circulatory failure	12 (0.37%)	09(0.75%)

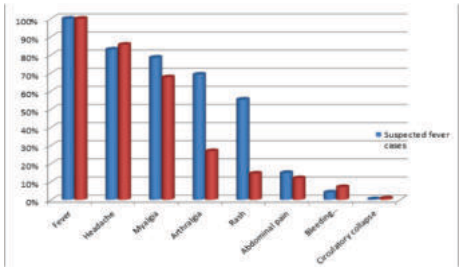

Fig : Clinical Manifeststions In Dengue Positive Cases:

Table 8: Distribution Of Platelets Count In Different Clinical Categories:

Sr. No	Platelets count (/mm3)	No.of patients	Category of dengue infection		
			DF (%)	DHF (%)	DSS (%)
1.	<25,000	12	7 (58.33%)	3 (33.33%)	2 (16.66%)
2.	25,000-50,000	41	34 (82.92%)	4 (9.75%)	3 (7.31%)
3.	50,000-75,000	86	66(76.74%)	20 (23.25%)	00
4.	75,000-1,00,000	191	191 (100%)	00	00
5.	>1,00,000	859	859 (100%)	00	00
6.	Total	1189	1157(97.30%)	27(2.27%)	5(0.42%)

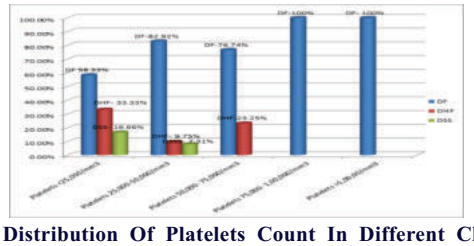

Fig : Distribution Of Platelets Count In Different Clinical Categories:

Table 9: Mortality Rate As Per Increase In Dengue Positive Cases:

Sr. No	Disease classification	No. of dengue positive cases , n= 1189(%)	Mortality (%)
1.	DF	1157(97.30%)	00
2.	DHF	27 (2.27%)	01 (0.08%)
3.	DSS	5 (0.42%)	02 (0.16%)
4.	Total	1189(100%)	03 (0.25%)

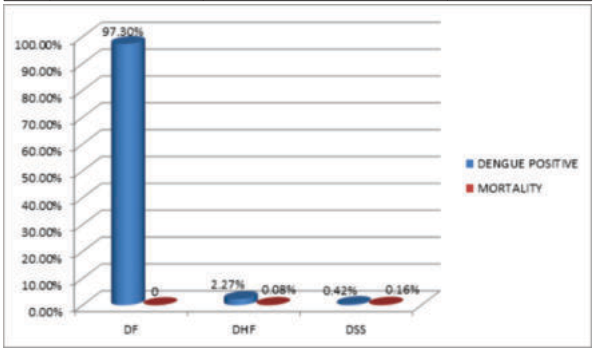

Fig : Distribution Of Mortality In Dengue Positive Cases:

Table 10: Co-infection Of Dengue And Chikunguniya:

Sr. No	Dengue positive , n= 2287	CHIK positive	Coinfection n= 1189
1.	1189 (37.09%)	106 (8.91%)	59 (4.96%)

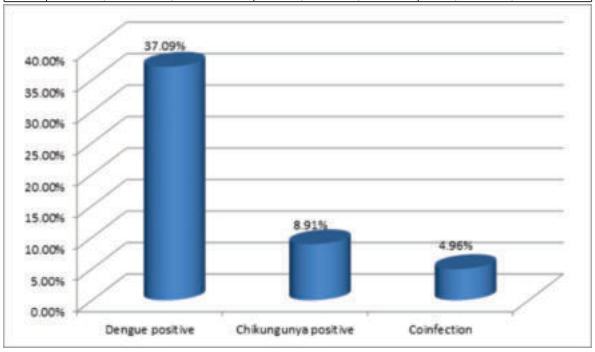

Fig - Co-infection Of Dengue And Chikunguniya

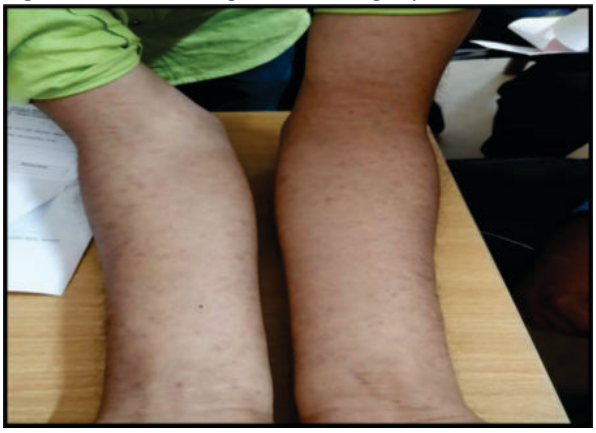

Fig – Showing Rashes Present On Both Hands.

DISCUSSION

In the present study, out of 3205 suspected fever cases, 1189 cases were positive for dengue fever. Total seropositivity of dengue fever was found to be 37.09%. (table 1) Our findings was similar to Ruta Kulkarni et al (2020) [2] who reported positivity of dengue in 38.6 % Pune and Kamalraj Mohan et al (2021) [3] who reported positivity of dengue 34% in Chennai, India.

Seropositivity of dengue infection by NS1 ELISA : In the present study, out of 3205 suspected fever cases, 455 (14.19%) cases were positive for NS1 Antigen by ELISA and 916 (28.58%) cases were negative . our findings are in accordance with Biswajyoti Borkakoty et al (2018) [4] who found NS1 positivity of 14.8%. Higher positivity of 27.5% was seen in the study conducted by Shilpi Hora et al (2021) [5].

Seropositivity of dengue infection by IgM ELISA : In the present study, out of 3205 suspected fever cases, 734 (22.90%) cases were found to be positive by IgM ELISA and 1100 (34.32%) were negative . Our findings are in accordance with Dr Vaidehi Kulkarni et al (2018) [6] who reported IgM positivity in 23% cases and Higher Seroprevalence of IgM positivity was found in study done by Srikant Kumar Dhar et al (2020) [7] i.e. 28% respectively.

- **In Fever <5 Days**
- In the present study,in 1986 patients with histroy of fever < 5 days of duration of them, NS1 ELISA was found to be positive in 15.86% ,while IgM ELISA positivity was found in 24.47% patients. M. M. Duthadeet et al (2015) [8] reported 35% NS1 positivity in patients having fever of 1 to 5 days which was much higher than our study.
- In the present study,in 1219 patients with histroy of fever < 5 days of duration of them, IgM ELISA positivity was found in 24.47% patients. Study done by Neeti Mishra et al (2015) [9] found IgM positivity in <3 days of illness is 39.2% cases.

- **In Fever >5 Days :**
- In the present study ,in 1219 patients having fever > 5 days of duration of them, NS1 ELISA was found to be positive in 10.74% patients and IgM ELISA positivity was found in 19.27% patients . Our findings were similar with M. M. Duthade et al (2015) [8] who reported NS1Antigen positivity of 8% in patients having fever for 5 days to 9 days.

Out of total 1189 dengue positive cases, 1261 (39.34%) were males and 1944(60.66%) were females. The ratio of Male to female was found to be 0.53:1.(table 3) . Our findings are similar with the study done by Study done by Thomas George et al (2021) (10) also reported female predominance of which 51.4% females and 48.6 % male and the male to-female ratio was found to be 1:1.05.

A Chakravarti et al (2016) [11] described that the dengue seropositivity was found to be significantly associated with the female gender. It has been suggested that immune responses in females are more competent than in males, resulting in greater production of cytokines, and also the capillary bed of females is prone to increased permeability which leads to severe manifestations of dengue in females but milder forms in males.

In the present study, out of total 1189 dengue positive cases living in urban areas were found to be affected more with 2116 (66.02%) cases than rural area with 1089(33.98%) . Our findinds are in accordance with Anju Dinkara et al (2019) [12] also reported that the urban population was more affected as 75.05% than rural (24.95%).

Two other major drivers of increased incidence and geographic spread of epidemic dengue were urbanization and globalization.This globalized system has been closely tied to the increased use of the jet airplane as the principal mode of transport over the past four decades. The movement of people infected with dengue viruses has been the principal driver in the global expansion of this disease [70]

In the present study, maximum positivity were seen in the age group of 21-30 years i.e 392 (32.97%) followed by 11-20years of age i.e 211 (17.74%), 31-40 years i.e 173 (14.55%) . Our findings were somewhat lower than the study done by K. Vidyasagar et al (2020) [13] who observed maximum seropositivity in the age group of 21-30 yrs (28.2%) followed by age group of 11-20 yrs (26%) and 17.21% in cases in the age group of 31-40 years.

Rishi Gowtham Racherla et al (2018) [14] also observed that adult age group with a mean age of 35.5 ± 11.6 years was most affected amongst all the age groups followed by paediatric with a mean age of 8.8 ± 5.2 years. This age group comprises working and student population. As dengue is mainly spread through Aedes mosquitoes which are day biters, the crowded areas such as workplaces and colleges may facilitate the spread of infection. Paediatric age group was next affected followed by geriatric age group.

In the present study dengue positivity in both the years 2019 and 2020 was found to be maximum in the month of september 164 (13.79%) and 154 (12.95%) followed by in october 105 (8.83%) and 112 (9.41%) and november 103(8.66%) and 96 (8.07%) respectively. Overall positivity in both the years was found to be maximum in the month of september 318 (26.74%) followed by in october 217

(18.24%) and november 199 (16.73%) respectively .Our findings are similar with study done by Muksedur Rahman et al (2018) [15] who had observed the overall frequency of dengue infection was more during the period from September (22.56%) to October (26.22%) mostly during post-monsoon period.

Sanjay Kumar et al (2015) [16] found that the Warm temperature in night, favors the survival of Aedes aegypti, while cool at night is harmful to the mosquito activity. Global warming affects the spread of this disease because temperature favors the growth of vector. Heavy rainfall may flush away eggs, larvae, and pupae from containers in the short term but residual water can create breeding habitats in the longer term. So, climatic conditions may affect the virus, the vector and/or human behavior both directly and indirectly. It is considered that increase in global temperature may lead to expansion of area of involvement and number of cases of vector-borne diseases.

In the present study out of total 1189 positive cases , All 1189 (100%) dengue positive cases had a histroy of fever as a chief complaints followed by 1061(89.23%) positivity in the patients having histroy of headche, 984 (82.75%) patients had myalgia , 385 (32.38%) had arthralgia , 198 (16.65%) patients had presented with the skin rashes, 126 (10.59%) presented with acute abdominal pain while 76 (6.39%) and 09 (0.75%) patients had bleeding manifestation and circulatory failure respectively as shown in Table 7. Similar findings were observed by T Patil S. et al (2019) [17] who reported in their study that , all cases were having fever (100%) followed by headache(90%), abdominal pain(71%),myalgia(64%),arthralgia (65%).

As far as Clinical category is concerned ,out of total 1189 positive cases, dengue fever (DF) was seen in 1157(97.30%) ,dengue hemorrhagic fever (DHF) in 27 (2.27%) and dengue shock syndrome (DSS) in 5(0.42%) cases. Table 8. Our study is in accordance with Ashwini Kumar et al (2010) [18] who reported 83.9% cases of dengue fever, 8.8% dengue hemorrhagic fever, and 7.3% with dengue shock syndrome. Study done by Gorre Chandra Shekar (2016) [19] also found 81% patients with DF, 10% patients with DHF and 9% patients with DSS.

Thrombocytopenia is the commonest feature in most of the dengue fever cases. In Dengue fever the virus may interact and activate platelets leading to thrombocytopenia. In our study Table 8 shows that amongst the 1189 dengue positive cases, 859 (72.25%) cases had platelets count >1,00,000/mm^3 while 330 (27.75%) cases had platelets count <1,00,000/mm^3 .

Platelets count <1,00,000/mm^3 in 191 (100%) cases had platelets count between 75,000- 1,00,000 /mm^3. 66 (76.74%) cases had platelets count between 50,000- 75,000/mm^3 and 34 (82.92%) cases of dengue fever had platelets count between 25,000- 50,000/mm^3 and 7 (58.33 %)cases had platelets count <25,000/mm^3. Table 8

Neelam Gupta et al reported (2019) [20] reported thrombocytopenia in 77.8% cases with platelets count <1,00,000 mm3 and >1,00,000 mm3 in 22.2% cases. Charu Kiran Agrawal et al (2021) [21] had observed 57% Platelet count between 100,000-150,000 /mm^3. 17.2 % Platelet count between 71,000-99,000 /mm^3. 11.4 % Platelet count between 56,000-70,000 /mm^3 and 14.2 % Platelet count between 40,000-55,000 /mm^3 .

Out of total 1189 dengue positive cases, 03 (0.25%) cases were reported death while rest 1186 (99.75%) cases recovered and discharged successfully. total mortality reported was 0.25% cases. our findings are similar with the study done by Dhruba Hari Chandi (2021) [22] reported 2(0.5%) death and Nishat Hussain Ahmed (2014) [23] reported the mortality in 0.06% cases.

Chikungunya And Co-Infections

Chikungunya has similar clinical presentation as dengue, so it has remained underreported in this part of the country. Even coinfections may result in illness with overlapping signs and symptoms, making diagnosis and treatment difficult for physicians. As mosquitoes are abundantly present, they may become infected with both types of viruses and often get transmitted to human beings as coinfections following the mosquito bite. (Maninder Kaur et al(2018) [24]

In the present study out of total 1189 dengue positive cases, 106 (8.91%) were positive for chikungunya and 59 (4.96%) were positive by both the dengue and chikungunya co-infection. Our findings are in accordance with the study done by Swati Gupta et al (2020) [25] who reported 8.5% had Chikungunya and 41.5% patients had Dengue. Dengue and Chikungunya co-infection was found in 4.5% patients.

Vector-borne diseases pose a major threat to the health of societies around the world. Vector-borne diseases account for more than 17% of all infectious diseases, causing more than 700,000 deaths annually.

Dengue Vector Control- Community based source reduction by treating mosquito breeding sites has been tried in a number of locations. Container surveys are a useful measure of the impact of source reduction efforts. Classic source reduction— the elimination of breeding sites— is conducted by trained inspectors under expert supervision but is highly laborious and ineffective Control of larvae uses the following methods such as use of kerosene, diesel oil, and similar products kill larvae and pupae by penetrating the tracheal system and preventing respiration, and monomolecular films of amphoteric surfactants, both natural (soya lecithin) and synthetic, have repeatedly surfaced as a putative control method. Insecticides such as DDT were effective against Aedes aegypti. Larvivorous fish have been used for many years in cisterns and other large containers. (3) CYD-TDV is the first dengue vaccine to be licensed. It was first licensed in Mexico in December 2015 for use in individuals 9-45 years of age living in endemic areas, and is now licensed in 20 countries. [26]

REFERENCES

1. The National Guideline for Dengue case management during COVID-19 pandemic has been approved by Joint Monitoring Group Chaired byDr Sunil Kumar, Director General of Health Services, Ministry of Healthand Family Welfare, Government of India on 20th October 2020, page 1-30
2. Kulkarni, R., Modak, M., Gosavi, M., Wani, D., Mishra, A. C., & Arankalle, V. A. (2020). Comparative assessment of commercial enzyme-linked immunosorbent assay & rapid diagnostic tests used for dengue diagnosis in India. The Indian journal of medical research, 151(1), 71–78. https://doi.org/10.4103/ijmr.IJMR_613_18
3. Mohan K, Nasimuddin S, Sathyaseelan RD, Meenakshisundaram PR,Gnanadesikan S, Malaiyan J. A study on clinical profile and laboratoryparameters of dengue fever patients in Chennai, Tamil Nadu, India. IPInt J Med Microbiol Trop Dis 2021;7(1):28-31.
4. Borkakoty B, Das M, Sarma K, Jakharia A, Das PK, Bhattacharya C, etal. Molecular characterisation and phylogenetic analysis of dengueoutbreak in Pasighat, Arunachal Pradesh, Northeast India. Indian JMedMicrobiol 2018;36:37-42.
5. Hora S, Salunke P, Shivram S. Comparative analysis of NS1 antigen card test and ELISA of clinically suspected dengue fever cases in a tertiary care hospital, Mumbai. Indian J Microbiol Res 2021;8(1):20-23.
6. Dr Vaidehi Kulkarni , Dr Badal Taori , Dr Babita Ghodke, ACorrelative Study of ECG Changes in Dengue Fever, JMSCRVol||06||Issue||10||Page 91-100||October 2018, DOI: https://dx.doi.org/10.18535/jmscr/v6i10.16
7. Srikant Kumar Dhar , Uday Bhanu Rout , Suse Naqash Nadar, K Sruthi, Nalini Kanta Sahoo , Saptaswa Nayak, Emerging Co- Infections in Dengue: A Hospital Based Study, JMSCR Vol||08||Issue||02||Page 836- 841||February2020, DOI:https://dx.doi.org/10.18535/jmscr/v8i2.142
8. M. M. Duthade, A.S. Damle, J.B.Bhakre, A.A.Gaikwad, J.A.Iravane,Arjun Jadhav and Anuja Samale, The Study of Detection of Dengue NS1Antigen and IgM Antibody by ELISA in and around Aurangabad, India,ISSN: 2319-7706 Volume 4 Number 10 (2015) pp. 416-422 http://www.ijcmas.com, Int.J.Curr.Microbiol.App.Sci (2015) 4(10): 416-422.
9. Neeti Mishra, Shailendra Mohan Tripathi, Vineeta Khare, Sana Islahi, MohdGulrez, Priyanka Shukla, Shadma Yaqoob, Y. I. Singh, "Comparison of NS1Antigen and Antibody Detection Method in Early Diagnosis of DengueInfection ", International Journal of Science and Research (IJSR), https://www.ijsr.net/search_index_results_paperid.php?id=SUB15969, Volume 4 Issue 1, January 2015, 2663 – 2668
10. George T, Pais M, Abraham S, Boloor R, Suresh S, Jakribettu RP, et al.Clinicolaboratory and treatment profile of dengue in children: Observations from a tertiary care hospital. Hamdan Med J 2021;14:13- 6. DOI: 10.4103/HMJ.HMJ_52_20
11. Chakravarti A, Roy P, Malik S, Siddiqui O, Thakur P. A study ongenderrelated differences in laboratory characteristics of dengue fever. IndianJ Med Microbiol 2016;34:82-4., DOI: 10.4103/0255-0857.174106
12. Dinkar A, Singh J. Dengue infection in North India: An experience of a tertiary care center from 2012 to 2017. Tzu Chi Med J 2020;32(1):36- 40. DOI: 10.4103/tcmj.tcmj_161_18
13. Vidyasagar K, Venkatesha D. Study of prevalence and serodiagnosis ofdengue fever in febrile patients attending a tertiary care hospital. J. EvolutionMed. Dent. Sci. 2020;9(21):1637-1640, DOI: 10.14260/jemds/2020/359.
14. Racherla RG, Pamireddy ML, Mohan A, Mudhigeti N, Mahalakshmi PA,Nallapireddy U, et al. Co-circulation of four dengue serotypes at SouthEastern Andhra Pradesh, India: A prospective study. Indian J MedMicrobiol 2018;36:236-40.
15. Rahman M, Sharma A, Patgiri S, Hussain E, Borah AK, Saikia L.Serotyping of dengue viruses circulating during 2014–2015 in Assam,India. Indian J Med Microbiol 2018;36:429-31, DOI:10.4103/ijmm.IJMM_17_121
16. Sanjay Kumar, Monica Singh and Arindam Chakraborty, ReviewArticle Climatic Imbalance and their Effect on Prevalence ofDengue Fever in India, ISSN: 2319-7706 Volume 4 Number 11 (2015)pp. 185-191 http://www.ijcmas.com
17. Patil ST, VirupakshaKL, KavyashreeNG.A study ofclinicalmanifestations and complications of dengue fever in medical collegehospital.Int J MedRes Rev. 2019;7(3):224-230, DOI: https://doi.org/10.17511/ijmrr.2019.i03.1
18. Kumar A, Rao CR, Pandit V, Shetty S, Bammigatti C, Samarasinghe CM.Clinical manifestations and trend of dengue cases admitted in a tertiarycare hospital, Udupidistrict,Karnataka. Indian J CommunityMed2010;35:386-90., doi: 10.4103/0970-0218.69253 https://www.ijcm.org.in/text.asp?2010/35/3/386/69253
19. Shekar GC, Amaravadi A. Clinical, Biochemical and HematologicalProfile in Dengue Fever. Int J Sci Stud 2016;4(7):144-149.
20. Gupta N, Bareja R, Diagnosis utility of various serological markersincluding NSI antigen for timely detection of dengue virus infection, Int J Med Microbiol Trop Dis 2019;5(1):37-40. DOI: 10.18231/2581-4761.2019.0009
21. Charu Kiran Agrawal, Swadha Sharma. A study of hematological profilesin dengue in a tertiary care hospital. IAIM, 2021; 8(9): 42-46.
22. Dhruba Hari Chandi, Prevalence of dengue virus infection among population of Bhaili visiting tertiary health institution; Chhattisgarh, Asian Journal of Medical Sciences | Mar-Apr 2020 | Vol 11 | Issue 2, http://nepjol.info/index.php/AJMS , DOI:

10.3126/ajms.v11i2.27345 , E-ISSN: 2091-0576 P-ISSN: 2467-9100

23 Ahmed N! H, Broor S. Dengue Fever Outbreak in Delhi, North India: AClinico-Epidemiological Study. Indian J Community Med 2015;40:135-8, DOI: 10.4103/0970-0218.153884.

24. Kaur M, Singh K, Sidhu SK, Devi P, Kaur M, Soneja S, et al.Coinfection of chikungunya and dengue viruses: A serological studyfrom North Western region of Punjab, India. J Lab Physicians 2018;10:443-7.

25. Swati Gupta, Sachee Agrawal, Jayanthi Shastri, Dengue andChikungunya Mono and Co-infections among Patients with Acute Febrile Illness, urnal of Clinical and Diagnostic Research. 2020 Oct, Vol-14(10):DC17-DC21, DOI: 10.7860/JCDR/2020/43920. 14125.

26. National guidelines on integrated vector management 2020 June 2020 Government of Nepal Ministry of Health and Population Department ofHealth Services Epidemiology and Disease Control Division Teku,Kathmandu. https://www.who.int/docs/default-source/nepaldocuments/communicable-disease_nepal/national-guidelines-onintegrated-vector-management. pdf?sfvrsn=128e7112_2