MAK HILL Publications International Journal of Tropical Medicine

Research Article
doi: 10.59218/makrjms.2023.3.43.47

A Study of the Clinical, Haematological and Biochemical Profiles of Individuals in North India with Dengue Virus Infections Implications for Patient Management

[1]Sujata, [2]Gurmeet Kaur, [3]Ankita and [4]Manish Kumar

[1]Department of Critical Care Medicine, A.B.V.I.M.S. and Dr. R.M.L. Hospital New Delhi, India

[2]Department of Medicine, A.B.V.I.M.S and Dr. R.M.L. Hospital New Delhi, India

[3]N.C. Medical College and Hospital, Israna, Panipat, India

[4]Pt. B.D. Sharma University of Health Sciences, Rohtak, India

ABSTRACT

Dengue fever is a mosquito borne arboviral disease that is a serious global public health. Problem, mostly in tropical and subtropical regions of the world. Dengue fever is present mainly in Africa, South-East Asia, Western Pacific and Caribbean. Infection with a specific dengue serotype results in lasting homotypic immunity against that particular serotype. Multiple serotypes may circulate simultaneously during an epidemic, potentially leading to an individual multiple infections, each corresponding to a distinct serotype. Dengue infection can be identified using clinical signs and laboratory investigations. Both non-specific and specific diagnostic measures are use in the evaluation of dengue. To underscore the most common clinical parameters, along with the haematological and biochemical investigations, among cases of dengue. A cross-sectional prospective study was conducted at Dengue ward in Atal Bihari Vajpayee institute of medical sciences and Dr. Ram Manohar Lohia Hospital, New Delhi from October 2021 December 2021. A physician performed clinical examinations on each research participant. Demographic characteristics and clinical profiles of research participants were obtained by nurses using a structured questionnaire, as previously published. A total of 450 febrile patients, who were suspected of having dengue virus infection according to the WHO criteria from 2009, underwent testing for dengue-specific IgM antibodies. Among these, 120 patients were confirmed to be positive for dengue. In 99 patients the most prevalent haematological finding was thrombocytopenia (platelet count 150,000/cumm) (96/99-96.9) then anaemia (haemoglobin level) in 37 (37/99-37.3%) and leukopenia (total) in 31 (31/99-31.1%). The commonest clinical feature was fever, 96 (96.9%) followed by headache in 92 (92/99-92.9%) myalgia 82 (82/99-82.8%) nausea/vomiting 46 (46/99-46.4%) abdominal pain 49(49/99-49.4%) eye pain and mucosal bleeding 25 (25/99-25.2%) in each of the cases. This study highlights that the most frequently reported symptoms among dengue patients were fever, headache and myalgia. Similarly, the prevalent observations included thrombocytopenia, anaemia, leukopenia and elevated AST levels. These findings serve as awarning to healthcare professionals, signalling the potential occurrence of dengue infection within the study region. Dengue, Fever, Haemorrhage, Thrombocytopenia, Anaemia.

OPEN ACCESS

Key Words

Dengue, fever, haemorrhage, thrombocytopenia, anaemia

Corresponding Author

Manish Kumar,
Pt. B.D. Sharma University of Health Sciences, Rohtak, India

Author Designation

[1,2]Professor
[3]Assistant Professor
[4]Senior Resident

Received: 25 October 2023
Accepted: 31 October 2023
Published: 1 November 2023

Citation: Sujata, Gurmeet Kaur, Ankita and Manish Kumar, 2023. A Study of the Clinical, Haematological and Biochemical Profiles of Individuals in North India with Dengue Virus Infections Implications for Patient Management. Int. J. Trop. Med., 18: 43-47, doi: 10.59218/makrjms.2023.3.43.47

INTRODUCTION

The Arboviral disease dengue fever is spread by mosquitoes and is a significant threat to worldwide public health.mostly in tropical and subtropical regions of the world[1]. Dengue fever is present mainly in Africa, South-East Asia, Western Pacific and Caribbean[2]. In recent decades, there has been a notable escalation in the global occurrence of dengue virus (DENV) infection, attributed to the virus's expansion into previously unaffected nations[3]. The primary factors contributing to the widespread and escalating incidences of dengue are rapid urbanization, population migration, inadequate sanitation facilities leading to favourable mosquito breeding sites, insufficient vector control measures and climatic change[4]. Dengue is caused by infection with any of the four serotypes of the dengue virus (DENV) . It is a single stranded RNA arbovirus that is a member of the Flaviviridae family[5].

A specific dengue serotype infection results in longlasting homotypic immunity against that specific serotype. Multiple serotypes may circulate simultaneously during an epidemic, potentially leading to an individual multiple infections, each corresponding to a distinct serotype[6].

As established in clinical practice, the diagnosis and management of the patient rely on clinical symptoms and abnormal laboratory findings[7]. The initial DENV infection can manifest as either asymptomatic or as a non-specific febrile illness, marked by a rapid onset of fever, intense headache, discomfort in bones, joints, myalgias, bleeding tendencies, weakness and rash[8,9].

These clinical manifestations closely resemble those of various other prevalent febrile illnesses in the region, such as typhoid fever, malaria and Kala Azar. The identification of dengue cases is made more difficult by this similarity[10].

While there exists no targeted treatment for dengue the timely identification of the infection, implementation of fluid replacement therapy and the administration of antipyretics and analgesics, combined with proficient nursing support, result in a substantial decrease in mortality rates. This approach has led to a decline in fatality rates from 20% to below 1% even in severe cases of dengue virus. Subsequent infection with distinct DENV serotype has been demonstrated to elevate the risk of developing severe cases of dengue[11].

Clinical symptoms and lab tests can be used to diagnose dengue infection. For the examination of dengue both general and specialised diagnostic techniques are used. Serum protein concentration, liver function tests and the evaluation of haematological parameters are examples of non-specific testing. Additionally, specific tests, including viral antigen testing, genome sequencing, and serology are also employed[12,13]. Medical Professional need to be aware of the most typical clinical, haematological and biochemical manifestations since they are important for patient management and can thus save a life. Thus, objective of this study was to underscore the most prevalent clinical indicators, along with the haematological and biochemical investigations, among cases of dengue.

MATERIALS AND METHODS

Study area and participants: From October-December 2021-2021 a cross-sectional prospective study was conducted at dengue ward in Atal Bihari Vajpayee institute of medical sciences and Dr. Ram Manohar Lohia Hospital, New Delhi.

Inclusion criteria: Febrile patients with dengue illness who were serologically confirmed with dengue specific IgM antibodies based on 2009 WHO criteria[2]. A febrile patient is one whose axillary temperature is higher than normal.

Exclusion criteria: Individuals diagnosed with typhoid fever, malaria, Kala-azar or any other chronic illnesses were excluded.

Data collection: Each research subject underwent a clinical evaluation by a doctor. Nurses used a structured questionnaire to collect the demographic data and clinical profiles of research participants as previously described[14]. The detection of specific IgM antibodies for dengue in serum using the enzyme-linked immunosorbent assay (Elisa, created by Euroimmun diagnostic) (25 assay result) led to the diagnosis of dengue. All standard investigation including haematological findings such as total leucocyte count (TLC) differential leukocyte count, platelet count, haemoglobin (Hgb) and haematocrit (Hct) were carried out using the automated blood analyser (Cell-DYN 1800 Abbott laboratories diagnostics division, USA).

The automated biochemistry analyser (Vegasys) was utilized for conducting various tests including blood smears for malaria parasite, biochemical assays for liver function (AST and ALT) renal function testing (Serum Creatinine and BUN) as well as total protein assessment[15]. The laboratory's reference ranges were used to determine the cutoff values for each test result.

Further more, medical records of individuals with positive dengue-specific IgM were examined to gather additional details, such as the presence of conditions like typhoid fever, Kala azar, or any other chronic illnesses.

Fig. 1: Descriptive statistics of duration of illness on presentation(days) of study subjects.

Fig. 2: Distribution of antigen and antibodies of study subjects.

Table 1: Gender and age of study participants (N = 9)

Variable	No of participants	Percentage
Gender		
Male	61	38.3
Female	38	61.6
Age		18.15
<18 years	18	81.8
>18 years	81	

Table 2: Descriptive statistics of duration of illness (days)

Variable	Mean±SD	Median (25-75th percentile)	Range
Duration of illness	5.75±2.44	5 (4-7)	44971

Table 3: Distribution of presenting complaints of study subjects

Presenting complaints	Frequency	Percentage
Fever	96	96.97
Vomiting	46	46.46
Abdominal pain	49	49.49
Bleeding manifestation	25	25.25
Diarrhea	9	9.09
Others	17	17.17

Table 4: Distribution of major complications of study subjects

Major	Complications frequency	Percentage
Bleeding	15	15.15
Polyserositis	13	13.13
Transamnitis	14	14.14
Acute kidney injury	2	2.02
Shock	3	3.03

Statistical analysis: The statistical programme SPSS 20.0 was used for data collection, entry and analysis. Both frequency and percentage were calculated using descriptive statistics. A table and a figure were used to present the data.

RESULTS

During the study period a total of 450 febrile patients, who were suspected of having dengue virus infection according to the WHO criteria from 2009, underwent testing for dengue-specific IgM antibodies. Among these, 120 patients were confirmed to be positive for dengue. The study comprised 99 (82.5%) of the positive cases, while the remaining 21 (18.3%) were excluded due to co-morbidities (Fig. 1). There were 61 male study participants (78/99-78.7%) and 38 female(38/99-38.3%). Participants in the study ranged in age from one year to 80 years. The average age of the study participants was 18 years

Eighteen (18/99-18.1%) study participants were <18 years (Table 1). The commonest clinical feature was fever, 96 (96.9%) followed by headache in 92 (92/99-92.9%) myalgia 82 (82/99-82.8%) nausea/vomiting 46 (46/99-46.4%) abdominal pain 49 (49/99-49.4%) eye pain and mucosal bleeding 25 (25/99-25.2%) in each of the cases, conjunctival haemorrhage and hepatomegaly 13 (13/99-13.1%) in each of the cases. Rashes and tourniquet test in 17 (17/99-17.1%) and 8 (8/99-8.1%) of cases were seen, respectively (Table 3). Dengue haematological profiles obtained after a hospital visit. In 99 patients the most prevalent haematological finding was thrombocytopenia platelet count 150,000 cumm. (96/99-96.9) then anaemia (haemoglobin level) 11 g dL^{-1} in 37 (37/99-37.3%) and leukopenia (total) in 31 (31/99-31.1%) 4,00 cum the circumstances. Haematocrit levels greater than 24% were found in 10 (10/99m, varied from 9-51% in 9.8% of the cases were observed (Table 4).

DISCUSSIONS

The escalation in the global prevalence of dengue virus in recent decades can be attributed to the limitations of existing management approaches, including vaccination and pesticides[16,17]. As a result, early detection and adequate medical therapy are critical. Goal of this study was to collect baseline data on clinical symptoms, haematological and biochemical markers of dengue patients. The evidence gathered is critical for the effective care of dengue patients.

In this study, the predominant clinical presentation was fever, succeeded by headache, myalgia, nausea, vomiting and abdominal discomfort. These findings are consistent with previous research[17,18]. Also, rash was identified in 17.7% of cases and hepatomegaly was noted in 13.1% of cases. In contrast a comparable study reported figures of 28.1% for rash and 12.5% for hepatomegaly among dengue patients. Bleeding tendency is a common clinical manifestation of dengue due to reduced platelet count and vascular leakage. This occurs as a result of the interaction between the dengue virus and host cells, triggering an excessive production of cytokines and activation of immune mechanisms. This results in infiltration of mononuclear cells, vascular endothelial alterations and perivascular

Table 5: Distribution of haematological and biochemical parameters of study subjects

Parameters	Frequency	Percentage
Haemoglobin(g dL)		
Anaemic {<11 for male, <13 for female}	37	37.37
Non-anaemic	62	62.63
Mean±SD	12.83±2.77	
Median (25-75th percentile)	13.1 (11.2-14.4)	
Range	4.6-19.1	
Total leucocyte count(mm³)		
≤4000 mm-³	31	31.31
4000-11000 mm-³	62	2.63
≥11000 mm-³	6	6.06
Mean±SD	6358.3±4995.44	
Median (25-75th percentile)	4800 (3505.5-8000)	
Range	1300-40000	
Platelet count(mm-³)		
≤1,50,000 mm-³	96	96.97
≥ = 1,50,000 mm³3	3.03%	
Mean±SD	43511.22±36075.2	
Median (25-75th percentile)	30000 (20000-60000)	
Range	2500-150000	
Packed cell volume (%)		
Normal {38.3-48.6% for male and 35.5-44.9% for female}	60	60.61
Deranged	39	39.39
Mean±SD	39.82±7.45	
Median (25-75th percentile)	40 (36-45)	
Range	13.1-57	
Total bilirubin(mg dL^{-1})		
≤0.2 mg dL^{-1}	1	1.01
0.2 to 1.2 mg dL^{-1}	62	62.63
≥1.2 mg dL^{-1}	36	36.36
Mean±SD	1.3±0.7	
Median (25-75th percentile)	1.1 (0.95-1.6)	
Range	0.1-5.2	
SGOT(U L)		
15-50 U L	23	23.23
≥50 U L	76	76.77
Mean±SD	213.53±452.5	
Median (25th-75th percentile)	103 (54-176.5)	
Range	18-3524	
SGPT(U L)		
15-50 U L	38	38.38
≥50 U L	61	61.62
Mean±SD	139.35±283.98	
Median (25-75th percentile)	68 (44.5-112.5)	
Range	15-1963	

edema[19]. In our study a significant proportion of patients exhibited mucosal bleeding a finding that aligns with prior research. However, this diverges from another study where cutaneous bleeding was reported as the predominant haemorrhagic manifestation[20]. According to another study, only, petechiae are haemorrhagic manifestations was reported[21]. The differences in clinical presentation between studies could be attributed to these differences. In strain of the virus and its virulence factor. The most often found finding in the current study, which is consistent with the finding of the other investigations is thrombocytopenia, one of the haematological profiles[22,23]. In our investigation, leukopenia was found in 31.3% of the cases but in previous studies, leukopenia was found in 56.9-50% of the cases[24]. While this is a novel study examining the clinical, haematological and biochemical aspects of dengue virus infection, certain limitations do exist. Owing to the cross-sectional design the ability to compare dengue patients with a control group and to track sequential haematological and biochemical changes was not feasible. These potential endeavours could enhance comprehension of dengue virus presentation in the future. Despite these outlined limitations this preliminary investigation offers the initial foundational data concerning the clinical and laboratory attributes of dengue virus infection.

CONCLUSION

Foremost determinant of dengue treatment and prognosis lies in the recognition of clinical symptoms, coupled with test results encompassing haematological and biochemical markers. This study highlights that the most frequently reported symptoms among dengue patients were fever, headache and myalgia. Similarly, the prevalent observations included thrombocytopenia, anaemia, leukopenia and elevated AST levels. These findings serve as a warning to healthcare professionals, signalling the potential occurrence of denge infection within the study region.

REFERENCES

1. Engelthaler, D., 1997. The reemergence of aedes aegypti in arizona. Emerging. Infect. Dis., 3: 241-242.

2. Khan A.H., A.S. Hayat, N. Masood, N.M. Solangi and T.Z. Shaikh, 2010. Frequency and clinical presentation of dengue fever at tertiary care hospital of hyderabad jamshoro. JLUMHS., 9: 88-94.
3. WHO, 2009. Dengue guidelines, for diagnosis, treatment, prevention and control. World health organization, https://www.who.int/publications-detail-redirect/9789241547871
4. Dash A.P. , R. Bhatia, T.Sunyoto, D.T. Mourya, 2013. Emerging and re-emerging arboviral diseases in Southeast Asia. J. Vector. Borne. Dis., 50: 77-84.
5. Nisalak, A., T.P. Endy, S. Nimmannitya, S. Kalayanarooj, U. Thisayakorn, *et al*., 2003. Serotype-specific dengue virus circulation and dengue disease in Bangkok, Thailand from 1973-1999. Am. J. Trop. Med. Hyg., 68: 191-202.
6. United, States, 2000. Imported dengue united states. Morb. Mortal. Wkly. Rep., 49: 248-253.
7. Kalayanarooj, S., D.W. Vaughn, S. Nimmannitya, S. Green and S. Suntayakorn *et al*., 1997. Early clinical and laboratory indicators of acute dengue illness. J. Infect. Dis., 176: 313-321.
8. Sabin, A.B., 1952. Research on dengue during world war II. Rces .Am. J. Trop. Med. Hyg., 1: 30-50.
9. Karabatsos, N., 1985. International catalogue of arboviruses: Including certain other viruses of vertebrates. 3Ed Edn., San Antonio, UK, ISBN-7: 8906098, Pages: 1147.
10. Amarasinghe, A., 2011. Dengue virus infection in Africa. Emer. Infect. Dis., 17: 1349-1354.
11. WHO., 2000. WHO report on global surveillance of epidemic-prone infectious diseases. World health organization, https://iris.who.int/handle/10665/66485
12. Paula, S.O.D. and B.A.L. da Fonseca, 2004. Dengue: A review of the laboratory tests a clinician must know to achieve a correct diagnosis. Braz. J. Infect. Dis., 8: 390-398.
13. Srichaikul, T. and S. Nimmannitya, 2000. Haematology in dengue and dengue haemorrhagic fever. Best. Pract. Res. Clin. Haematology., 13: 261-276.
14. Ferede, G., M. Tiruneh, E. Abate, Y. Wondimeneh and D. Damtie *et al*., 2018. A serologic study of dengue in northwest Ethiopia: Suggesting preventive and control measures. PLOS. Neglected. Trop. Dis., Vol. 12. 10.1371/journal.pntd.0006430
15. HM, 2000. Health management organization. Health management organization, https://healthmanagement.org/products/view/automatic-biochemistry-analyzer-bench-top-vegasys-ams
16. Kyle, J.L. and E. Harris, 2008. Global spread and persistence of dengue. Ann. Rev. Microbiol., 62: 71-92.
17. M, T.B., 2017. Clinical and laboratory profile in seropositive dengue cases at a tertiary care hospital, south India. World J. Pharm. Pharm. Sci., 6: 1571-1581.
18. Chaudhuri, N., S. Vithyavathi and K. Sankar, 2016. Clinical and laboratory profile of different dengue sub types in dengue virus infection. Int. J. Res. Med. Sci., 4: 743-748.
19. Nadia, A.A, L.M. Mahmood, J. Ayesha, J. Muhammad, T. Nuzhat, M. Amina, *et al*., 2012. Cutaneous manifestations in patients of dengue fever. J. Pk. Assoca. Derma., 22: 320-324.
20. Eregowda, A. and S. Valliappan, 2015. Clinical profile of dengue infection in a tertiary care hospital. Indian. J. Child Health., 2: 68-71.
21. Badawy, A.A. Aziz., S.E.A. Hassanien and A.M. Abdou, 2016. Clinical and hematological effects of dengue viruses infection. American. J. Infect. Diseases. Micr., 4: 74-78.
22. Hasan, S.R., M. Riaz and F.A. Jafri, 2012. Characteristics and outcome of dengue infection; Clinical perspective from a secondary care hospital of Karachi. Pak. J. Med. Sci., 29: 115-118.
23. Ahmed S., N. Ali, S. Ashraf, M. Ilyas, W.U.Z. Tariq and R.A. Chotani, 2008. Dengue fever outbreak: A clinical management experience. J. Coll. Phy. Surg. Pak., 18: 8-12.
24. Yaseen, M. and S.A. Khan, 2017. Evaluation of clinico-hematological and biochemical changes in dengue fever at CIMSH lucknow. Ijcmr., 4: 1527-1529.