Original Research Article

An Observation-Based Study Assessing Clinicodemographic and Outcome of Severe Dengue Infection in Pediatric Population

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Abstract

Aim: The aim of the present study was to assess clinical profile of dengue infection in children less than 14 years of age and to evaluate outcome of dengue fever admitted for the duration of 12 months, in Department of Pediatrics

Material & Methods: The cross-sectional observation-based study was conducted on 100 children admitted to the Department of Pediatrics with severe dengue infection for the duration of 12 months.

Results: The youngest one was 1 month of age. Majority of the patients belonged to 6-8 years followed by 3-5 years. 55 (55%) percent of patients were male and 45% of patients were female. It was observed that half of the patients (52%) maintained their normal weight followed by obese (25%), overweight (20%), and 3% of patients were underweight. The average duration of hospital stay was 4 to 6 days in 65% of patients. The mean duration was 4.8±2 days with a range of 1 to 14 days. The average ICU stay was ≤3 days in 56% of patients. The mean ICU stay was 2.2±2 days, ranging from 1 to 8 days. The total number of cases of severe dengue were 100, out of which dengue shock syndrome (DSS) was in 51% of the patients followed by dengue hemorrhagic fever (DHF) in 16% of patient and expanded dengue syndrome (EDS) was 10% of the patient. 17% of patients with DSS progressed to DHF and 6% of patients with DHF progressed to grade EDS after admission and hospital stay. B+ ve blood group was found in 43% of patients followed by O+ ve (26%), A+ ve (28%) and AB+ ve were 3%. Pleural effusion was found in 50% of the cases detected by chest X-ray. Right-sided effusion was most commonly seen in 44% followed by left-sided effusion in 6% of cases, and bilateral effusion in 2% of the cases. Among these severe dengue cases, 32% of cases had pulmonary edema and 2% cases had pericardial effusion.

Conclusion: High grade fever, vomiting, abdominal pain and skin rash with normal or low platelet count were varying clinical presentation. Early clinical suspicion and diagnosis with prompt management accompanied by preventive measures can prevent morbidity and the mortality associated with dengue.

Keywords: Dengue with or without warning signs, Severe Dengue, Thrombocytopenia.

Introduction

Dengue is one of the most rapidly spreading mosquitos born viral disease in the word. Dengue is an acute febrile illness caused by flavivirus and transmitted by the bite of female Aedes mosquito infected with one of the four dengue viruses. The first clinical cases were reported in 1780 by Benjamin Rush, who coined the term Break bone fever because of the symptoms of myalgia and arthralgia. Dengue fever is transmitted by bite of Aedes aegypti mosquito and also by albopictus. Dengue virus belongs to flaviviridae and there are four serotypes of the virus DV-1, DV-2, DV-3, and DV-4 [1].

Symptoms of dengue range from mild fever to incapacitating high fever with severe headache, pain behind the eyes, muscle and joint pain, and rash. Severe dengue (also known as dengue hemorrhagic fever [DHF] or dengue shock syndrome) is characterized by abdominal pain, persistent vomiting, shock, bleeding, thrombocytopenia, and breathing difficult. [2] Globally 50 million dengue infections are reported

annually. [3] In India the annual incidence is estimated to be 7.5 to 32.5 million. [4] The case fatality rate in patients with severe dengue infection which consists of dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be as high as 44%. [5,6] Early diagnosis and careful management increase the survival of patients, so clinical suspicion of dengue is important which depends on the recognition of its signs and symptoms among patients of acute febrile illness. Atypical manifestations of dengue fever (DF) are more common than that reported in the past, and neurological, cardiac, and other manifestations are being reported more frequent. [2,7] It can have varied and multisystemic manifestations which can go unrecognized, so high index of suspicion required for atypical manifestations. [8] Because the clinical symptoms of dengue are so diverse, accurate clinical diagnosis is challenging.

As such, it is essential that laboratory or point-of-care diagnostics be used in conjunction with the assessment of clinical presentation. Dengue fever is known to affect hematological and biochemical parameters and a simple clinical and laboratory monitoring of the affected patients helps to reduce the morbidity and mortality. Patients with severe dengue (SD) can be predicted by clinical profile, laboratory and warning signs which could be saved by early interventions.

To validate this hypothesis the present study was aimed to assess the common clinical symptoms, and laboratory findings of severe dengue fever as well as their final outcome in children up to 14 years of age in Bihar city where dengue outbreaks was rampant.

Material & Methods

The cross-sectional observation-based study was conducted on 100 children admitted to the Department of Pediatrics of Nalanda Medical College and Hospital, Patna, Bihar, India, with severe dengue infection for the duration of 12 months.

Inclusion Criteria

All children aged up to 14 years with positive dengue tests, either NS1 antigen, IgM antibody, or RT-PCR test with severe dengue fever were included in the study.

Exclusion Criteria

Children with other bacterial and parasitic illnesses were excluded from the study.

Methodology

Demographic variables, presenting complaints, and examination findings were recorded on a structured questionnaire. Then following observation were done at presentation and during the course of illness. Age and sex of patients, clinical sign and symptoms, development of complications (shock, bleeding, adult respiratory distress syndrome, renal failure), total leucocyte count, differential leucocyte count, Haemoglobin, hematocrit, lever function test, blood urea nitrogen, serum creatinine, chest X-ray posteroanterior view, electrocardiography, Ultrasonography of whole abdomen. All patients were managed according to the standards management protocol of national guidelines.[9] In refractory shock, extended measures (inotropes, 3% Nacl) were given. After the first data collection, patients were monitored periodically (clinical as well as laboratory and radiological investigation) as and when required till recovery of patients.

Statistical analysis

The statistical analysis was carried out using the Statistical Package for Social Sciences version 22.0 for Windows (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics were done for quantitative data as a minimum and maximum of the range as well as mean ± SD (standard deviation) for quantitative normally distributed data, while it was done for qualitative data as number and percentage. Inferential analyses were done for quantitative variables using an independent t-test in cases of two independent groups with normally distributed data. In qualitative data, inferential analyses for independent variables were done using the Chi-square test for differences between proportions. The level of significance was taken at P value <0.050 as significant, otherwise non-significant. Qualitative variables are expressed as frequency, percentage like gender classification, blood group, and clinical features, and quantitative variables like age, duration of hospitalization, and ICU stay are expressed as mean±standard deviation.

Results

Table 1: Demographic distribution of the study patients

Demographicprofile	Number ofpatients	Percentage
Age in years		
≤2	10	10
03-05	25	25
06-08	32	32
09-11	24	24
>11	9	9
Mean±SD	5.60 ± 3.63	

Gender		
Male	55	55
Female	45	45
Weight (kg)		
Normal	52	52
Underweight	3	3
Overweight	20	20
Obese	25	25

The youngest one was 1 month of age. Majority of the patients belonged to 6-8 years followed by 3-5 years. 55 (55%) percent of patients were male and 45% of patients were female. It was observed that half of the patients (52%) maintained their normal weight followed by obese (25%), overweight (20%), and 3% of patients were underweight.

Table 2: Distribution of the study patients after hospitalization

Distribution of thestudy	Number ofpatients	%
Duration of hospitalization (in days)		
≤3	25	25
04-06	65	65
>6	10	10
Mean±SD	4.6±2	
ICU stay (in days)		
≤3	56	56
04-06	38	38
≥6	6	6
Mean ±SD	2.2±2	
Range (min-max)	1-8	
Classification		
Dengue shock syndromeDSS	51	51
Dengue hemorrhagicfever DHF	16	16
Expanded denguesyndrome EDS	10	10
DSS with DHF	17	17
DHF with ED	6	6
Blood group		
A+	28	28
AB+	3	3
B+	43	43
O+	26	26

The average duration of hospital stay was 4 to 6 days in 65% of patients. The mean duration was 4.8±2 days with a range of 1 to 14 days. The average ICU stay was ≤3 days in 56% of patients. The mean ICU stay was 2.2±2 days, ranging from 1 to 8 days. The total number of cases of severe dengue were 100, out of which dengue shock syndrome (DSS) was in 51% of the patients followed by dengue hemorrhagic fever (DHF) in 16% of patient and expanded dengue syndrome (EDS) was 10% of the patient. 17% of patients with DSS progressed to DHF and 6% of patients with DHF progressed to grade EDS after admission and hospital stay. B+ ve blood group was found in 43% of patients followed by O+ ve (26%), A+ ve (28%) and AB+ ve were 3%.

Table 3: Clinical presentation of severe dengue cases

Clinical presentation	Number ofpatients	Percentage
Fever		
Duration of fever(in days)	98	98
≤3	38	38
04-06	58	58
>6	8	8
Clinical features		
Abdominal painand vomiting	78	78
Shock	64	64
Ascites	36	36
Pleural effusion	48	48

Hepatomegaly	24	24
Rash	19	19
Loose stool	17	17
Breathingdifficulty	18	18
Cough	10	10
Head ache	7	7
Myalgia andArthralgia	6	6
Convulsion	4	4
Altered consciousness	3	3
Splenomegaly	0	0
Bleeding	18	18
Hematemesis andmelena	15	15
Prick sitebleeding	2	2
Gum bleeding	1	1
Menorrhagia	1	1

The most common symptom was fever seen in 98% during admission. It was observed that more than half (58%) of patients had a duration of fever of 4-6 days followed by ≤3 days in 54 cases (38%) and ≥7 days in 8 cases (8%). The next most common symptom was abdominal pain and vomiting which were more than three fourth (78%) of patients followed by shock in 64 (64%) of patients. The rash was found in 18 cases (18%). It was observed that 17 cases (17%) had loose stool, 18 cases (18%) had breathing difficulty and 10 cases (10%) had a cough. Headache was present in 7 cases (7%), myalgia and arthralgia in 6 cases (6%). Convulsion and altered consciousness were rare presentations seen in 4 cases (4%) and 3 cases (3%) respectively.

Table 4: Investigations of severe dengue cases

Investigations	Number ofpatients	Percentage
Dengue serology		
NSI	75	75
IgM	19	19
RT-PCR	21	21
IgG and IgM	10	10
NSI and RT-PCR	12	12
NSI and IgM	7	7
Leukopenia (<4000cells/mm3)	26	26
Thrombocytopenia	84	84
Raised Hematocrit(>45%)	24	24
Raised ALT (IU/L)	41	41
Raised AST (IU/L)	58	58
Low Albumin	77	77
Prolong PT	32	32
Prolong APTT	34	34
Raised Creatinine	7	7
Hypokalemia	16	16
Hyperkalemia	4	4
Hyponatremia	44	44
Hypernatremia	4	4
Raised D-dimer	68	68
Low fibrinogen	54	54
Chest X-ray		
Right pleural effusion	44	44
Left pleural effusion	6	6
Bilateral pleuraleffusion	2	2
Pulmonary edema	32	32
Pericardial effusion	2	2

Pleural effusion was found in 50% of the cases detected by chest X-ray. Right-sided effusion was most commonly seen in 44% followed by left-sided effusion in 6% of cases, and bilateral effusion in 2% of the cases. Among these severe dengue cases, 32% of cases had pulmonary edema and 2% cases had pericardial effusion.

Table 5: Outcome of severe dengue cases

Outcome	N	%
Recovered	96	96
Death	4	4

In our study, the majority of 96 cases (96%) recovered, and 4 cases (4%) expired due to intractable shock, multi-organ failure, and DIC.

Discussion

Globally 50 million dengue infections are reported annually. [10] The first dengue fever in India was reported during 1956 from Vellore and the first dengue haemorrhagic fever occurred in Calcutta in 1963. [11] In India the annual incidence is estimated to be 7.5 to 32.5 million. [12] Aedes albopictus was found to be the most abundant vector in the areas surveyed, followed by Aedes aegypti. DENV-2 is the prevailing serotype. [13] The case fatality rate in patients with severe dengue infection which consists of dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) can be as high as 44%. [14] If intervention occurs early, mortality is less than 1%. [15] Dengue fever presents as common viral fever which causes dangerous complications. Dengue reinfection is observed to be more severe in children due to immunological phenomenon. [16]

The youngest one was 1 month of age. Majority of the patients belonged to 6-8 years followed by 3-5 years. 55 (55%) percent of patients were male and 45% of patients were female. Similar results were reported by the study done by Pothapregada S [17] found mean age was 6.9±3.3 years, the male: female ratio was 1.2:1, and that found common age group of 5-10 years, the female ratio was 1.3:1. It was observed that half of the patients (52%) maintained their normal weight followed by obese (25%), overweight (20%), and 3% of patients were underweight. The study showed similar findings that severe vascular leakage occurred in 244 (90%), severe bleeding in 39 (14%), and severe organ dysfunction in 28 (10%) of 271 severe dengue patients. ICU care was needed in 98.7% of the patients and the average ICU stay was ≤3 days in 80.0% of patients. [18] The average duration of hospital stay was 4 to 6 days in 65% of patients. The mean duration was 4.8±2 days with a range of 1 to 14 days. The average ICU stay was ≤3 days in 56% of patients. The mean ICU stay was 2.2±2 days, ranging from 1 to 8 days. The total number of cases of severe dengue were 100, out of which dengue shock syndrome (DSS) was in 51% of the patients followed by dengue hemorrhagic fever (DHF) in 16% of patient and expanded dengue syndrome (EDS) was 10% of the patient. 17% of patients with DSS progressed to DHF and 6% of patients with DHF progressed to grade EDS after admission and hospital stay. B+ ve blood group

was found in 43% of patients followed by O+ ve (26%), A+ ve (28%) and AB+ ve were 3%. The most common symptom was fever seen in 98% during admission which was comparable to the earlier observations whereas reported fever in 94.6% [19] reported fever in 93% of patients [20] reported fever in 96.8% of patients. Abdominal pain and vomiting was the second most common clinical feature and was present in 77.3% of patients which is like other reports. [21] reported abdominal pain as the second most clinical feature followed by vomiting. [22]

It was observed that more than half (58%) of patients had a duration of fever of 4-6 days followed by ≤3 days in 54 cases (38%) and ≥7 days in 8 cases (8%). The next most common symptom was abdominal pain and vomiting which were more than three fourth (78%) of patients followed by shock in 64 (64%) of patients. The rash was found in 18 cases (18%). It was observed that 17 cases (17%) had loose stool, 18 cases (18%) had breathing difficulty and 10 cases (10%) had a cough. Headache was present in 7 cases (7%), myalgia and arthralgia in 6 cases (6%). Convulsion and altered consciousness were rare presentations seen in 4 cases (4%) and 3 cases (3%) respectively. Pleural effusion was found in 50% of the cases detected by chest X-ray. Right-sided effusion was most commonly seen in 44% followed by left-sided effusion in 6% of cases, and bilateral effusion in 2% of the cases. Among these severe dengue cases, 32% of cases had pulmonary edema and 2% cases had pericardial effusion. In our study, the majority of 96 cases (96%) recovered, and 4 cases (4%) expired due to intractable shock, multi-organ failure, and DIC. But other studies by Joshi R [23] where hepatomegaly was the most common physical finding. Normal leukocyte count was present in 63.54% of the cases, while leucopenia was seen in 42 cases (28%) which were consistent with other studies. But Ratageri VH [24] showed leukopenia was significantly related to severe dengue cases which were against our result.

Kurnia B [25] found common blood group was O positive and the B group is more prevalent in children which were similar to our study. In this study, 25.3% of patients were obese, and 17.3% of patients were overweight. Almost all obese and overweight patients presented with DSS. There are no clear-cut guidelines for haemoconcentration in the Indian population. Elevation of SGOT was significantly more compared to SGPT in the present study and is more associated with severity of infection which coincides with others also. [26]

SGOT raise more than SGPT in dengue may be due to involvement of myocytes. Value more than 1000 IU/L is seen in severe dengue. Very high levels of SGOT and SGPT indicate severity of the disease along with morbidity and mortality. This differs from the pattern seen in viral hepatitis. [27]

Conclusion

Severe dengue fever is a dreaded illness among children. However, timely diagnosis and management can significantly reduce the case fatality rate despite its varied presentations and features. Our study comprehensively outlines the typical and atypical symptoms, severity grading, investigations, and management protocols based on the latest national guidelines. Severe cases often exhibit dominant features such as abdominal pain, vomiting, shock, ascites, and pleural effusion. Significant laboratory findings include raised AST and D-dimer, low fibrinogen and albumin levels, and hyponatremia. Early detection and efficient management are crucial in mitigating the severity of the disease.

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