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Original Research Article

Clinical and laboratory profile of dengue fever in children in a tertiary care hospital of Navi Mumbai, India

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ABSTRACT

Background: Dengue fever is a mosquito born arboviral illness endemic in tropical countries and causes significant mortality and morbidity due to lack of definitive treatment. The objective of this study was to assess the clinical and laboratory profile of confirmed cases of dengue in children up to 12 years of age and also to charactrise the risk factors for severe dengue.
Methods: This is a descriptive, observational, retrospective study done in the Department of Pediatrics, Terna Medical College, Nerul, Navi Mumbai, India. Medical records of all children up to 12 years of age diagnosed to have dengue were reviewed. Their clinical and laboratory profile were recorded in a pro forma and analyzed. All cases were classified as per WHO guidelines into non severe and severe dengue cases.
Results: Among the 117 confirmed dengue cases, (84.6%) had non severe dengue and (15.4%) had severe dengue. The most common age group affected was 9-12 years (45.3%) with a male to female ratio of 2.4:1. Fever was the most common clinical feature seen in all cases followed by headache (83%), myalgia (81%), ascites (24.7%), vomiting (17.9%). Clinical signs of ascitis, hepatomegally, gastrointestinal bleeding, pleural effusion and shock were predominantly associated with severe dengue cases. Laboratory parameters showed leukopenia in 58.1% and thrombocytopenia (platelet counts <20,000/cumm^3) in16.2% cases. Elevated liver enzymes, raised hematocrit (36.3%) and coagulation abnormalities were seen in over 50% dengue cases and were significantly associated with severe dengue dengue.
Conclusions: Knowledge of clinical and laboratory profile of dengue cases of a particular area will help in early prediction of risk factors for severe dengue resulting in favourable outcome of such cases.

Keywords: Clinical profile, Hematocrit, Hepatomegaly, Thrombocytopenia

INTRODUCTION

Dengue is a mosquito born viral illness caused by one of the four serotypes of dengue virus (DEN-1, DEN-2, DEN-3, DEN-4) belonging to the family flaviviridae.[1,2] It is transmitted mainly by Aedes aegypti mosquito and also by Aedes albopictus. Annually approximately 50-100 million individuals are infected globally with annual incidence of 7.5 to 32.5 million cases in India.[1,3,4] The incidence has increased many fold in India due to unplanned urbanization and migration of population to urban areas.[1,4] Clinically dengue can present as mild asymptomatic fever that resolves rapidly or can manifest as a severe disease characterized by excessive bleeding and plasma leakage that eventually leads to shock and death. Some of the reported clinical signs and symptoms of dengue in children are fever, retro-orbital pain, myalgia, arthalgia, rash, petechiae, mucosal bleeding etc.[5,6] The unpredictable nature of its severity and consequent fatality coupled with lack of specific antivirals means that clinical management is largely based on providing timely and appropriate supportive treatment. Hence, this study is an attempt to elucidate the clinical and laboratory profile of serologically confirmed

cases of dengue fever in children admitted in our hospital and also to charactrise the risk factors for severe dengue.

METHODS

This is a descriptive, observational, record-based study conducted in the Pediatric department of Terna speciality hospital and research centre, Nerul, Navi Mumbai. Authors retrospectively reviewed the clinical records of children up to 12 years of age who were admitted in pediatric ward with confirmed dengue both clinical and lab confirmed - either by nonstructural protein 1 (NS1) antigen positive or anti-dengue immunoglobulin M (IgM) antibody positive from January 2016 to December 2019. Dengue patients with comorbid conditions like other associated infections, debilitating chronic illnesses and those with incomplete medical records were excluded from the study. Clinical symptoms and signs including vital parameters like pulse rate (PR), respiratory rate (RR), and blood pressure observed on the day of admission as well as during hospital stay were entered in a standard pro forma prepared by literature review and expert opinion. shock, defined as the presence of at least two clinical signs of hypoperfusion (e.g. slow capillary filling >2 s; cold, clammy skin; or rapid and weak pulse) associated with narrow pulse pressure (20 mmHg) or age-specific hypotension. Hypotension was taken as systolic blood pressure (SBP) below the following values for the age groups: Below 1 year <70 mmHg, 1-10 years <70 mmHg + (age in years ×2), above 10 years <90 mmHg. Narrow pulse pressure was taken as the difference between SBP and diastolic BP ≤20 mmHg and heart rate <60/min was considered as bradycardia.[7,8] The various laboratory investigations done during hospitalization like haemoglobin (HB) estimation, hematocrit (HCT), platelet count, aspartate aminotransferase (SGOT) and alanine aminotransferase (SGPT), activated partial thromboplastin time (a PTT), prothrombin time (PT) were also entered in the proforma. Ultrasound (USG) abdomen findings like hepatomegaly, ascites, gallbladder wall edema, and chest X-ray findings of pleural effusion, electrocardiogram (ECG) done in relevant cases were also entered.

All confirmed dengue cases were further classified as non-severe dengue (dengue without warning signs, dengue with warning signs) and severe dengue (SD) according to WHO classification 2009.[9]

Statistical analysis

All the data was entered into Microsoft excel sheet and analysed. P value less than 0.05 was considered significant. Institutional and hospital ethical committee approval was obtained for the study.

RESULTS

We reviewed 123 confirmed cases of dengue, but 6 cases were excluded due to associated comorbidities in 3 (malaria in 1, chronic renal failure in one and enteric fever in one) and 3 cases were excluded due to incomplete medical records. Hence total 117 cases were included in final analysis.

Among 117 dengue cases 99 (84.6%) had non-severe dengue and 18 (15.4%) cases had severe dengue as per WHO 2009 protocol.[9]

There were 83 (70.09%) males and 34 (29.06%) females. Among males, 72 (72%) were diagnosed with non-severe dengue, 11 (61%) were among severe dengue cases and among females 27 (27%) were non-severe cases and 7 (38.9%) were among severe cases. In present study both non-severe dengue and severe dengue cases were seen more among males than in females. Male to female ratio in our study was 2.4:1. The most common age group affected in our study was 9-12years (45.3%), 53 cases with 49 (49.5%) non-severe and 4 (22.2%) severe dengue cases followed by 5-8years age group which had total 43 cases with 32 (32%) non-severe and 11 (61%) severe dengue cases. The least affected group was between 1-4 years with total 21 (17.9%) cases out of which 18 (18%) were non-severe and 3 (16.7%) were severe dengue cases. The mean age of hospitalised children was 7.45 years (Table 1).

Table 1: Epidemiological parameters of dengue cases.

Parameter	variables	Non-severe dengue N=99 (%)	Severe dengue N=18 (%)	Total cases	Mean (SD)
Age	1-4 Year	18 (18.1%)	3 (16.7%)	21 (17.9%)	7.45 (2.842)
	5-8 Year	32 (32.3%)	11 (61.1%)	43 (36.8%)	
	9-12 Year	49 (49.49%)	4 (22.2%)	53 (45.3%)	
Sex	Females	27 (27.27%)	7 (38.9%)	34 (29%)	
	Males	72 (72.7%)	11 (61,1%)	83 (71%)	

SD=Standard deviation

Among the clinical features, fever (100%) was the most common presenting feature, followed by headache in 97 (83%) myalgia in 95 (81%), ascitis in 29 (24.7%), vomiting in 21 (17.9%), abdominal pain and rash in 16 (13.6%) each respectively. Hepatomegaly was observed in 15 (13%), Petechiae and gastrointestinal bleeding were

noticed in 13 (11%) each respectively. Pleural effusion was seen in 11 (9.4%), dyspnoea in 10 (8.5%), shock in 6 (5%), seizure in 5 (4.3%), itching in 5 (4.3%) and bradycardia was observed in 2 (1.7%). The clinical features of ascitis, vomiting, hepatomegally and petechiae were predominantly associated with severe dengue cases than non-severe dengue ($p<0.05$) whereas gastro intestinal bleeding in the form of hematemesis and malena and shock was only noticed in cases of severe dengue (Table 2).

Table 2: Clinical profile of dengue patients.

Signs and symptoms	Number (%)	Non-severe dengue n=99 (%)	Severe dengue n=18 (%)
Fever	117 (100%)	99 (100%)	18 (100%)
Headache	97 (82.9%)	82 (82%)	15 (83.3%)
Myalgias	95 (81%)	81 (81%)	14 (77.8%)
Ascitis	29 (24.7%)	14 (14%)	15 (83.3%)
Vomiting	21 (17.9%)	5 (5%)	16 (88.9%)
Abdominal pain	16 (13.6%)	6 (6%)	10 (55.6%)
Rash	16 (13.6%)	8 (8%)	8 (44.4%)
Heptomegally	15 (12.8%)	1 (1%)	14 (77.8%)
Petechiae	13 (11%)	3 (3%)	10(55.6%)
Gastrointestinal bleeding	13(11%)	0	13 (72.2%)
Pleural effusion	11 (9.4%)	3 (3%)	8 (44.4%)
Dyspnoea	10 (8.5%)	3 (3%)	7 (38.9%)
Shock	6 (5%)	0	6 (33.3%)
Seizures	5 (4.3%)	1 (1%)	4 (22.2%)
Itching	5 (4.3%)	3 (3.03%)	2 (11.11%)
Bradycardia	2 (1.7%)	1 (1%)	1 (5.5%)

Among laboratory parameters, Leukopenia (<4000/mm^3) was observed in 68 (58.1%) cases with 10 severe dengue cases and 58 non-severe dengue cases. Normal leukocyte counts (4000-11000cells/mm^3) were observed in 49 (41.9%) cases with 8 cases of severe dengue and 41 cases of non-severe dengue. None of dengue case had leucocytosis (>11000/cu mm^3). Raised haematocrit ≥36.3% was seen in 65 (55.6%) of total cases with 49 (48.5%) in non-severe and 16 (89%) in severe dengue cases. Severe thrombocytopenia (platelet count <20,000/mm^3) was seen in 19(16.2%) of total cases with 61% among severe dengue and 8% in non-severe dengue. Thrombocytopenia (platelet count of 20,000-< 50,000/mm^3) was seen in 44 (37.6%) of total cases with 33.3% in severe dengue cases and 38.3% in non-severe dengue cases.

Thrombocytopenia with platelet count between 50,000 - 1,00,000/ mm^3 was noticed in 33 (28.2%) of total cases with 5.5% in severe dengue cases and 32.3% in non-severe dengue cases. Platelet counts >100000/mm^3 were observed in 21 (18%) cases and all of them were non severe dengue cases. Statistical significance (p value: <0.00001) for thrombocytopenia and haematocrit (p value: 0.001975) was seen in severe dengue cases than in non-severe dengue cases. In liver enzymatic profile, SGOT was raised in 56 (48%) cases with 94.4% rise seen among severe dengue cases and 39% in Non severe cases. SGPT was raised in 58 (49.5%) cases out of which 89% were severe dengue and 42% were non-severe dengue cases. Significant p value was observed in both SGOT (p value: <0.00001) and SGPT (p value: <0.00001) in severe dengue cases than in Non severe dengue cases. SGOT >1000 IU/L was observed in only one case of severe dengue and SGPT >1000 IU/L was observed in only 2 cases of severe dengue. Activated partial thromboplastin time (a PTT) was abnormal in 67 (57.2%) cases and Prothrombin time (PT) was abnormal in 24 (20.5%) cases. Statistical significance (p value: 0.003194) for a PTT and PT (p value: <0.00001) was seen in severe dengue cases than in non-severe dengue cases (Table 3).

Among radiological parameters, pleural effusion was seen in 12 cases out of which 50% were severe dengue and 3% were non-severe dengue cases. In this study ascites and hepatomegally was a significant finding by USG abdomen. Ascitis was seen in 33 cases with 91% severe dengue cases and17% non-severe dengue cases which was statistically significant (p value<0.05). Hepatomgally was observed in 21 cases in which 77% were severe dengue and 7% were non severe dengue cases. Gallbladder thickening was observed in 61% (11) severe dengue and 2% (2) of non-severe dengue cases. Splenomegally was not noticed in any case (Table 4).

Table 3: Laboratory parameters of dengue patients.

Parameter	Variables	Non-severe dengue N=99(%)	Severe dengue N=18 (%)	Total cases N=177 (%)	p value
Total leucocyte count ()	<4000cells/mm^3	58 (58.6%)	10 (56%)	68 (58.1%)	0 .000084
	4000-11000/mm^3(normal)	41 (41.4%)	8 (44%)	49 (41.9%)	
	>11000/mm^3	0	0	0	
Hematocrit	<36.3%	50 (50.5%)	2 (11%)	52 (44.4%)	0.001975
	>36.3%	49 (48.5%/)	16 (89%)	65 (55.6%)	
Pletelet count	>1Lakh/mm^3	21 (21.2%)	0	21 (18%)	<0.00001
	50,000-1Lakh/mm^3	32 (32.3%)	1 (5.5%)	33 (28.2%)	
	20,000-<50,000mm^3	38 (38.3%)	6 (33.3%)	44 (37.6%)	
	<20,000/mm^3	8 (8%)	11 (61%)	19 (16.2%)	
Liver enzymes	**Rise in SGOT(IU/L)**				<0.00001
	Total	39 (39.3%)	17 (94.4%)	56 (48%)	
	50-200U	32	2	34	
	>200-1000U	7	13	20	
	>1000U	0	2	2	
	Rise in SGPT(IU/L)				<0.00001
	Total	42 (42.4%)	16 (89%)	58 (49.5%)	
	50-200U	36	1	37	
	>200-1000U	6	13	19	
	>1000U	0	2	2	
Coagulation profile					
APTT	Normal	48 (48%)	2 (11.1%)	50 (42.7%)	0.003194
	Abnormal	51 (51%)	16 (88.9%)	67 (57.2%)	
PT	Normal	89 (89%)	4 (22.2%)	93 (79.4%)	<0.00001
	Abnormal	10 (10%)	14 (77.7)	24 (20.5%)	

Table 4: Radiological findings in dengue cases.

Parameters	Non-severe dengue (n=99)	Severe dengue (n=18)
Hepatomegally	7 (7%)	14 (77%)
Splenomegally	0	0
Ascitis	17 (17%)	16 (91%)
Pleural effusion	3 (3%)	9 (50%)
Gall bladder wall edema	2 (2%)	11 (61%)

DISCUSSION

Dengue is an important arboviral infection in tropical countries. In the recent decades the global incidence of dengue fever has increased dramatically.10 Hence the knowledge of clinical and laboratory profile of dengue cases in a particular demographic area is of utmost importance for the appropriate management of such cases.

In the present study, authors analysed total 117 cases of confirmed dengue out of which 99 (84.6%) were categorised as cases of non-severe dengue and 18 (15.4%) were cases of severe dengue as per WHO TDR 2009.[9] There was significant difference in male : female ratio in this study (2.4: 1) Which is similar to results of many other studies.[11,12] The reason for male preponderance could be due to traditional way of wearing covered dress by female children which prevents their direct exposure to mosquitoes. However, in other studies no such significant difference was noticed.[13] The maximum numbers of cases were seen in the age group of 9-12 years (45.3%) and the least affected age group was 1-4 year (17%). The reason for involvement of older children could be due to their increased outdoor activities and more exposure to the breeding places of mosquitoes while playing. Similar results were noticed in other studies.[11,12]

Fever (100%) was the most common presenting feature, followed by headache in 97 (83%) myalgia in 95 (81%), ascitis in 29 (24.7%), vomiting in 21 (17.9%), abdominal pain and rash in 16 (13.6%) each respectively. Petechiae and gastrointestinal bleeding were noticed in 13 (11%) each respectively. Findings of this study were similar to findings of previous studies.[14] In this study the clinical features of ascitis, hepatomegally, vomiting, hepatomegally and petechiae were predominantly associated with severe dengue cases than non-severe dengue ($p<0.05$) whereas gastro intestinal bleeding in the form of hematemesis and malena and shock was only

noticed in cases of severe dengue. Similar results were reported by various other studies.[15-17]

In the present study, leucopenia was observed in 58.1% of children while 49% of children had normal leukocyte count which is similar to findings of Gomber S et al.[18] Thrombocytopenia was seen in all cases of dengue but platelet counts above 1 lakh were only seen in non-severe dengue cases and platelet counts below 20,000/cumm^3 were significantly associated with severe dengue cases. However, there was no correlation between bleeding manifestations and platelet counts as similar to finding of Sharma NL et al.[19] About 55% dengue cases had risen in hematocrit >36.3% in this study and was more seen in severe dengue cases (89%) as rise in hematocrit is an indicator of plasma leakage in dengue cases. Similar findings were also reported by Kumar SK et al.[11] Elevated level of SGOT was observed in 81% and SGPT in 82% of dengue cases in the present study. Elevated liver enzyme levels correlated well with the severity of dengue fever as all children with severe dengue had elevated liver enzymes and liver enzyme levels above 1000IU/ were only noticed in severe dengue cases. These results are similar to the findings of previous studies.[20] In the present study the coagulation parameters like a PTT and PT were abnormal in 57.2% and 20.5% respectively but the significant bleeding was seen in 11% cases and all of them had severe dengue. Coagulation profile abnormalities were noticed in more than 70% cases of severe dengue in our study which is similar to results of study conducted by Mairuhu et al, in which coagulation abnormalities are found in >75% of children with severe dengue fever.[21] Radiological findings of Ascitis, hepatomegally, pleural effusion and gall bladder wall edema were significantly associated with severe dengue cases in this study. Similar results are reported by many other previous studies.[22,23]

CONCLUSION

Dengue fever is one of the most common arboviral mediated outbreaks in Pediatric age group with considerable mortality and morbidity. In this study we tried to evaluate common clinical and laboratory profile of dengue patients and also tried to find out the parameters indicative of severe dengue in our demographic area. In this study, the most common symptom was fever followed by headache, myalgia, vomiting, abdominal pain and rash whereas most common sign was ascitis, hepatomegally, petechiae and pleural effusion. Leucopenia was a common feature in all dengue cases where as severe thrombocytopenia, elevated liver enzymes, increased hematocrit (>36.3), abnormal coagulation profile, hepatomegally, ascitis and plural effusion were significantly associated with severe dengue cases. Knowledge of these factors will be of utmost help in early diagnosis of severe dengue and early initiation of appropriate supportive treatment can result in better outcome of severe dengue cases.

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