VOLUME-8, ISSUE-4, APRIL-2019 • PRINT ISSN No 2277 - 8160

Original Research Paper

Microbiology

PROFILE OF DENGUE VIRAL INFECTION IN TERTIARY CARE HOSPITAL IN WESTERN UTTAR PRADESH

Sadab — Msc. Medical Microbiology student, Department of Microbiology, Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital, Meerut- 250005

Vandana Sardana* — MD, Associate Professor, Department of Microbiology, Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital, Meerut- 250005 *Corresponding Author

Anita Pandey — MD, Professor & Head, Department of Microbiology, Subharti Medical College and associated Chhatrapati Shivaji Subharti Hospital, Meerut-250005

ABSTRACT

Background: Dengue is one of most serious arthropod-borne viral infection of humans, caused by a flavivirus. The infection usually occurs with clinical manifestations ranging from an asymptomatic or mild febrile illness as classical dengue fever to the potentially life threatening illness, dengue hemorrhagic fever and dengue shock syndrome.

Aim & Objectives: To study the frequency of dengue infection in a clinically suspected patients.To determine the laboratory profile of dengue viral infection in patient's serum.

Materials and method: Serum samples from 1714 clinically suspected cases, were processed for the detection of dengue NS1 antigen (Non-structural 1), anti IgM antibodies and anti IgG antibodies using commercial ELISA kit.

Result: The frequency of dengue infection was found to be 21.47%, (368/1714). Out of 368 cases, 85.05% were suffering from recent infection and 8.16% were carrying primary infection. Recent secondary infection was present in 2.18% cases and 2.98% had secondary infection. 1.63% cases were infected by dengue virus for the second time or they were suffering from recent secondary infection**.**Fever was present in all the cases. Other common clinical manifestations were headache, myalgia, retro-orbital pain, sore throat, jaundice and petechiae. Young and middle aged individuals were commonly infected, showing males predominance. Maximum cases were positive in the month of October followed by November, September and August.

Conclusion: Dengue is endemic in city population. Early diagnosis of dengue and institution of appropriate supportive therapy may decrease risk of hemorrhage and shock. Climatic and environmental factors should be monitored to control the vector density.

KEYWORDS : Dengue, NS1 Antigen, IgM, IgG, primary infection, secondary infection

INTRODUCTION

Dengue (break bone fever) is a mosquito – borne viral infection. Dengue virus belongs to family flaviviridae.[1] Its genome comprises a single stranded positive sense RNA encoding three structural and seven non- structural proteins.[2] There are four serotypes, referred to as DEN 1-4, that are genetically similar but antigenically distinct,[3] defined by inability of individually elicited antibodies to cross neutralize. Dengue is spread primarily by the vector *Aedes aegypti* mosquito, a that can be found throughout the tropical and sub-tropical regions of the world.[4,5] Classical dengue is an acute infection presenting clinically 4-10 days following the bite of an infected mosquito. The disease is characterized by elevated temperature, severe headache, retro-orbital pain, malaise, severe joint and muscle pain, nausea and vomiting with a rash appearing after 3 to 4 days after onset of fever.[6] Following a primary infection, the patient is immunologically protected from disease caused by the particular dengue serotype.[7]

MATERIALS AND METHOD:

The prospective study was carried out in the Post graduate Department of Microbiology, Subharti Medical College, and associated Chhatrapati Shivaji Subharti Hospital, Meerut, over a period of one year (May 2017 to April 2018). All clinically suspected febrile patients irrespective of age and gender were included in the study. Patients with concomitant malaria and enteric fever were excluded from the study.

Ethical approval was taken by taken by the institutional ethics committee before conducting the study.

Sample collection: A total of 1714 blood samples were collected from clinically suspected cases, from different wards and the out-patient departments.Whole blood sample was collected by a trained phlebotomist in red top vacutainer.

Serum separation: Whole blood sample collected in red top vacutainer was inverted 5 times to facilitate the clotting process. Sample was allowed to clot for 1 hour at room temperature. Once the clot had formed, sample was centrifuged for 15 minutes at 10,000 rpm (as per kit literature). Using a sterile pipette, serum was aliquoted into labeled vials.

Serum storage: Serum samples were stored at 2-8°C for up to 7 days or frozen at -20°C or below for up to 30 days.

Sample processing:

Serum samples were tested for the presence of Dengue NS1 antigen,IgM antibodies and IgG antibodies by ELISA (**MAC ELISA, J. Mitra & Co. Pvt. Ltd)** as per manufacturers' instructions.

RESULTS

Out of total of 1714 samples collected from clinically suspected cases, 368 (21.47%) cases were found to be infected by dengue virus and the remaining 1346 (78.53%) were negative for dengue antigen and antibodies.(Figure 1). Out of total of 368 dengue positive cases, 313 (85.05%) were suffering from recent infection and 30(8.16%) were carrying primary infection. Recent secondary infection was present in 8(2.18%) cases and 11(2.98%) had secondary infection. 6 (1.63%) cases were infected by dengue virus for the second time or they were suffering from recent secondary infection.(Table 1)

Fever was present in all the patients (100%) , followed by headache (73.36%), myalgia (48.9%), retro-orbital pain (12.5%), sore throat (10.86%), jaundice (9.79%), petechiae(8.15%), unconsciousness (7.60%), gastrointestinal bleed (6.79%), vomiting (6.52%), itching (5.70%), diarrhea (3.80%), seizure (2.98%), abdominal pain (2.71%),chest pain (2.17%), breathlessness (1.35%) and shock (1.08%).(Table 2)

Out of 368 dengue positive cases, 226 (61.4%)were males and 142 (38.6%) were females. Males out numbered females with the ratio of 1.6:1. Majority of the cases were of younger age group (29.35%), followed by middle age group (21.18%).(Table 3)

Maximum number of dengue positive cases were observed in the month of October followed by November, September and August. (Figure 2)

Figure 1: Frequency of Dengue infection (n= 1714)

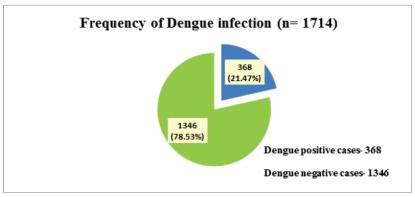


Table 1 : Interpretation of dengue confirmed cases by diag nostic parameters (n=368)

Serial No.	NS1	IgM	IgG	Interpretation	No of cases. (%)
1.	+	-	-	Recent primary infection	301 (81.79)
2.	+	+	-	Recent primary infection	12 (3.26)
3.	-	+	-	Primary infection	30 (8.16)
4.	-	+	+	Recent secondary infection	08 (2.18)
5.	-	-	+	Secondary infection	11 (2.98)
6.	+	+	+	2nd exposure of infection or recent secondary infection	6 (1.63)

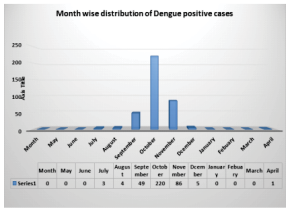
Table 2: Clinical presentation in dengue positive cases(n = 368)

S.No.	Signs / Symptoms	No of cases (%)
1.	Fever	368 (100%)
2.	Headache	270 (73.36%)
3.	Myalgia	180 (48.9%)
4.	Retro- orbital pain	46 (12.5%)
5.	Sore throat	40 (10.86%)
6.	Jaundice	36 (9.79%)
7.	Petechiae	32 (8.69%)
8.	Unconsciousness	28 (7.60 %)
9.	Gastrointestinal bleed	25 (6.79%)
10.	Vomiting	24 (6.52%)
11.	Itching	21 (5.70%)
12.	Diarrhea	14 (3.80%)
13.	Seizure	11 (2.98%)
14.	Pain in abdomen	10 (2.71%)
15.	Chest pain	08 (2.17%)
16.	Breathlessness	05 (1.35%)
17.	Shock	04 (1.08%)

Table 3: Age and gender wise distribution of Dengue positive cases (n= 368)

Age- group (in years)	No. of Male cases (%)	No. of Female cases (%)	Total number of cases (%)
<10	26 (7.06%)	9 (2.44%)	35 (9.5%)
11-20	25 (6.8%)	20 (5.5%)	45 (12.3%)
21-30	65 (17.67%)	43(11.68%)	108 (29.35%)
31-40	56 (15.21%)	22 (5.97%)	78 (21.18%)
41-50	28 (7.6%)	24 (6.5%)	52 (14.1%)
51-60	17 (4.61%)	17 (4.61%)	34 (9.23%)
>60	9 (2.44%)	7 (1.9%)	16 (4.34%)
TOTAL	226 (61.4%)	142 (38.6%)	368(100%)

Figure 2: Month- wise distribution of dengue positive cases (n=368)



DISCUSSION

Dengue is emerging as a serious public health problem globally. The expanding geographical distribution of both the virus and the mosquito vector is leading to increased frequency of epidemics, and the emergence of DHF due to climatic changes and the failure to control the mosquito vector.[8,9]

In our study, frequency of dengue fever among the clinically suspected cases was 21.47% .Our finding was similar to the study done in Kerala by Karunakaran A *et al.*[10] who had reported the positive rate of dengue cases in 21.5% of suspected patients. Another study carried out by Sathiavathy KA *et al.*[11] had found the dengue positivity rate of 30.8% in Central Kerala.[11] In Colombia, Restrepo BN *et al.*[12] reported that the incidence of dengue infection was 6.9% in 2010 and 9.5% in 2011.

Out of total of 368 dengue positive cases, 85.05% were suffering from recent infection and 8.16% were carrying primary infection. Recent secondary infection was present in 2.18% cases and 2.98% had secondary infection.1.63% cases were infected by dengue virus for the second time or they were suffering from recent secondary infection.

Malik SM *et al.*[13] reported the dengue positivity of 56% in Lahore, out of which 20.40% were suffering from recent primary infection and 18.36% were carrying primary infection. Recent secondary infection was present in 4.08% individuals and 17.34% individuals were infected with secondary infection, and 19.38% were infected by the dengue virus for the second time or they were suffering from recent secondary infection.[13]

In Pune Mehta SR *et al.*[14] found that 80.6% of cases were positive for NS1 antigen, 11.7% patients tested positivefor IgG, and 5.68% positive for IgM. Study done by Munir *et al.*[15] in 2014, showed the presence of high number of NS1 antigen positive cases (60.20%), indicating the early stage of fever.

In 2011 Hakim *et al.*[16] observed that the presence of NS1 and IgM is seen directly proportional while the presence of IgG and NS1 is inversely proportional as the detection of NS1 decreased with the increase of IgG. Another study also found that the rate of detection of NS1antigen is indirectly proportional to the presence of IgG while IgM detection rate is directly proportional to NS1 antigen (Wang and Sekaran, 2010).[17]

In 2018, a study done by Damodar T *et al.* in Mangalore observed that 29% cases were positive by at least one of the tests i.e. IgM ELISA, IgG ELISA, NS1 ELISA. Secondary infection was found 21.67% cases.[18]

In our set up all the patients had presented with fever. Other common clinical manifestations were headache, myalgia, retro-orbital pain, sore throat, jaundice and petechiae. Breathlessness and shock were the rare clinical findings. Our observations were similar to the studies done by Mishra S *et al.* (2016, Odhisha)[19] and Valvaula S *et al.* (2016, Kolar).[20]

A study done in Uttarakhand by Singh R, Singh SP and Ahmad N[21] also found that fever was present in 100% followed by headache(80%) myalgia (63.6%), petechiae(50%), shock (18.6%), gastrointestinal bleed (6.4%) and ARDS(2.1%), dengue positive cases, Males out numbered females with the ratio of 1.6:1.

In our study, among the dengue positive cases, males out numbered females with the ratio of 1.6:1. Most of the cases were of younger and middle age group. A study done by Malik *et al.*[13] which also showed that males (62.24%) were more commonly affected than females and dengue cases were more common in children and young adults.[13] Singh R *et al.*[21] found that 57.1% were male cases and 2.9% female cases and majority patients of younger age group. In 2017, study done in Bihar also showed the male predominance with

maximum cases in middle age group. 61(63.54%) patients were male and 35 (36.45%) were female.[22]

We observed the maximum number of dengue positive cases in the month of October followed by November, September and August. In a study done in Delhi, Kumar A*et al.*[23] also reported the maximum cases in the month of October. A study done in Central Kerala, observed that in 2007 there was sharp rise in June which showed decline after August. In 2008 also the rise was observed in June, but high rate lasted up to December. In 2009 the rise started in May and fall occurred from November. The similar pattern was found in 2010, 2012, 2013 and 2014. In 2015 and 2016 the rise started in June, but the rate was already high from the beginning of year.[11] In 2013, Singh R *et al.*[21] found that maximum cases were from September to November in Uttarakhand. Number of cases increases in rainy and post rainy seasons because of water stagnation which serves as breeding ground for mosquitoes.[21]Study done in Kolkata had also reported the similar seasonal variation.[24] Thus, the preventive methods to control the mosquitoes must be implemented at the beginning of monsoon.

Limitations: Detection of DEN viral DNA and serotyping of the dengue virus could not be done due to limited resources.

CONCLUSION:

Dengue viral infection is endemic in city population. A timely diagnosisof dengue, institution of appropriate therapeutic measures may decrease the risk of complications and mortality. Periodic monitoring of dengue through surveillance of febrile cases would be useful for the detection of outbreaks, the enforcement of vector control measures and the management of dengue cases.

REFERENCES

1. Brooks GF, Carroll KC, Butel JS, Morse SA, Mietzner TA. (eds.) Jawetz, Melnick & Adelberg's Medical Microbiology. Twenty sixth edition.USA:The McGraw Hill Companies; 2013.
2. Perera R, Kuhn RJ. Structural proteomics of dengue virus. Curr Opin Microbiol. 2008; 11:369–7
3. Guzman MG, Halstead SB, Artsob H, et al. Dengue: a continuing global threat. Nat Rev Microbiol. 2010;8:S7–16.
4. Smith CE. The history of dengue in tropical Asia and its probable relationship tothe mosquito Aedes aegypti. J Trop Med Hyg.1956; 59:243–51.
5. Halstead SB. Dengue. Lancet.2007; 370:1644–52.
6. Kautner I, Robinson MJ, Kuhnle U. Dengue virus infection: epidemiology, pathogenesis, clinical presentation, diagnosis, and prevention. J Pediatr. 1997; 131:516–24.
7. Halstead SB. Etiologies of the experimental dengue of Siler and Simmons. Am J Trop Med Hyg.1974;23:974–82
8. Schwartz E, Moskovitz A, Potasman I, Peri G, Grossman Z, Alkan ML, et al. Changing epidemiology of dengue fever in travelers to Thailand. Eur J Clin Microbiol Infect Dis. 2000;19:784-6.
9. Gubler DJ. Aedes aegypti and aedes aegypti-borne disease control in the 1990s: Top down or bottom up. Charles Franklin Craig Lecture. Am J Trop Med Hyg. 1989;40:571-8.
10. Karunakaran A, Ilyas WM, Sheen SF, Jose NK, Nujum ZT. Risk factors of mortality among dengue patients admitted to a tertiary care setting in Kerala, India. Journal of infection and public health. 2014;7(2):114-20.
11. Sathiavathy KA, Kuttichira P, Prasad AB, Kuttichira DP. Pattern of dengue fever epidemic: observations from laboratory results of a tertiary care hospital in central Kerala. Indian J Applied research.2017;7:678-79.
12. Restrepo BN, Piedrahita LD, Agudelo IY, Parra-Henao G, Osorio JE. Frequency and clinical features of dengue infection in a school children cohort from medellin, Colombia. J Trop Med. 2012;2012: 120496. pmid:23304167
13. Malik MS, Javed F, Wasim M, Ulfat M, Arshad S et al. Frequency of Dengue virus Infection among Febrile Patients of Lahore. Global Journal of Health Science.2017;9(10): 212-17.
14. Mehta SR, Bafna TA, Pokale AB. Demographic and clinical spectrum of dengue patients admitted in a tertiary care hospital. Med J Dr DY Patil Vidyapeeth. 2018;11:128-31.
15. Munir MA, Alam SE, Khan ZU, Saeed Q, Arif A, Iqbal R, Saqib MA, Qureshi H. Dengue fever in patients admitted in tertiary care hospitals in Pakistan. Journal of Pakistan Medical Association.2014;64:553-9.
16. Hakim ST, Tayyab SMH, Nadeem SG. An experience with dengue in Pakistan: An expanding problem. Ibnosina Journal of Medicine and Biomedical Sciences.2011; 3(1):3-8. https://doi.org/10.4103/1947-489X.210848
17. Wang SM, Sekaran SD. Early diagnosis of Dengue infection using a commercial Dengue Duo rapidtest kit for the detection of NS1, IGM, and IGG. The American journal of tropical medicine and hygiene.2010;83(3):690-695. https://doi.org/10.4269/ajtmh.2010.10-0117
18. Damodar T, Dias M, Mani R, Shilpa KA, Anand AM, Ravi V, Tiewsoh J. Clinical and laboratory profile of dengue viral infections in and around Mangalore, India. Indian Journal of Medical Microbiology.2017;35(2):256-61.
19. Mishra S, Ramanathan R, Agarwalla SK. Clinical profile of dengue fever in children: a study from Southern Odisha, India. Scientifica.2016;2016:1-6.
20. Vulavala S, Reddy Y, Kamarthy P. Study Of Clinical And Laboratory Profile Of Dengue Fever Patients. European journal of pharmaceutical and medical research.2016;3(11): 613-16.
21. Singh R, Singh SP, Ahmad N. A study of clinical and laboratory profile of dengue fever in a tertiary care centre of Uttarakhand, IndiInt J Res Med Sci. 2014;2(1):160-163
22. Mishra AK, Kumar S, Kumar P, Ahmad A, Kumar S et al.Study on Clinical Profile f Dengue Fever in a Tertiary Care Centre of Bihar . International Journal of Scientific Study .2018;6:43-46.
23. Kumar A, Rongpharpi S, Duggal SD, Gur R, Choudhary S, et al. Clinical, Epidemiological and Microbiological Profile of Dengue Fever at a Tertiary Care Hospital in Delhi, India. J Infect Dis Med. 2017;2(2):110. DOI: 10.4172/2576-1420.1000110
24. Bandyopadhya B, Bhattacharya I, Adhikary S et al. " A Comprehensive Study on the 2012 Dengue fever outbreaks in Kolkata, India,"ISRN Virology.2013;03:5.