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Original Research Article

Clinico - Hematological profile of dengue in children in a tertiary care hospital

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ABSTRACT

Introduction: Dengue is one of the febrile illnesses which is caused by the Dengue fever virus. It affects people of all ages, from the infants to the elderly and is characterized by flu-like symptoms such as fever, anorexia, nausea, vomitings.

Materials and Methods: 382 children below the age of 18 years who presented with symptoms of dengue fever and were admitted into the pediatric ward and intensive care unit and tested NS1 positive or IgM positive were included into the study. Blood was collected for serological, hematological and biochemical analysis especially SGPT and SGOT.

Results: 35.3% of them had dengue fever, 62.04% had dengue hemorrhagic fever and 2.6% had dengue shock syndrome. Fever was seen in 100%, abdominal pain in 67.3%, lethargy in 75.1%, 54.4% with headache, 58.6% with joint pains. The mean hemoglobin level among the children was 10.07 ± 3.19, platelet count below 10000 was seen in 3.4% of the cases, 10000-50000 cells/mm^3 in 12.8%. leucocyte count <4 x 10^3in 48.2%, 4-6 x 10^{3n}cells /cc in 47%, increased hematocrit in 15.2%. Increased SGPT was seen in 63.1% and elevated SGOT was in 59.2% of the patients.

Conclusion: Since the treatment of dengue is relatively simple, the patients must be made aware to seek the medical help as soon as possible to reduce the amount of morbidity and mortality.

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1. Introduction

Dengue is one of the febrile illnesses which is caused by the Dengue fever virus (DENV) belonging to the family Flaviviridae and genus Flavivirus. There are 4 closely related but serologically different types in this genus, DENV-1, DENV-2, DENV-3, and DENV-4. People in the endemic countries can be affected by any of these types. This virus is transmitted by the Aedes mosquitoes during a blood meal.[1–3]

In the recent years, Dengue fever has become one of the major health problems all over the world affecting both tropical and subtropical countries. World Health Organization has estimated that around 2.5 billion people are at risk of getting dengue infection out of which 1.8 billion reside in the South – East Asia and the Western Pacific.[4] 100 million people are affected by Dengue virus every year.[5] Several hundred thousand persons are affected by DHF and DSS each year.[4,6] In India, Dengue was first reported way back in 1812, and since then, many cases have been reported all over the country with the most being from Calcutta, Delhi and Chennai.[7–9] It is endemic in most of India especially in the rural places. Around 80 outbreaks have been reported I India, with the largest one in 1996 in Delhi, with 10252 cases reported and 453 deaths.[5]

The main causes for dengue can be attributed to the increase in the mosquito population due to the rainy season, population explosion in the urban areas, not to mention the urbanization and lack of proper hygienic condition such as open disposal of wastes.[10]

It affects people of all ages, from the infants to the elderly and is characterized by flu-like symptoms such as

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fever, anorexia, nausea, vomitings.[11] However, in severe cases it may lead to complications such as Dengue Hemorrhagic Fever (DHF) and Dengue Shock Syndrome (DSS) which are generally life threatening. Since there is no vaccine, symptomatic treatment incruding hydration with fluids and monitoring the patient is the available option.[12] DHF is characterized by vascular leaking of plasma, thrombocytopenia, which may lead to circulatory failure and DSS is characterized by shock.[4] The fatality rates of these two complications are estimated to be 20% in case of DHF and 44% in DSS.[4]

Usually the first infection with dengue happens in the childhood, as the children population are more vulnerable, during their play time in the open. There have been reports of neonatal transmission also.[13,14] Moreover, the signs and symptoms which are associated with dengue are very similar to those by many of the other microorganisms, so identifying them as dengue is a challenge. Many tests such as specific and non specific tests are required to confirm the diagnosis as dengue fever.[15] The specific tests for dengue consist of detection of the NS1 antigen. IgM or IgG antibodies, by either rapid tests or ELISA, the non specific tests are blood counts, platelet count, tourniquet tests, liver function test like SGPT and SGOT.[16,17] NS1 antigen is a glycoprotein present in the patients at vey high concentrations during the dengue infection. It can be detected as early as day 1 to day 9.[12]

Hence a very prompt and early diagnosis is required during the febrile stages so that its progress towards the complication can be arrested and the person can be treated immediately. We have conducted this study to analyze the clinical, hematological and biochemical parameter of patients affected by Dengue.

2. Materials and Methods

This study was conducted by the Department of paediatrics and Microbiology at Mallareddy Institute of medical Sciences over a period of two years. 382 Children below the age of 18 years who presented with symptoms of dengue fever and were admitted into the pediatric ward and intensive care unit and were tested NS1 positive or IgM positive were included into the study. All these 382 children presented with symptoms such as vomiting, diarrhea, acute fever of 2-7 days duration, hypotension, rashes, edema, headache, retro-orbital pain, myalgia, bleeding manifestations, shock.

This study was cleared by the Institutional Ethical Committee. After attaining the informed consent from the parents or guardians of the patients, detailed demographic details such as age, weight, temperature blood pressure etc. were taken from all the patients and they were all subjected to clinical and physical examination. Blood was collected from all the patients sent to the central laboratory for the complete blood picture including the platelet count, hemoglobin estimation, hematocrit estimation. Prothrombin and thromboplastin time and erythrocyte sedimentation rate. Biochemical tests such as liver function tests, urea, creatinine and electrolytes were estimated. Chest X-Ray was also done for all the patients. Detection of NS1 antigen, IgM and IgG antibody for dengue was done for all patient, for the confirmation of deNgue, in the beginning of the study. Serological diagnosis of the dengue fever was done by ELISA. However the titres of the antigen or the antibodies were not done.

Patients who were positive for malarial parasites or WIDAL tests were excluded from the study. Other causes of fever like septicemia, leptospitosis were also excluded from the study. In case ascites was suspected, ultrasound of the abdomen was also done. Torniquet test, CBP. ESP and platelet count was repeated daily as were the other biochemical parameters till the patient was discharged.

All the children were managed with IV fluids and blood products, where required. The patient was followed up and the outcome was observed.Statistical analysis was done using SPSS 14 software and mean and standard deviation was calculated. For comparison, fischer t test was used.

3. Results

Out of the 382 children in our study, 129 (33.8%) of them were females and 253 (66.2%) were males (Figure 1). The mean age of the patients affected was 9.56 $\pm$ 3.32 years.

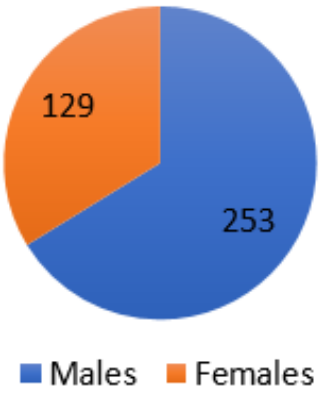

Fig. 1: Sexwise distribution of the patients

Fever was present in all the children who were admitted for dengue. Abdominal pain was seen in 257 (67.3%) of the cases while vomitings were seen in 224 (58.6%) of the cases. Most of the children 287 (75.1%) of the patients were lethargic. Joint aches and pains were seen in 207 (51.2%) and 208 (54.4%) of the children head headaches. Hepatomegaly was observed in 156 (40.8%) and splenomegaly in 128 (33.5%) of the affected children (Table 1).

Table 1: Symptoms of dengue in children

Symptoms	Number	Percentage
Fever	382	100%
Vomitings	224	58.6%
Rapid respiratory state	129	33.8%
High pulse rate	137	35.9%
Enlarged liver	156	40.8%
Splenomegaly	128	33.5%
Headache	208	54.4%
Retro orbital pain	148	38.7%)
Abdominal Pain	257	67.3%
Joint aches and pains	207	51.2%
Rashes	173	45.3%
Lethargy	287	75.1%
Petechiae	131	34.3%

Among the 382 patients in the study, 135 of them (35.3%) had dengue fever, 237 (62.04%) had dengue hemorrhagic fever and 10 (2.6%) had dengue shock syndrome (Figure 2).

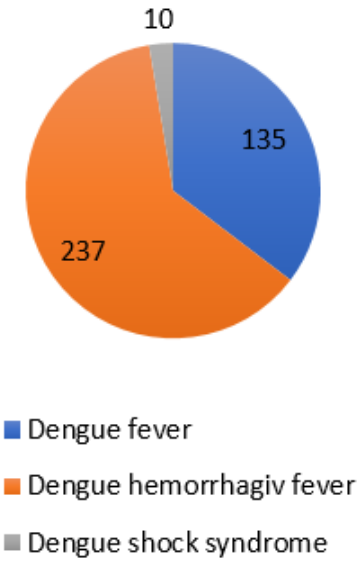

Fig. 2: Classification of dengue among patients

Among the patients with dengue hemorrhagic fever and Dengue Shock syndrome, 179 (72.5%) were positive for the tourniquet test, 46 (18.6%) had epistaxis, 31 (12.6%) had bleeding gums, 22 (8.9%) had bleeding skin, 14 (5.7%) had hematemesis (Figure 3).

The mean hemoglobin level among the children was 10.07 ± 3.19. 96 (25.1%) of the children had platelet count in the normal range i.e above 1.5 lakh. 106 (27.7%) had between 1 lakh – 1.5 lakh. 118 (30.9%) children had a platelet count between 50000 to 1 lakh cells/mm^3, 49 (12.8%) had between 10000-50000 cells/mm^3. The leucocyte count of the children was <4 x 10^{3}in 184 (48.2%)

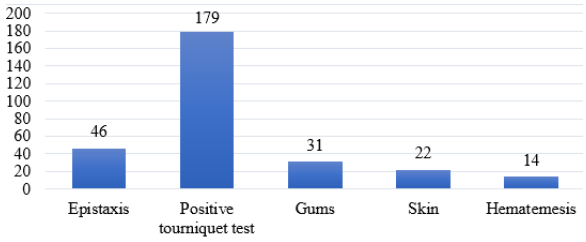

Fig. 3: Bleedingmanfestations

cases and 4-6 x 10^{3}in 167 (43.7%). 58 (15.2%) had increased hematocrit values, 241 (63.1%) had increased levels of SGPT and 226 (59.2%) had high SGOT levels. 15 children succumbed to the disease (Table 2).

Table 2: Hematological and biochemical parameters

Hematological parameters	Number (Percentage)
Hemoglobin levels (mean gm/dl ±SD)	10.07 ± 3.19
Platelet count (cells/mm3)	
>150000	96 (25.1%)
100000-150000	106 (27.7%)
50000-100000	118 (30.9%)
10000-50000	49 (12.8%)
<10000	13 (3.4%)
Leucocyte count /cc	
6-10 x 10^3	31 (8.1%)
4-6 x 10^3	167 (43.7%)
<4 x 10^3	184 (48.2%)
Increased Hematocrit	58 (15.2%)
Raised SGPT	241 (63.1%)
Raised SGOT	226 (59.2%)
Death	15 (3.9%)

4. Discussion

Dengue is one of the common global diseases which causes severe morbidity and mortality among patients and therefore is of concern. The clinical symptoms of this disease is very similar to that of malaria and typhoid, and especially in children, requires systematic differential diagnosis. The outbreaks of dengue is also on the rise due to industrialization and urbanization, which has resulted in over population. This is further accentuate with the poor hygiene, leading to stagnation of water and proliferation of the mosquitoes.[18]

In the present study, the prevalence of males affected were significantly more than the females. A higher male: female ratio was observed in a study by Selvan et al, who observed a 1.7: 1 ratio.[19] Similar results were reported by studies of Agarwal et al and Goh et al,[20,21] while a female predominance was observed in studies of Mittal et al[22] and Kabra et al.[23]

The mean age of the patients affected in our study was 9.56 ± 3.32 years with the youngest being2 years and the eldest 18 years. Most of the children were between 8 to 11 years. A study by Narayanan et al,[9] Kabra et al[23] and Banik et al[24] reported 7 to 8 years to be the most common age group to be affected.

The most common symptom seen among the patients were fever in all the patients. Most of the children were lethargic, abdominal pain was seen in 67.3%, vomitings in 58.6%, joint pains in 51.2%, headaches in 54.4%, hepatomegaly was seen in 40.8% of the patients and splenomegaly in 33.5% of the cases. Retro orbital pain was seen in 38.7% of the children. In a similar study by Laul et al, 87% of the patients had headache and 41% retro-orbital pain.[25] A study by Mandal et al reported 62.16% of the patients to have headache,[7] while a very high number of 90% present with this symptom in a study by Itoda et al.[26] In contrast, Awasthi et al reported only 9% of the patients with headache in their study.[27] Mittal et al, reported 100% of the patients to have fever corroborating our study, with 63% of them having headache and 71% with abdominal pain.[22]

The most common bleeding manifestations among the patient with dengue hemorrhagic syndrome and dengue shock syndrome, positive tourniquet test in 72.5%, epistaxis in 18.6%, bleeding gums in 12.6%. in a study by Laul et al, bleeding manifestations were observed in 20% of the patientswhile Karoli et al observed 40% of the patients with bleeding manifestations.[28] Tourniquet test was positive in 76.92% of the cases in a study by Saha and Ghosh.[29] while Srivastava et al and Gomber et al had a low tourniquet positivity in their study, which they attributed to the darker Indian skin.[30,31]

The mean hemoglobin level among the children was 10.07 ± 3.19 gm/dL. Only 25.1% of the children had platelet count in the normal range i.e above 1.5 lakh while 27.7% had between 1 lakh – 1.5 lakh cells/cumm and 30.9% children had a platelet count between 50000 to 1 lakh cells/mm^3, 12.8% had between 10000-50000 cells/mm^3. The leucocyte count of the children was <4 x 10^{3}in 8.2% cases and 4-6 x 10^{3}in48.2%. 15.2% had increased hematocrit values. Thrombocytopenia was observed in 78% of the cases in a study by Laul et al in which 70% of them had a leucocyte count of less than 5000 cells/mm3.[25] Leucopenia was observed in 71% of the cases in a study by Itoda et al,[26] 90% by Ageep et al[32] and in 29.73% in another study by Mandal et al.[7] The low leucocyte count was said to be due to the inhibition od myeloid progenitor cells due to the virus.[25] Higher hematocrit was associated with the increase in plasma permeability, which was also observed in our case.The more serious patietns had a higher hematocrit, and in most of the cases the rise was more than 20%. Similar was the case in a study by Jain et al, where hematocrit was higher in the more affected patients.[33]

63.1% of the children in the present study had increased levels of SGPT and 59.2% had high SGOT levels. 57% of the patietns in the study by Laul et al had elevated ALT levels and 49% had elevated AST levels.[25] Various other studies also reported elevated ALT and AST levels.[34–36]

In some studies, there were cases with patients with no fever but with thrombocytopenia and leukopenia, showing that dengue may present in a wide range of signs and symptoms.[37]

5. Conclusion

Though dengue has high levels of morbidity and mortality, the treatment is fairly simple and relatively less expensive. However, for this, the patients need to seek medical intervention as early as possible. Therefore, the community must be made aware of the disease and to reach timely help at the earliest so that the severity of the disease can be curbed as early as possible and the treatment can be effective.

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7. Conflict of Interest

The authors declare they have no conflict of interest.

References

1. Gulati S, Maheshwari A. Atypical manifestations of dengue. *Trop Med Int Health*. 2007;12(9):1087–95. doi:10.1111/j.1365-3156.2007.01891.x.
2. Ramasamy R, Surendran S. Global climate change and its potential impact on disease transmission by salinity-tolerant mosquito vectors in coastal zones. *Front Physiol*. 0198;3:198.
3. Anderson CR, Downs WG, Hill AE. Isolation of Dengue Virus from a Human Being in Trinidad. *Sci*. 1956;124(3214):224–5. doi:10.1126/science.124.3214.224.
4. World Health Organization Dengue: Guidelines for diagnosis, treatment, prevention and control. Geneva: WHO; 2009.
5. Vector Borne Diseases: Recent Statistics from different states in India. 2007;Available from: http://mohfw.nic.in/NVBDCP%20WEBSITE/home.htm.
6. Harris E, Sandoval E, Téllez Y, Videa E, Amador JJ, Gonzalez A, et al. Clinical, epidemiologic, and virologic features of dengue in the 1998 epidemic in Nicaragua. *Am J Trop Med Hyg* . 2000;63(1):5–11. doi:10.4269/ajtmh.2000.63.5.
7. Mandal SK, Ganguly J, Sil K. Clinical profiles of dengue fever in a teaching hospital of eastern India. *Natl J Med Res*. 2013;3(2):173–6.
8. Konar NR, Mandal AK, Saha AK. Hemorrhagic fever in Kolkata. *J Assoc Physicians India*. 1966;14:331–40.
9. Narayanan M, Aravind MA, Thilothammal N, Prema R, Sargunam CS, Ramamurty N, et al. Dengue fever epidemic in Chennai-a study of clinical profile and outcome. *Indian Pediatr*. 2002;39:1027–33.
10. Gibbons RV. Dengue: an escalating problem. *BMJ*. 2002;324(7353):1563–6. doi:10.1136/bmj.324.7353.1563.
11. Rigau-Perez JG. Dengue and dengue haemorrhagic fever. *Lancet*. 1998;352:971–7.
12. Paranavitane S, Gomes L, Kamaladasa A, Adikari TN, Wickramasinghe N, Jeewandara C, et al. Dengue NS1 antigen as a marker of severe clinical disease. *BMC Infect Dis*. 2014;14(1):570. doi:10.1186/s12879-014-0570-8.

13. Castellanos-Morfín J, Hernández-Pérez P, Arellano-Cortés B, Newton-Sánchez OA, Espinoza-Gómez F. Report of a case of neonatal dengue. *Bol Med Hosp Infant Mex*. 2006;63:202–6.
14. Fatimil E, Mollah S, Ahmed M. RahmanVertical transmission of dengue: first case report from Bangladesh. *Southeast Asian J Trop Med Public Health*. 2003;34:800–3.
15. Ralapanawa U, Alawattegama ATM, Gunrathne M, Tennakoon S, Kularatne SAM, Jayalath T, et al. Value of peripheral blood count for dengue severity prediction. *BMC Res Notes*. 2018;11(1):400. doi:10.1186/s13104-018-3505-4.
16. Paula SD, da Fonseca BL. Dengue: a review of the laboratory tests a clinician must know to achieve a correct diagnosis. *Braz J Infect Dis*. 2004;8(6):371.
17. Srichaikul T, Nimmannitya S. Haematology in dengue and dengue haemorrhagic fever. *Best Pract Res Clin Haematol*. 2000;13(2):261–76. doi:10.1053/beha.2000.0073.
18. Gubler DJ. Dengue and Dengue Hemorrhagic Fever. *Clin Microbiol Rev*. 1998;11(3):480–96. doi:10.1128/cmr.11.3.480.
19. Selvan T, Nagaraj MV, Saravanan P, Somashekar. A study of clinical profile of dengue fever in children. *Int J Contemp Pediatr*. 2017;4(2):534–7. doi:10.18203/2349-3291.ijcp20170704.
20. Agarwal R, Kapoor S, Nagar R, Mishra A, Tandon R, Mathur A, et al. A clinical study of the patients with dengue hemorrhagic fever during the epidemic of 1996 at Lucknow, India. *Southeast Asian J Trop Med Public Health*. 1999;30:735–40.
21. Goh KT, Ng SK, Chan YC, Lim SJ, Chua EC. Epidemiological aspects of an outbreak of dengue fever/dengue hemorrhagic fever in Singapore. *Southeast Asian J Trop Med Public Health*. 1987;18:295–302.
22. Mittal H, Faridi MMA, Arora SK, Patil R. Clinicohematological Profile and Platelet Trends in Children with Dengue During 2010 Epidemic in North India. *Indian J Pediat*. 2012;79(4):467–71. doi:10.1007/s12098-011-0586-7.
23. Kabra SK, Jain Y, Pandey RM, Madhulika, Singhal T, Tripathi P, et al. Dengue haemorrhagic fever in children in the 1996 Delhi epidemic. *Trans R Soc Trop Med Hyg*. 1999;93(3):294–8. doi:10.1016/s0035-9203(99)90027-5.
24. Banik GB, Pal TK, Mandal A, Chakrabarty MS, Chakrabarti SK. Dengue hemorrhagic fever in Calcutta. *Indian Pediatr*. 1994;31:685–7.
25. Laul A, Laul P, Merugumala V, Pathak R. Urvashi Miglani Pinkee Saxena. Clinical Profiles of Dengue Infection during an Outbreak in Northern India. *J Trop Med*. 2016;Available from: http://dx.doi.org/10.1155/2016/5917934.
26. Itoda I, Masuda G, Suganuma A. Clinical features of 62 imported cases of dengue fever in Japan. *Am J Trop Med Hygiene*. 2006;75(3):470–4. doi:10.4269/ajtmh.2006.75.470.
27. Awasthi S, Singh VK, Kumar S, Kumar A, Dutta S. The changing clinical spectrum of Dengue fever in the 2009 epidemic in north India: a tertiary teaching hospital based study. *J Clin Diagn Res*. 2012;6(6):999–1002.
28. Karoli R, Fatima J, Siddiqi Z, Kazmi KI, Sultania AR. Clinical profile of dengue infection at a teaching hospital in North India. *J Infect Dev Ctries*. 2011;6(07):551–4. doi:10.3855/jidc.2010.
29. Srivastava VK, Suri S, Bhasin A, Srivastava L, Bharadwaj M. An epidemic of dengue haemorrhagic fever and dengue shock syndrome in Delhi: a clinical study. *Ann Trop Pediatr* . 1990;10(4):329–34. doi:10.1080/02724936.1990.11747453.
30. Gomber S, Ramachandran VG, Kumar S, Agarwal KN, Gupta P, Gupta P. Hematologicalobservations as diagnostic markers in dengue hemorrhagic fever- a reappraisal. *Indian Pediar*. 2001;38:477–81.
31. Kalayanarooj S, Vaughn DW, Nimmannitya S, Green S, Suntayakorn S, Kunentrasai N, et al. Early Clinical and Laboratory Indicators of Acute Dengue Illness. *J Infect Dis* . 1997;176(2):313–21. doi:10.1086/514047.
32. Ageep AK, Malik AA, Elkarsani MS. Clinical presentations and laboratory findings in suspected cases of dengue virus. *Saudi Med J*. 2006;27(11):1711–3.
33. Jain A, Shah AN, Patel P, Desai M, Somani S, Parikh P, et al. A clinico-hematological profile of Dengue outbreak among healthcare professionals in a tertiary care hospital of Ahmedabad with analysis on economic impact. *Natl J Community Med*. 2013;4(2):286–90.
34. Kalayanarooj S, Vaughn DW, Nimmannitya S, Green S, Suntayakorn S, Kunentrasai N, et al. Early Clinical and Laboratory Indicators of Acute Dengue Illness. *J Infect Dis*. 1997;176(2):313–21. doi:10.1086/514047.
35. Pushpa V, Venkatadesikalu M, Mohan S, Cherian T, John TJ, Ponnuraj EM, et al. An epidemic of dengue haemorrhagic fever/dengue shock syndrome in tropical India. *Ann Trop Paediatr*. 1998;18(4):289–93. doi:10.1080/02724936.1998.11747962.
36. Kuo CH, Chiou SS, Tai D, Lan CK, Liaw YF, Chang-Chien CS, et al. Liver Biochemical Tests and Dengue Fever. *Am J Trop Med Hygiene*. 1992;47(3):265–70. doi:10.4269/ajtmh.1992.47.265.
37. Clinical profile of Dengue infection at a center in north Karnataka, India. *Glob J Infect Dis Clin Res*. 2019;5(1):6–9.

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