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Clinical Study of Various Clinical Presentations of Dengue Viral Infection in Paediatric Age Group at a Tertiary Hospital

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Abstract

Dengue fever is usually a benign syndrome caused by an arthropod borne virus. This study reviewed the common clinical features, various laboratory investigations, radiological factors and management in cases of dengue fever. The timely appropriate management of dengue fever can considerably reduce both morbidity and mortality. Present study was hospital based, prospective, observational study, conducted in children (1 month-15 years age) with serologically confirmed (either with positive NS1 antigen or IgM/IgG antibodies by rapid serology test kit or ELISA) dengue admitted to the paediatric ward. The common chief complaints were fever, vomiting, refusal to feed, headache, bleeding tendency abdominal pain. The common significant general examination findings were tachypnea, petechiae rash. In our study significant systemic examination findings were free fluid in the abdomen less commonly seen was hepatomegaly and abdominal tenderness. The common laboratory findings were thrombocytopenia, raised SGPT, leukopenia and both IgG and IgM antibody positive. In our study distension of the abdomen was significantly related with abdominal fluid collection. The bleeding manifestations correlated with high levels of SGPT. But it was independent of thrombocytopenia, hepatomegaly and secondary infection. The risk factors of DHF/DSS were vomiting, myalgia, rash, retro-orbital pain, petechiae, malena, edema, abdominal pain, hepatomegaly, free fluid collection in abdomen, pleural effusion, thrombocytopenia raised SGPT. In our study IVF and antipyretics were given to all patients. Platelets and whole blood was given in 20% and 13.3% respectively. Inotropic drugs were mainly required in DSS cases. DSS patients required more supportive therapy in the form of blood component therapy together with inotropic supports. Early diagnosis, appropriate investigations, strict monitoring and prompt supportive management go a long way in reducing mortality in dengue.

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Key Words

Dengue fever, children bleeding tendencies, erythematous rash, distention of abdomen, thrombocytopenia, elevated liver enzymes

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INTRODUCTION

Dengue is a mosquito borne viral illness caused by Flaviviridae, genus flavivirus. Dengue virus infection is increasingly being recognised as one of the world's major emerging infectious diseases. Dengue is endemic in most tropic and subtropical countries including India especially in urban areas[1]. The clinical picture of Dengue virus infection varies from asymptomatic infection to a febrile flu like illness to a more severe form like DHF which can lead to Dengue Shock Syndrome (DSS) as shown in the diagrammatic presentation[2]. DHF and DSS are now leading cause of hospital admission and death among children in Asia[3]. Each year approximately 5,00,000 cases of dengue haemorrhagic fever require hospitalization, including 90% children <15 years of age. Mortality of Dengue haemorrhagic fever is approximately 5% with 25,000 deaths reported each year. During epidemics of dengue, attack rates among susceptible are often 40-50% but can reach up to 80-90%. Without proper treatment, DHF case fatality rate can exceed 20%. With modern supportive therapy rates can be reduced to less than 1%[4].

The world health organization (WHO) classifies dengue as a major international public health concern because of the expanding geographic distribution of both the virus and the mosquito vector, the increased frequency of epidemics, the co-circulation of multiple virus serotypes and the emergence of dengue haemorrhagic fever in new areas[2,5]. Present study was aimed to study various clinical presentations of dengue viral infection in paediatric age group at a tertiary hospital.

MATERIALS AND METHODS

Present study was hospital based, prospective, observational study, conducted in department of paediatrics in paediatric intensive care unit and in ward of Dr. B. R. Ambedkar Medical College and Hospital, Bangalore, India. Study duration was of 2 years (October 2010-September 2012). Study approval was obtained from institutional ethical committee.

Inclusion Criteria:

- Children (1 month-15 years age) with serologically confirmed (either with positive NS1 antigen or IgM/IgG antibodies by rapid serology test kit or ELISA) dengue admitted to the paediatric ward, parents willing to participate in present study.

Exclusion Criteria:

- Patient who does not full fill the criteria for probable case of dengue.
- Patients having thrombocytopenia due to any other hematological disorder.
- Cases confirmed as malaria, typhoid, chikungunya and other causes.
- Patients without parental consent.

Informed and written consent was obtained from the parents/guardian of all patients included in the study after explanation. The demographic, symptoms (Fever, restlessness, lethargy, Body ache, backache, retro-orbital pain, Bleeding tendencies, Rash, convulsions, Vomiting, oliguria), clinical findings (Distension of abdomen, hepatomegaly, Difficulty in breathing, drowsy or unconsciousness, Pitting/ non pitting edema, periorbital edema, pleural effusion, ascites), sign of plasma leakage (pleural effusion, ascites, raised haematocrit, bleeding, Narrow pulse pressure, hypovolemic shock thrombocytopenia) were noted.

Laboratory investigation carried out in these patients included haemoglobin, total and differential count, hematocrit, platelet count, SGPT, serum electrolytes, chest x-ray and ultrasonography of the chest and abdomen, CSF analysis was done in patients with altered sensorium. Heart rate, blood pressure, platelet count and hematocrit were monitored daily for first five days of admission.

The enrolled cases were classified based on the WHO guidelines as severe dengue fever which included dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS), non-severe dengue (with or without warning signs) and undifferentiated fever. The patients were treated as per WHO guidelines by paracetamol, inotropes, I.V. fluids and whole blood, platelet transfusions where required. Outcomes of patients were recorded.

Data was collected and compiled using Microsoft Excel, analyzed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS AND DISCUSSIONS

In this study, the total number of cases was 90. Out of which 44 (48.89%) were cases of dengue hemorrhagic fever, 34 (37.78%) were cases of dengue shock syndrome and 12 (13.33%) were cases of dengue fever. Dengue hemorrhagic fever was most commonly seen in the study.

In the study there were 52 (57.78%) males and 38 (43.22%) females. The male to female ratio was 1.3:1. In the age group distribution, maximum number 46 (51.11%) were seen in the 6-15 years of age, out of which male children were 27 (51.92%) and female children 19 (50%). In the 1-6 years age group, 35 (38.89%) and in infant age group total 9 (10%) patients were seen.

Fever was present in 100% of the cases. Other common complaints were vomiting (76.67%), rash (70%), abdominal pain (54.44%), distention of abdomen (33.33%), blood in stools (44.44%), headache

Table 1: Various presentations of dengue.

Presentation of dengue	No. of cases	percentage
Dengue fever	12	13.33
Dengue hemorrhagic fever	44	48.89
Dengue shock syndrome	34	37.78
Total	90	100

Table 2: Age and sex distribution of patients.

Age group (yrs.)	Gender		
	Boys	Girls	Total #
Infants	7 (13.46%)	2 (5.26%)	9 (10%)
1 to <6yrs	18 (34.62%)	17 (44.74%)	35 (38.89%)
6 to 15 yrs.	27 (51.92%)	19 (50%)	46 (51.11%)
Total	52 (57.78%)	38 (43.22%)	90 (100%)

Table 3: Common complaints among different age groups in study subjects.

Complaints	Age group			
	1 month-1yr	1-<6 yrs.	6-15 yrs.	Total
Fever	9	35	46	90 (100%) $
Biphasic	1	5	6	12 (13.33%) #
Vomiting	5	26	38	69 (76.67%) #
Back pain	0	6	14	20 (22.22%) #
Refusal to feed	9	11	13	33 (36.67%) *
Retro orbital pain	0	3	28	31 (34.44%) *
Headache	0	13	22	35 (38.89%) *
Body ache	0	6	4	10 (11.11%) #
Arthralgia	0	5	8	13 (14.44%) #
Myalgia	0	9	16	25 (27.78%) #
Rash	5	26	32	63 (70%) #
Bleeding gums	1	7	4	12 (13.33%) #
Bleeding nose	4	10	13	27 (30%) #
Bleeding mouth	0	6	2	8 (8.89%) #
Bleeding stool	3	16	21	40 (44.44%) #
Abdominal pain	1	22	26	49 (54.44%) *
Abdominal distention	5	12	13	30 (33.33%) #
Convulsion	2	5	0	7 (7.78%) *

*= X2= p<0.001 # = NS $ = X2 not possible

Table 4: Clinical examination findings among dengue cases.

Clinical findings Presence of	Diagnosis			
	DF (n=12)	DHF (n=44)	DSS(n=34)	Total (n=90)
Tachypnea	2 (16.67%)	14 (31.82%)	28 (82.35%)	44 (48.89%) *
Pallor	6 (50%)	22 (50%)	19 (55.88%)	47 (52.22%) NS
Icterus	0 (0%)	2 (4.55%)	2 (5.88%)	4 (4.44%) NS
Lymphadenopathy	4 (33.33%)	4 (9.09%)	1 (2.94%)	9 (10%) NS
Pedal edema	5 (41.67%)	19 (43.18%)	12 (35.29%)	36 (40%) NS
Periorbital edema	1 (8.33%)	4 (9.09%)	3 (8.82%)	8 (8.89%) NS
Limb edema	4 (33.33%)	15 (34.09%)	7 (20.59%)	26 (28.89%) NS
Anasarca	0 (0%)	0 (0%)	9 (26.47%)	9 (10%) NS
Petechiae (p=<0.001)	0 (0%)	32 (72.73%)	13 (38.24%)	45 (50%)
Purpura	0 (0%)	5 (11.36%)	2 (5.88%)	7 (7.78%) NS
Ecchymoses	0 (0%)	0 (0%)	1 (2.94%)	1 (1.11%) NS
Gum bleeding	0 (0%)	7 (15.91%)	4 (11.76%)	11 (12.22%) NS
Epistaxis	0 (0%)	17 (38.64%)	10 (29.41%)	27 (30%) NS
Melena (p=<0.0001)	0 (0%)	26 (59.09%)	19 (55.88%)	45 (50%)
Haematemesis	0 (0%)	7 (15.91%)	10 (29.41%)	17 (18.89%) NS
Rash (total cases)	9 (75%)	35 (79.55%)	22 (64.71%)	66 (73.33%) *
Rash	1	0 (0%)	4 (9.09%)	3 (8 . 8 2 %)
	7 (10.61%)			
2	3 (25%)	3 (6.82%)	3 (8.82%)	9 (10%)
3	2 (16.67%)	9 (20.45%)	5 (14.71%)	16 (17.78%)
4	2 (16.67%)	8 (18.18%)	4 (11.76%)	14 (21.21%)
3+4	2 (16.67%)	11 (25%)	7 (20.59%)	20 (33.33%)
Erythema	4 (33.33%)	10 (22.73%)	13 (38.24%)	27 (30%) NS
Tourniquet test	1 (8.33%)	10 (22.73%)	3 (8.82%)	14 (15.56%) NS
Signs of shock	0 (0%)	0 (0%)	34 (100%)	34 (37.78%)

Table 5: Trend in heart rate & blood pressure among those who survived an episode of dengue.

	Day 1	Day 2	Day 3	Day 4	Day 5
Heart rate					
Bradycardia	15 (16.7%)	19	15	9	2 (2.25%)
Tachycardia	57 (63.3%)	44	22	8	2 (2.25%)
Normal	18 (20.0%)	27	53	72	85 (95.5%)
Blood pressure					
Hypotension	49 (54.4%)	32	26	11	3 (3.37%)
normal	41 (45.6%)	58	64	78	86 (96.63%)

Table 6: Systemic examination findings.

Examination findings	Diagnosis			
	DF (n=12)	DHF (n=44)	DSS (n=34)	Total (n=90)
Abdominal tenderness NS	7 (58.33%)	28 (63.64%)	17 (50%)	52 (57.78%)
Hepatomegaly NS	12 (100%)	36 (81.82%)	30 (88.24%)	78 (86.67%)
Splenomegaly NS	3 (25%)	9 (20.45%)	7 (20.59%)	19 (21.11%)
Fluid collection *	1 (8.33%)	9 (20.45%)	22 (64.71%)	32 (35.56%)
CNS-Conscious	12 (100%)	27 (61.36%)	1 (2.94%)	40 (44.44%)
Disoriented	0 (0%)	14 (31.82%)	19 (55.58%)	33 (36.67%)
Unconscious *	0 (0%)	3 (6.82%)	14 (41.18%)	17 (18.89%)
Respiratory system-Crepts (1)	0 (0%)	1 (2.27%)	24 (70.59%)	25 (27.78%)
Unilateral effusion (2a)	0 (0%)	0 (0%)	7 (26.47%)	9 (10%)
Bilateral effusion (2b)	0 (0%)	0 (0%)	5 (14.71%)	5 (5.56%)
Respiratory distress	0 (0%)	0 (0%)	6 (17.65%)	6 (6.67%)

*=p<0.0001 (significant), NS = not significant

Table 7: The laboratory findings in study cases.

Investigations	Type of dengue cases			
	DF (n=12)	DHF (n=44)	DSS (n=34)	Total (n=90)
Leukopenia	6 (50%)	24 (54.55%)	18 (52.94%)	48 (53.33%)
Leucocytosis	3 (25%)	7 (15.91%)	0 (0%)	10 (11.11%)
Normal leucocytes	3 (25%)	13 (29.55%)	16 (47.06%)	32 (35.56%)
Thrombocytopenia	10 (83.33%)	33 (75%)	28 (82.35%)	71 (78.89%)
Hematocrit >36.3%	6 (50%)	18 (40.91%)	13 (38.24%)	37 (41.11%)
SGPT increase	5 (41.67%)	30 (68.18%)	32 (94.12%)	67 (74.44%)
Na+ (hyponatremia)	1 (8.33%)	20 (45.45%)	9 (26.47%)	30 (33.33%)
IgG + IgM present	0 (0%)	16 (36.36%)	22 (64.71%)	38 (42.22%)
IgM present	12 (100%)	28 (63.64%)	12 (35.29%)	52 (57.78%)

Table 8: The radiological changes in the various dengue cases.

Radiological findings	Dengue cases			
	DF (n=12)	DHF (n=44)	DSS (n=34)	Total (n=90)
Pleural effusion	2 (16.6%)	16 (36.36%)	26 (76.47%)	44 (48.89%)
Left sided effusion	1 (8.33%)	5 (11.36%)	6 (17.65%)	12 (13.33%)
Right sided effusion	1 (8.33%)	11 (25%)	1 (35.29%)	24 (26.67%)
Right+ Left effusion	0 (0%)	0 (0%)	8 (23.53%)	8 (8.89%)
X-ray pulmonary edema	0 (0%)	0 (0%)	11 (32.35%)	11 (12.22%)
USG hepatomegaly	12 (100%)	40 (90.91%)	31 (91.18%)	83 (92.22%)
USG fluid in abdomen	8 (66.67%)	41 (93.18%)	34 (100%)	83 (92.22%)
USG gall bladder edema	2 (16.6%)	13 (29.55%)	22 (64.71%)	37 (41.11%)
USG pleural effusion	5 (41.67%)	30 (68.18%)	32 (94.12%)	67 (74.44%)
Left pleural effusion	1 (20%)	10 (33.33%)	8 (25%)	19 (21.11%)
Right pleural effusion	4 (80%)	17 (56.67%)	16 (50%)	37 (41.11%)
Right and left effusion	0 (0%)	3 (10%)	8 (25%)	11 (12.22%)

Table 9: Relationship between abdominal distention and hepatomegaly .

Clinical signs	Complaint abdominal distention		
	Present	absent	Total
Hepatomegaly Present	39 (92.86%)	44 (91.67%)	83 (92.22%)
Abdominal fluid collection Present	42 (100%)	41 (85.42%)	83 (92.22%)

Table 10: shows the correlation between bleeding manifestation with following factors.

	Bleeding Manifestation		
Thrombocytopenia	**Present**	**Absent**	**Total**
Present	59	12	71
Absent	16	3	19
Total #	75	15	90
Raised SGPT			
Present	62	5	67
Absent	16	7	23
Total*	78	12	90
Hepatomegaly			
Present	69	14	83
Absent	5	2	7
Total #	74	16	90
IgG+IgM positive			
Present	31	7	38
Absent	45	7	52
Total #	76	14	90

* = significant, # = not significant

Table 11: The management of dengue cases.

Management details	Dengue cases			
	DF (n=12)	DHF (n=44)	DSS (n=34)	Total
Intravenous fluids	12	44	34	90 (100%)
Antipyretics	12	44	34	90 (100%)
Platelet transfusion	1 (8.33%)	11 (25%)	6 (17.65%)	18 (20%)
WB	1 (8.33%)	2 (4.55%)	9 (26.47%)	12 (13.33%)
Dopamine	0 (0%)	1 (2.27%)	29 (85.29%)	30 (33.33%)
Dobutamine	0 (0%)	0 (0%)	23 (67.65%)	23 (25.56%)
Noradrenaline	0 (0%)	0 (0%)	8 (23.53%)	8 (8.89%)
Adrenaline	0 (0%)	0 (0%)	0 (0%)	0 (0%)

Table 12: Average duration of stay among dengue cases.

Duration of stay	Dengue cases			
	DF	DHF	DSS	Total
1-3 days	0 (0%)	0 (0%)	7 (20.59%)	7 (7.78%)
4-6 days	12 (100%)	33 (75%)	17 (50%)	62 (68.89%)
>7 days	0 (0%)	11 (25%)	10 (29.41%)	21 (23.33%)

(38.89%), refusal to feed (36.67%), retro orbital pain (34.44%), bleeding from nose (30%), from gums (13.33%) and from mouth (8.89%).

Older children also came with complaints of myalgia (27.78%), back pain (22.22%), arthralgia (14.44%) and convulsions (7.78%). Abdominal pain, refusal to feed, retro orbital pain, headache and convulsions were statistically significant.

Rash was found to be the most common examination finding which was present in 73.33% of the patients followed by pallor (52.22%). In the study 50% of cases had petechiae and melena and closely followed by tachypnea (48.89%) which was statistically significant. Other common findings observed were pedal edema (40%), epistaxis (30%) and limb edema (28.89%). Haematemesis and positive tourniquet test were also found in 18.89% and 15.56% of the cases respectively. Anasarca (10%), periorbital edema (8.89%), Lymphadenopathy (10%) and purpura (7.78%) were also present. Less commonly icterus (4.44%) and ecchymosis (1.11%) were also seen.

On the first day of admission 57 (63.3%) patients presented with fever along with tachycardia with only 15 (16.7%) and 18 (20.0%) patients presenting with bardycardia or normal heart rate respectively. But over a period of illness and treatment gradually the heart rate returned to normal over a period of 5 days in 85 (95.5%) patients and only 2 (2.25%) patients were having tachycardia and bardycardia. 49 (54.4%) patients on the 1st day of admission had hypotension and 41 (45.6%) patients presented with normal blood pressure.

Among the various findings hepatomegaly was most common finding (86.67%) followed by abdominal tenderness (57.78%). On clinical examination only 32 (35.56%) cases were having signs of fluid collection which was significant. On respiratory examination crepts, unilateral effusion and bilateral effusion was also seen in 25 (27.78%), 9 (10%) and 5 (5.56%) cases respectively. Respiratory distress was also seen in in smaller number of cases (6.67%). Patients presented with unconsciousness are 17 (18.89%) which was statistically significant.

In the study the laboratory investigations show thrombocytopenia in 71 (78.89%) cases, which was the most common finding. The second most commonly seen was raised SGPT in 67 (74.44%) cases followed by leukopenia in 48 (53.33%) cases. One of the important findings of dengue is raised hematocrit in which was seen in 37 (41.11%) patients. Hyponatremia occurred in 30 (33.33%) patients. Secondary infection occurred in 38 (42.22%) patients, mainly in dengue shock syndrome (64.71%).

On the 1st day of admission 19 patients had normal platelet count (>1,00,000), 40 patients had mild thrombocytopenia (50,000-1,00,000) and 31 patients had severe thrombocytopenia (<50,000). On the 5th day of admission 30 patients had normal platelet count, 50 had mild thrombocytopenia and only 9 patients had severe thrombocytopenia.

After the clinical examination, X-ray features were confirmed with USG abdomen. On ultrasonography, hepatomegaly and free fluid in abdomen were the most common findings which were seen in 92.22% of the cases. Another finding seen was pleural effusion (74.44%). Out of those, 37 (41.11%) cases were of right sided pleural effusion and 19 (21.11%) cases of left sided pleural effusion were seen. Bilateral pleural effusion was seen in 11 (12.22%) cases of total pleural cases. Pulmonary edema was also noticed by X-ray chest in 11 (12.22%) cases.

42 (46.67%) patients had complaints of abdominal distention, out of which 39 (92.86%) had hepatomegaly and all 42 (100%) patients had abdominal fluid collection confirmed by ultrasonography. 3 (7.14%) cases had complaints of distention of abdomen but hepatomegaly was not present. Total 48 (53.33%) patients did not have complaints of distention of

abdomen but still hepatomegaly was present in 44 (91.67%) cases and abdominal fluid collection in 41 (85.42%).

In this study, it was found that bleeding manifestation was related with raised enzyme SGPT and not correlated with thrombocytopenia, hepatomegaly or secondary infection.

IV fluids and antipyretics were given to 100% of patients. Inotropic drugs were mainly required in DSS. 30 (33.33%) cases required dopamine out of which only 1(3.33%) patient of DHF required dopamine. Other 29 (96.67%) cases of DSS required dopamine. Dobutamine was used in 23 (25.56%) cases of DSS, whereas noradrenaline was required in 8 (8.89%) cases of DSS.

After hospital admission the average duration of stay was 4-6 days. There was a total of 62 (68.89%) cases admitted for 4-6days, in which all 12 (100%) cases of DF, 33 (75%) of DHF and 17 (50%) cases of DSS were observed. In the study, 21 (23.33%) cases were admitted for more than 7 days, out of which 11 (25%) cases of DHF and 10 (29.41%) cases of DSS were seen. Only 7 (7.78%) cases were admitted for 1-3 days in which all were cases of DSS. Mean duration of stay was 5.39 days.

In present study, a total of 90 dengue positive cases were taken, out of which 12 (13.3%) patients had DF, 44 (48.89%) patients had DHF and 34 (37.78%) patients had DSS. In the study by Ira Shah *et al*.[6] DF (2.5%), DHF (51.3%) and DSS (46.2%) was observed whereas Kabra SK *et al.*[7] reported DF (10%), DHF (42%) and DSS (47%). Thus, DHF and DSS are more common in the subgroups of dengue due to secondary infection and the wide spread of the dengue virus.

In present study, most common age group was 6-15years and mean age was 5.3years. In the study by Ira Shah *et al*.[6] the mean age was 4.9years, where as in the study by Kabra *et al*.[7] the peak age was 8 years and Gomber *et al*.[8] showed a similar finding, with common age group of 6-15 years (78.9%). C.H. Rasul *et al*.[9] study shows the common age group being 5-9 years (57.1%) and mean age being 7.2 years.

In the sex distribution, a male preponderance was seen. Male to female ratio was 1.3:1, which was similar to Agarwal *et al*.[1]1.4:1. Whereas in studies of C.H.RH. Rasul *al*.[9] and Kamath *et al*.[10] the male. female ratio was 1:1. This was probably due to more importance being given to male child.

In the study, patients had complaints of fever (100%) with mean duration of 5.4 days, vomiting (76.67%), rash (70%), abdominal pain (54.44%), headache (38.89%), retro orbital pain (34.44%), myalgia (27.78%), back pain (22.22%), arthralgia (14.44%), body ache (11.11%) and convulsion (7.78%). Whereas in the study by Ira Shah *et al*.[6] the chief presentation was with fever (100%) with mean duration being 7.7 days, vomiting (86.6%), rash (41%), altered sensorium (48.7%). Other complaints like diarrhea (48.7%) and cough (38.4%) were also present. In Agarwal *et al*.[1] fever (100%), abdominal pain (49%), vomiting (68%) and convulsion (8%).

Bleeding in dengue is multi factorial. Reduced platelets and fibrinogen are the two most prominent haemostatic defects responsible for bleeding in DHF. Clinical manifestations of bleed are highly variable from simple skin bleeds like petechiae, purpura to severe bleeds like gastrointestinal bleeds and fatal intra cranial bleeds. In our study tourniquet test was positive in 15.56% of cases. Melena (50%) and petechiae (50%) were significant bleeding manifestations in patients of dengue. Other manifestations were epistaxis (30%) and haematemesis (18.89%). Ira Shah *et al*.[6] presented with melena (85.7%), haematemesis (9.5%), petechiae (2.6%), whereas in Agarwal *et al*.[1] presented with haematemesis (39%), epistaxis (36%), skin bleeds (33%) and tourniquet test positive (32%) cases. In another study of predictors of spontaneous bleeding by Shivbalan *et al*.[11] petechiae was the most frequent (46.6%) followed by haematemesis (26%), melena (21.6%), subconjunctival haemorrhage (6.6%). In a study by Richard *et al*.[12] tourniquet test was positive in 100% cases, petechiae (43.5%) and epistaxis (39.1%). There is poor sensitivity of tourniquet test in the diagnosis of DHF [8].

On systemic examination, abdominal tenderness (57.78%), hepatomegaly (86.67%), ascites (35.56%), pleural effusion (16.67%), splenomegaly (21.11%) and altered sensorium was present in (18.89%). Pleural effusion on the right side (41.11%) was more common than in the left side (21.11%) and bilateral effusion (12.22%) was seen in cases of DSS. Whereas in the study of Ira Shah *et al*.[6] ascites (35.8%), Splenomegaly (30.8%) and Agarwal *et al*.[1] showed hepatomegaly in 72% and splenomegaly in 19% of cases.

On laboratory examination, in our study leukopenia was present in 53.33%, thrombocytopenia in 78.89%, hemoconcentration (>36.3%) in 41.11%, raised SGPT in 74.44%, primary infection was present in 57.78% and secondary infection was present in 42.22%, hyponatremia was also present in 33.33% cases. Ira Shah *et al*.[6] study showed thrombocytopenia (92.3%), raised liver enzyme (74.3%), leukopenia (23%) hemoconcentration (>40%) in 7.7%. Hunter *et al*.[13] study showed thrombocytopenia and leukopenia in >70% of cases and elevated liver enzyme in 47% cases. In our study thrombocytopenia and leukopenia was more or less

similar in the subgroups of dengue whereas raised serum level of enzyme SGPT was more in DHF (68.18%) and DSS (94.14%).

The mechanism that contribute to pathogenesis of thrombocytopenia in dengue infection include immune mediated platelet destruction related to platelet associated immunoglobulin involving anti-dengue virus activity (PAIgG and PAIgM), virus induced bone marrow suppression and increased binding of platelets to dengue virus infected endothelial cells[14].

Ultrasonography and radiography can reliably detect the presence of pleural effusion and ascites in children with DHF[15]. In our study, on systemic examination ascites was seen in 35.56% and pleural effusion in 16.67%. Whereas on chest x-ray pleural effusion was found in 48.89% and on ultrasonography, ascites was seen in 92.22% and pleural effusion in 74.44% and gall bladder edema 41.11%. In the study Balasubramanian *et al*.[16] on ultrasonography ascites 70.76%, pleural effusion 67.69%, gall bladder changes 64.6% were reported. Ultrasound was found to be superior when compared with chest x-ray to detect plasma leakage[16]. Ultrasound is ideal owing to its safety and that it is non-ionising and would assist in detecting plasma leakage even before it clinically manifests. Similar findings have been reported earlier[15,17].

In our study the relation between the complaints of abdominal distention with hepatomegaly was not found to be significant whereas with abdominal collection of fluid was statistically significant. Correlation between raised SGPT and hepatomegaly was also not a significant finding. In our study the relation between bleeding tendencies with raised SGPT was statistically significant but thrombocytopenia, hepatomegaly and secondary infection were not significantly related with bleeding manifestations. This is similar to the Wahid *et al*.[18] study, in which hepatomegaly and raised liver enzymes were more common with bleeding manifestation. The tourniquet test and thrombocytopenia did not correlate well with bleeding manifestations suggesting alternate pathogenesis of bleeding[8].

The maximum number of patients (68.89%) duration of hospital stay was 4-6 days in all subgroups of dengue. 23.33% of DHF and DSS patients were admitted in the hospital for more than 7 days. No patient of DF required hospital stay for >6 days. Mean duration of stay was 5.39 days. In the study of Agarwal *et al*.[1] means duration of stay was 6.17 days in DSS and 3.63 days in DHF also not affected[7].

In our study of 90 patients, only 1 death occurred (refractory shock with ARDS). Mortality in Ira Shah *et al*.[6] study was 7.6% and in Rasul *et al*.[9] death rate was 7%. Mortality causes were similar to Ira Shah *et al*.[6] and Kamath *et al*.[10] Appropriate investigations, strict monitoring and prompt supportive management can reduce mortality in dengue. However, for effective management, recognition of the epidemic and taking steps for prevention of transmission by eliminating the mosquito vector is essential.

CONCLUSION

Endemicity of dengue fever is on the rise with increased incidence among children. Fever, hepatomegaly, vomiting, bleeding tendencies, erythematous rash, distention of abdomen, ascites and pleural effusion, respiratory distress are suggestive of a more severe course. Laboratory investigations reveal thrombocytopenia, elevated liver enzymes leukopenia. Predictive markers for DHS/DSS are younger age, rash, melena, petechiae, tender abdomen, fluid collection in abdomen, hepatomegaly, pleural effusion, thrombocytopenia and secondary infections.

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