Original Research Article

Seroprevalence of Dengue infection in febrile patients at a tertiary care centre of Patna

Archna[1], S.N. Singh[2], Mukesh Kumar[3*]

[1]Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India
[2]Professor and HOD, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India
[3]Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India

Received: 19-07-2021 / Revised: 13-08-2021 / Accepted: 11-10-2021

Abstract

Background : Dengue, an arboviral infection emerging as the most important mosquito-borne viral disease. It is a serious global public health problem. Currently there are no licensed vaccines or specific therapeutics to stop its rapid emergence and global spread. There are four serotypes of the virus and all four virus types circulate and cause epidemics. Clinical features of dengue virus infection include continous high fever lasting 2-7 days, rash with haemorrhagic tendency and joint pain. Efficient and accurate diagnosis of dengue is of primary importance for clinical care surveillance activities, outbreak control and vaccine development. For the prevention of dengue and other arboviruses, there is a need of developing and implementing preparedness plans. Dengue vaccines have been under development since the 1940s, but a tetravalent vaccine which simultaneously provides long-term protection against all DV serotypes is round the corner. **AIM:** To assess Seroprevalence of Dengue infection in febrile patients at a tertiary care centre of Patna. **Methods :** All clinically suspected patients tested for NS1 Ag & IgM Ab by ELISA. **Result:** out of 9332 samples tested, 4710 samples tested were positive for dengue infection (50.47%) and the remaining 4622 (49.53%) samples were negative. **Conclusion :** The seroprevalence of dengue is high especially in post monsoon season. There is a need of special attention by the authorities for the control and prevention.

Keywords: Dengue, Seroprevalence, Arboviral infection.

Introduction

Dengue is a systemic arboviral acute infection transmitted between humans by Aedes aegypti and Aedes albopictus mosquitoes. it is a serious global public health problem. For some patients, dengue is a life-threatening illness. There are currently no licensed vaccines or specific therapeutics, and substantial vector control efforts have not stopped its rapid emergence and global spread. The contemporary worldwide distribution of the risk of dengue virus infection and its public health burden are poorly known[1-3]The word "dengue" is derived from the Swahili phrase Ka-dinga pepo, meaning "cramp-like seizure"[4] Dengue fever occurs worldwide, in nearly all tropical and subtropical countries[5]. The first clinically recognized dengue epidemics occurred almost simultaneously in Asia, Africa, and North America in the 1780s. The first clinical case report dates from 1789 of 1780 epidemic in Philadelphia (kgmc). Dengue virus was first isolated in India in 1945[6]. Dengue viruses (DV) belong to family *Flaviviridae* and there are four serotypes of the virus referred to as DV-1, DV-2, DV-3 and DV-4. Dengue virus is a positive-stranded encapsulated RNA virus and is composed of three structural protein genes, which encode the nucleocapsid or core (C) protein, a membrane-associated (M) protein, an enveloped (E) glycoprotein and seven non-structural (NS) proteins[4]. All four virus types circulate and cause epidemics, but only occasional cases of DHF/DSS have been reported in India[7]. Infection with one dengue serotype provides lifelong immunity to that virus, but there is no cross protective immunity to the other serotypes. Thus, persons living in an area of endemic dengue can be infected with three, and probably four, dengue serotypes during their lifetime[8]Climate change, the expansion of dengue vectors to new geographic regions, increasing human movement across borders, global trade, and urban migration collectively have changed the scope and scale of dengue fever from a national to a global concern. The increasing number of dengue cases imported from endemic countries to non non-endemic areas highlight the importance of global collaboration to manage dengue epidemic[9-11] Knowledge of the geographical distribution and burden of dengue is essential for understanding its contribution to global morbidity and mortality burdens, in determining how to allocate the optimum limited resources for dengue control, and in evaluating the impact of such activities internationally. Estimates of both apparent and inapparent infection distributions is essential for assessing clinical surveillance and for future vaccine demand and delivery strategies[12-14] Clinical features of dengue virus infection include continous high fever lasting 2-7 days, rash with haemorrhagic tendency and joint pain[15]. There is an increase in hematocrit 20 % above to corresponding age, sex and population.

Efficient and accurate diagnosis of dengue is of primary importance for clinical care (i.e. early detection of severe cases, case confirmation and differential diagnosis with other infectious diseases), surveillance activities, outbreak control, pathogenesis, academic research, vaccine development, and clinical trials. Laboratory diagnosis methods for confirming dengue virus infection may involve detection of the virus, viral nucleic acid, antigens or antibodies, or a combination of these techniques. After the onset of illness, the virus can be detected in serum, plasma, circulating blood cells and other tissues for 4–5 days. During the early stages of the disease, virus isolation, nucleic acid or antigen detection can be used

**Correspondence*
Dr. Mukesh Kumar
Tutor, Department of Microbiology, Patna Medical College and Hospital, Patna, Bihar, India.
E-mail: anupamberwal@gmail.com

to diagnose the infection. At the end of the acute phase of infection, serology is the method of choice for diagnosis.The management of dengue virus infection is essentially supportive and symptomatic. No specific treatment is available.For the prevention of dengue and other arboviruses, there is a need of developing and implementing preparedness plans. These should include epidemiological, entomological and environmental surveillance programme, laboratory support, clinical case management and vector control. National partnerships involving government bodies, research institutions and the private sector, as well as international collaborations, are needed for comprehensive plans and programmes for dengue epidemic preparedness and response Primary prevention of dengue is currently possible only with vector control and personal protection from the bites of infected mosquitoes. However, the development of vaccines and drugs has the potential to change this. Despite formidable challenges to developing tetravalent dengue vaccines, significant progress has been made in recent years and the pace towards clinical efficacy trials has accelerated substantially[16-19]. Triggered by the continued unchecked spread of dengue worldwide, there has been renewed interest in dengue by researchers, funding agencies, policymakers and vaccine manufacturers alike. The creation of public–private partnerships for product development has facilitated the process. Recent studies of the burden of disease have quantified the cost of dengue both to the public sector and to households and have demonstrated the potential cost-effectiveness of a dengue vaccine. The vaccine pipeline is now sufficiently advanced for it to be possible to have a first generation dengue vaccine licensed within the next five to seven years. In addition, a number of diverse candidates are at earlier stages of evaluation and could become second-generation vaccines.

Dengue vaccines have been under development since the 1940s, but a tetravalent vaccine which simultaneously provides long-term protection against all DV serotypes is round the corner.

Materials and Methods

This prospective study is conducted at the Department of Microbiology, PMCH, Patna, a tertiary care hospital of Bihar for a duration of one year. During the study period all the patients who attended the outdoor of Department of Medicine and Emergency Department with history of fever with more than or equal to two of the following: joint pain, rash, myalgia, retro-orbital pain, headache and haemorrhagic manifestation are included in the study. Blood samples were collected in the EDTA vial from patients clinically diagnosed as dengue fever .The serum was separated. Investigations like NS1 antigen ELISA, IgM antibody ELISA were done on all serum samples. Cases with Positive NS1 antigen and IgM Dengue antibody or both were recognized as Dengue fever. NS1 antigen was detected by Qualisa microwell Enzyme Immunoassay and IgM dengue antibody by NIV dengue IgM capture ELISA kit. IgG antibody is not reliable marker as it is a cross reacting antibody to other flaviviruses also hence not considered in this study[20]

Statistical analysis used

Microsoft excel sheet 2007 & Epi Info software (version 7.2.0.1) was used for different statistical analysis

Results and Discussion

Clinically suspected dengue patients from Jan. 2019 to Dec 2019 were included in this study. Total 9332 samples from febrile patients were collected & tested as per protocol. Of these 4710 (50.47%) were confirmed dengue cases & remaining 4622 (49,53%) were considered as dengue negative.

During Study period highest number of cases were noted in the month of October (2305) followed by November (1229).

Out of 3336 samples tested for NS1 Ag, 1454 (43.59%) were positive and out of 6051 samples tested for IgM Ab, 3256 (53.81%) were negative. Maximum number of patients belonged to the age group of 16-30 years i.e 2591 (55%) followed by age group 31-40 years i.e 983 (20.9%).

Dengue is an important emerging disease of the tropical & sub tropical regions today. India is one of the seven countries in the South East Asia, endemic for DF & Dengue Hemorrhagic Fever & may become a major niche for dengue infection in nearby future[21].

The present study shows that the maximum no. of cases occurred between the months of September to December. In other studies by Kulkarni et al in their study of Dengue cases in a tertiary care center in Jaipur reported cases from September to November[22] Mohan D.K. reported most of the cases during the month of June to September[23].Dengue in 2011-2013 in A.J. Institute of Medical Sciences and Research Center, Mangalore, Karnataka, reported cases throughout the year with peak admission in April followed by May and June[24]

Table 1: Seroprevalence of dengue infection positive and negative cases

Dengue infection	Total	Percentage
Dengue positive	4710	50.47%
Dengue negative	4622	49.53%
Total	9332	

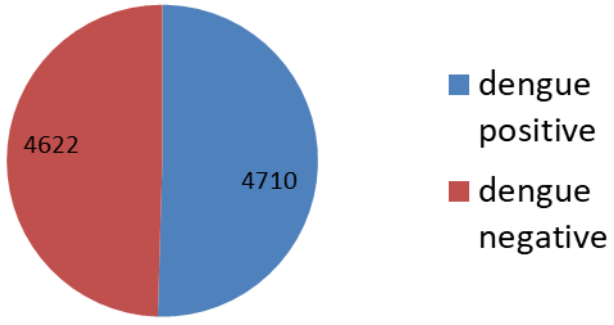

Fig 1: Seroprevalence of dengue positive and negative cases

Table 2: Distribution of dengue Positive cases

Parameter	Total test done	Positive	Percentage
IgM	6051	3256	53.81%
NS1	3336	1454	43.59 %

Table 3: Month wise distribution of dengue cases

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
NS1 Ag	0	0	0	0	0	0	1	4	98	1007	322	17
IgM Ab	0	0	0	0	3	2	41	72	306	1298	907	627
Total	0	0	0	0	3	2	42	76	404	2305	1229	644

Table 4: Sex wise distribution of positive cases

Sex	No. of patients	Percentage
Male	3243	68.85
Female	1467	31.15

Table 5: Age wise distribution of positive cases

Age group (in years)	No. of patients	Percentage
1M – 15 years	754	16.0
16-30 years	2591	55.0
31-40 years	983	20.9
41-50 years	241	5.1
51-60 years	91	1.9
> 61 years	50	1.1

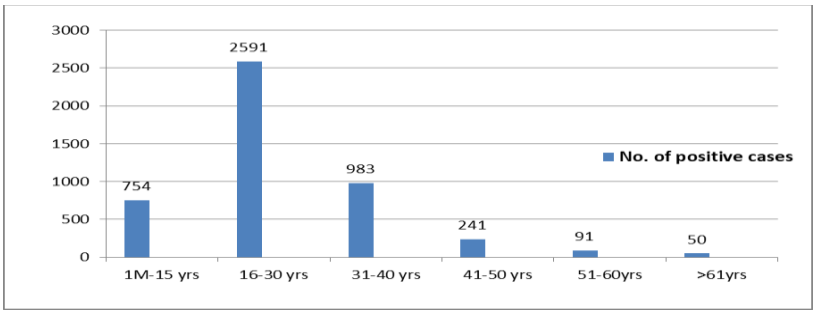

Fig 2: Age wise distribution of positive cases

Conclusion

Since monsoon in our region in not heavy & has intermittent showers, peak of case is seen during mid & end of monsoon. Dengue disease continues to involve newer areas, newer populations and is increasing in magnitude, epidemic after epidemic. Every aspect of dengue viral infection continues to be a challenge; the pathogenesis of severe dengue disease is not known. A lot more remains to be achieved for creating an impact.

References

1. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL et al. The global distribution and burden of dengue. Nature. 496:504-507.
2. World Health Organization. Dengue: Guidelines for Diagnosis, Treatment, Prevention and Control. WHO/HTM/NTD/ DEN/2009.1. World Health Organization 2009
3. Halstead SB. Pathogenesis of dengue: challenges to molecular biology. Science. 1988; 239:476-481.
4. Gupta N, Srivastava S, Jain A et al. Dengue in India. Indian J Med Res 2012;136: 373-390.
5. Thongcharoen P, Jatanasen S. Dengue haemorrhagic fever and dengue shock syndrome introduction, historical and epidemiological background. In: Thongcharoen P, compiler. Monograph on dengue haemorrhagic fever. WHO, Regional Office for South-East Asia, 1993, 1-8p.
6. Sabin AB. Research on dengue during World War II. Am J Trop Med Hyg. 1952; 1:30-50.
7. Rao CVRM. Dengue fever in India. Indian J Pediatr. 1987; 54:11-4.
8. Akila et al. Understanding Dengue and Implications for Prevention ARJMCS. 2016; 2(5):1.
9. Murray NE, Quam MB, Wilder-Smith A. Epidemiology of dengue: past, present and future prospects. Clin Epidemiol. 2013; 5:299-309.
10. Gupta N, Srivastava S, Jain A, Chaturvedi UC. Dengue in India. Indian J Med Res. 2012; 136:373-390.
11. Shepard DS et al. Economic and disease burden of dengue illness in India. Am. J. Trop. Med. Hyg. 2014; 91(6):1235-124.
12. Beatty ME, Letson GW, Margolis HS. Estimating the global burden of dengue. Am. J. Trop. Med. Hyg. 2009; 81(Suppl. 1):231.
13. Van Kleef E, Bambrick H, Hales S. The geographic distribution of dengue fever and the potential influence of global climate change. TropIKA. net http:// journal.tropika.net/ scielo.php? script5sci_arttext&pid5S2078- 86062010005000001 & lng5 en&nrm5iso, 2009.
14. World Health Organization. International Travel and Health: Situation as on 1 January 2012. World Health Organization 2012.
15. Brady OJ, Gething PW, Bhatt S, Messina JP, Brownstein JS et al. Refining the Global Spatial Limits of Dengue Virus Transmission by Evidence- Based Consensus. PLoS Negl Trop Dis. 2012; 6(8):e1760.
16. Edelman R. Dengue vaccines approach the finish line. Clinical Infectious Diseases. 2007; 45(Suppl 1):S56–S60.
17. Guy B, Almond JW. Towards a dengue vaccine: progress to date and remaining challenges. Comparative Immunology, Microbiology and Infectious Diseases. 2008; 2-3:239-252.
18. Hombach J. Vaccines against dengue: a review of current candidate vaccines at advanced development stages. Revista Panamericana de Salud Pública. 2007; 21:254-260.
19. Whitehead SS et al. Prospects for a dengue virus vaccine. Nature Reviews. Microbiology. 2007; 5:518–528.

20. Kumar A, Rao CR, Pandit V, Shetty S, Bammigatti C, Samarasinghe CM. Clinical Manifestations & Trend of dengue cases admitted in a Tertiary Care Hospital Udupi District, Karnataka. Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine. 2010; 35(3):386-90.
21. Prakash Doke, Satish Pawar. Profile of dengue fever outbreak in Maharashtra; Indian Journal of Community Medicine 2000; 25(4):2000.
22. Prathyusha CV, Sudarsini P, Umamaheswara Rao K. Clinico-haematological profile and outcome of dengue fever in children. Int.J.Curr. Microbiol. App.Sci. 2013; 2(10):338-346.
23. A Abrol, A Dewan, N Agarwal, A Galhotra, N Goel, H Swami. A Clinico Epidemiological Profile of Dengue Fever Cases in a Peri-Urban Area of Chandigarh. The Internet Journal of Epidemiology. 2006;5(1):1
24. Jonathan G. Lim, Salvacion R, Gatchalian Ma, Rosario Z. Capeding. Profile of Pediatric patients with DF/ DHF over a Five Year Period (2000-04). Pediatric Infectious Disease Society of Philippines Journal. 2010; 11(1):26-34.

Conflict of Interest: Nil
Source of support:Nil