Original Article

A Retrospective Observational Study of Dengue Fever in a Tertiary Care Center in Kerala

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Abstract

Introduction: Dengue fever (DF) has emerged as an important infectious disease in Kerala with increasing incidence year after year. Knowledge of the clinical and laboratory profile is essential in the early diagnosis and appropriate management of this occasionally fatal illness.

Materials and Methods: This is a descriptive, observational, record-based study done in the Department of Pediatrics, Government Medical College, Ernakulam. All children <15 years of age diagnosed to have DF were classified according to WHO new case classification guidelines, and their clinical and laboratory profile were recorded in a pro forma and analyzed.

Results: Among the 78 dengue serology positive cases, 19.23% had DF with no warning signs, 57.20% had DF with warning signs, and 23.07% had severe dengue. The most common age group affected was 11-15 years (46%) with a male to female ratio of 1.68:1. Fever was seen in all cases followed by vomiting, myalgia, and headache. Hepatomegaly was a major clinical finding observed in 56.41%, while hypotension and low pulse pressure was seen in 12.82% of cases. Lab parameters showed leukopenia in 48.72% and severe thrombocytopenia 8.97% patients. Among those with elevated liver enzymes, aspartate aminotransferase rise was more than alanine aminotransferase in all cases, but none had values above 1000 U/L. Blood products were needed in 15.38% cases. There was no mortality observed in our study.

Conclusion: DF continues to be a major health hazard in children. Strong clinical suspicion, early diagnosis with rapid tests and strict adherence to revised WHO guidelines definitely favors a very good outcome.

Key words: Aspartate amino transferase, Bradycardia, Dengue fever, Thrombocytopenia, Warning signs

INTRODUCTION

Dengue infection is a major health problem in India.[1] Every year during the period from July to November, there is an upsurge of dengue cases in South India as this region receives heavy rains (>200 cm) during the southwest monsoon. Temperature and rainfall are major climatic factors responsible for dengue epidemic during this season.[2,3] The clinical spectrum ranges from self-limiting influenza-like illness to life-threatening dengue hemorrhagic fever (DHF) and dengue shock syndrome

(DSS).[1] The severity of disease is more in children with 90% of DHF occurring in <15 years of age.[4] There are four antigenic types of dengue virus (DENV) 1, 2, 3, 4. DENVs are transmitted by *Aedes aegypti* mosquito. The primary infection in a nonimmune person usually causes dengue fever (DF) and subsequent infection by a different serotype causes more severe illness like DHF/DSS. Clinical manifestations of dengue seem to be changing. Fever, rash, body ache, and bleeding manifestations are still the common manifestations;[5] however, clinicians in the endemic areas should be aware of unusual presentations such as fulminant hepatic failure, severe plasma leakage, shock, altered sensorium, cardiac involvement, and acute renal dysfunction.[6]

DF has emerged as an important infectious disease in Kerala state. According to survey done by the Centre for Research in Medical Entomology, Kerala started reporting deaths due to DF as early as 1997.[7] Since then there has

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been frequent outbreaks of DF every year in various districts of Kerala such as Kottayam, Idukki, Ernakulam, and Thiruvananthapuram.[8] Understanding the clinical and laboratory profile of DF is essential for early diagnosis and appropriate patient management which can improve the outcome of this potentially morbid and occasionally fatal disease in the pediatric population.

Our study outlines the clinical spectrum and the various manifestations as well as evaluates the laboratory findings in hospitalized cases of DF.

MATERIALS AND METHODS

This is a descriptive, observational, record-based study done in the Department of Pediatrics, Government Medical College, Ernakulam, during the period January 1, 2015 to December 31, 2016. We retrospectively analyzed the case records of children <15 years diagnosed to have DF both clinical and lab confirmed - either by nonstructural protein 1 (NS1) antigen positive or anti-dengue immunoglobulin M (IgM) antibody positive during this study period. Dengue with comorbid conditions that may affect the outcome such as major congenital anomalies and debilitating chronic illness as well as patients with incomplete medical records were excluded from the study. Data were entered in a standard pro forma prepared by literature review and expert opinion. Dengue infection was classified according to WHO classification 2009 as dengue without warning signs, dengue with warning signs and severe dengue (SD).[1]
- DF: Fever with any two of: Nausea, vomiting, rash, myalgia, leucopenia, positive tourniquet test.
- DF with warnings signs DFWS: The above with any one of: Abdomen pain, tenderness, persistent vomiting, ascites, pleural effusion, mucosal bleeding, lethargy, restlessness, hepatomegaly, increase in hematocrit (HCT) with a rapid decrease in platelet count.
- SD: The above with at least one: Severe plasma leakage such as shock and pleural effusion, severe bleeding, severe organ involvement-liver, central nervous system, and heart.

The data entered in the pro forma included symptoms and clinical findings both at the time of presentation, as well as during hospitalization. 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.[9] Narrow pulse pressure was taken as the difference between SBP and diastolic BP ≤20 mmHg and heart rate <60/min was considered as bradycardia.[9] Laboratory analysis relevant to DF included HCT, hemoglobin (Hb), total count at the time of admission as well as lowest platelet count, aspartate

aminotransferase (AST) and alanine aminotransferase (ALT) values during hospitalization. Results of rapid qualitative immunochromatographic test for detection of NS1 antigen, IgM and IgG antibodies using Helico Dengue Combo Kit were also recorded.[10] In relevant cases, ultrasound abdomen findings of hepatomegaly, ascites, gallbladder wall edema, and chest X-ray findings of pleural effusion were documented.

Other parameters studied included blood product transfusions, duration of hospital stay, and outcome in the form of improvement with or without complications. The statistical analysis was performed using SPSS 16.020 software.

RESULTS

We evaluated 78 cases of DF out of 87 confirmed cases. 7 cases were excluded due to insufficient data in the records. 2 cases were also excluded as they had comorbid conditions such as malaria and hereditary spherocytosis.

Among the 78 dengue serology positive cases, 15 (19.23%) had DF with no warning signs, 45 (57.20%) had DFWS, and 18 (23.07%) had SD (Table 1). There were 36 (46.15%) patients in the age group 11-15 years being the commonest age group affected, followed by 27 (36.62%) in the age group 6-10 years and 15 (19.23%) in 0-5 years age group (Table 2). The male to female ratio was 1.68:1.

The maximum admissions were during the months of May to August with 69 confirmed cases (88.46%) of DF followed by January to April with 5 cases (6.41%) and September to December with 4 cases (5.13%).

Common clinical features included fever (100%), vomiting (64.1%), headache (41.02%), myalgia (46.15%), abdominal

Table 1: Distribution of dengue according to WHO classification

Cases	Male (%)	Female (%)	Total (%)
DF	8 (53.33)	7 (46.67)	15 (19.23)
DFWS	27 (60)	18 (40)	45 (57.20)
SD	14 (77.78)	4 (22.22)	18 (23.07)
Total	49 (62.82)	29 (37.18)	78 (100)

DF: Dengue fever, DFWS: Dengue fever with warning signs, SD: Severe dengue

Table 2: Age distribution of cases

Age	DF (%)	DFWS (%)	SD (%)	Total (%)
0-5	3 (20)	8 (17.78)	4 (22.22)	15 (19.23)
6-10	3 (20)	19 (42.22)	5 (27.78)	27 (34.62)
11-15	9 (60)	18 (40)	9 (50)	36 (46.15)
Total	15	45	18	78

DF: Dengue fever, DFWS: Dengue fever with warning signs, SD: Severe dengue

pain (41.02%), petechiae (14.10%), melena (11.53%), maculopapularrash (11.53%), retro orbital pain (8.97%), and convulsions (2.56%) (Table 3). Hepatomegaly was noted in 56.41% cases, hypotension in 12.82%, narrow pulse pressure in 12.82%, pleural effusion in 10.25%, ascites in 7.69%, and bradycardia in 7.69% of DF cases (Table 4). About 35 (44.87%) cases had normal leukocyte count, while leukopenia was seen in 38 (48.72%) and leukocytosis in 5 (6.41%) cases. Increased mean Hb and HCT values along with decreased platelet counts were seen in the SD group (Table 3). Platelet count was <20,000 in 7 (8.97%) patients (Figure 1). AST >100 U/L was seen in a larger proportion of patients 38 (48.71%) when compared to ALT >100 U/L in 16 (20.5%). In all these patients, AST was elevated more than ALT, with three patients having AST values more than 500 and none having liver enzyme values above 1000. Dengue NS1 Ag was positive in 57.69%, followed by IgM antibody in 17.95% and NS1 Ag + IgM antibody in 14.1%. Ultrasonography of abdomen of patients who had warning signs and SD revealed hepatomegaly as the most common finding (Table 5).

Fever was managed with paracetamol; fluid management was according to WHO protocol by using normal saline. Blood products were given in 12 (15.38%) cases. The duration of hospital stay ranged from 4 to 8 days. There was no mortality in the study group during the study period.
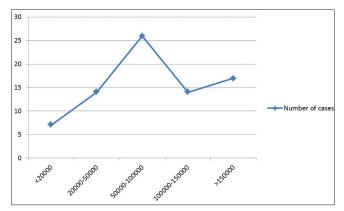

Figure 1: Platelet count in dengue fever

DISCUSSION

This study describes the clinical features, laboratory findings and outcome of DF, DFWS, and SD in pediatric patients. We had 15 (19.23%) cases of DF with no warning signs, 45 (57.20%) cases of dengue with warning signs, and 18 (23.07%) cases of SD. The high incidence of DFWS correlates with the study conducted by Jain.[11] The maximum number of dengue cases in our study were seen in the months of May to August which indicated an active viral transmission during monsoon and post-monsoon period as reported in earlier studies.[12,13] A male predominance seen was similar to various studies.[14,15] The most common age group affected was 11-15 years (46.15%). This correlated with a study conducted by Eregowda and Valliappan[16] and Mishra *et al.*[17]

Common clinical features included fever, vomiting, headache, myalgia, abdominal pain, petechiae, melena, maculopapular rash, and retro-orbital pain as shown in the previous studies.[16,18,19] Skin bleeds in the form of petechiae was the most common hemorrhagic manifestation followed by melena[19,20] as against epistaxis in some studies.[21,22] Hepatomegaly followed by narrow pulse pressure and hypotension were common clinical findings. In our study, the most common cardiac manifestation was bradycardia (7.69%) which is also the most common finding in various other studies.[23]

Higher levels of Hb and HCT were found in patients with SD in contrast to study by Kale *et al.* which showed higher Hb and HCT in the DF without warning signs.[24] In our study, severe thrombocytopenia (platelet count <20000) was seen in 8.97% which correlated with a study by Kale *et al.* where they had 6.67% of cases with severe thrombocytopenia.[24]

In this study, elevation of AST was more when compared to ALT in all cases which coincide with other studies.[25] Increase in AST more than ALT in dengue is thought to be due to the involvement of myocytes. Very high levels of AST and ALT going above 1000 U/L indicate severity of the disease along with morbidity and mortality and this differs from that seen in other viral hepatitis.[26] In our study,

Table 3: Mean, platelet count, AST, and ALT values

Parameter	Mean±SD			
	DF	DWS	SD	Total
Hb (g%)	11.99±1.083	12.40±1.53	12.64±1.24	12.37±1.392
HCT%	37.35±3.06	40.12±4.33	41.45±5.30	39.9±4.53
Platelet (10^5/μL)	1.87±0.75	0.93±0.58	0.65±0.74	1.05±0.77
AST (U/L)	82.53±65.58	130.95±109.5	197±213.26	129.77±137.19
ALT (U/L)	57.6±50.14	81.57±72.98	100.5±111.51	76.53±80.08

DF: Dengue fever, SD: Standard deviation, AST: Aspartate amino transferase, ALT: Alanine amino transferase, Hb: Hemoglobin, HCT: Hematocrit

Table 4: Clinical profile of DF

Symptoms	Cases (%)
Fever	78 (100)
Vomiting	50 (64.10)
Myalgia	36 (46.15)
Abdominal pain	32 (41.02)
Headache	32 (41.02)
Petechiae	11 (14.10)
Rash	9 (11.53)
GI bleed	9 (11.53)
Lethargy	7 (8.97)
Retro-orbital pain	7 (8.97)
Dyspnea	4 (5.12)
Seizure	2 (2.56)
Hepatomegaly	44 (56.41)
Hypotension	10 (12.82)
Low pulse pressure	10 (12.82)
Pleural effusion	8 (10.25)
Ascites	6 (7.69)
Bradycardia	6 (7.69)

DF: Dengue fever, GI: Gastrointestinal

Table 5: Radiological findings

Findings	DFWS (%)	SD (%)
Hepatomegaly	24 (53.33)	12 (66.66)
Splenomegaly	1 (2.22)	0
Peri-gallbladder edema	3 (6.66)	4 (22.22)
Ascites	3 (6.66)	7 (38.33)
Pleural effusion	1 (2.22)	8 (4.44)

DFWS: Dengue fever with warning signs, SD: Severe dengue

only three patients had AST value more than 500 and none had values above 1000. The majority of the patients in this study were positive for NS1 followed by IgM. This is due to the early presentation and early admission of suspected DF cases.[17]

In this study hepatomegaly, gallbladder wall edema and ascites were the predominant findings in ultrasound scan of abdomen in patients with warning signs and SD. This was fond to be significantly associated with severe presentations of DF in some studies, and therefore, can be taken as an indicator of severity of DHF in children.[27,28]

CONCLUSION

DF is a common acute febrile illness which comes as an epidemic in various parts of the country including Kerala. Over the recent years, it has emerged as one of the dreaded fevers in children. In our study, the most common age group affected is 6-15 years with maximum number of cases during the monsoon and post-monsoon season. Fever, vomiting, headache, myalgia, and abdominal pain continue to be the common presentation. Rise in AST more than ALT is a consistent finding in DF along with rise in HCT and Hb. Radiological evaluation will also help

in assessing the severity of the illness and thus initiating appropriate therapy. Knowledge and understanding of the varied presentations of DF in a region will definitely help in improving the outcome of this potentially fatal disease.

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