

## Original Research Article

# Dengue fever and its epidemiological characteristics: a study from Eastern India

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## ABSTRACT

**Background:** Dengue fever (DF) has become a major global public health problem. In India, epidemics are becoming more frequent. Dengue infection ranges from mild illness to a severe form of haemorrhagic fever and shock syndrome which may prove fatal. Early recognition and meticulous management are very important to save precious lives from this killer disease.

**Methods:** Total 82 patients (63 male, 19 female) admitted with diagnosis of dengue fever were analysed in details from clinical features to outcomes.

**Results:** Fever was the most consistent symptoms. Biochemical abnormalities in liver function test were very evident. Bleeding manifestations has no correlation with platelet count. Platelet transfusion was needed in very few patients.

**Conclusions:** High suspicion, early investigations and diagnosis is very important to prevent fatal complications of dengue fever and adequate hydration is one of the most effective treatments.

**Keywords:** DF, DHF, DSS, LFT, Platelet count

## INTRODUCTION

Dengue fever (DF) is a disease caused by a family of viruses that are transmitted by mosquitoes. It is an acute illness of sudden onset that usually follows a benign course with symptoms such as headache, fever, exhaustion, severe muscle and joint pain, swollen glands (lymphadenopathy), and rash. The presence (the "dengue triad") of fever, rash, and headache (and other pains) is particularly characteristic of dengue. Other signs of dengue fever include bleeding gums, severe pain behind the eyes, and red palms and soles.<sup>1</sup> Dengue strikes people with low levels of immunity. Because it is caused by one

of four serotypes of virus, it is possible to get dengue fever multiple times. However, an attack of dengue produces immunity for a lifetime to that particular serotype to which the patient was exposed. Dengue goes by other names, including "breakbone" or "dandy fever." Victims of dengue often experiences intense joint and muscle pain, hence the name breakbone fever.<sup>2</sup>

Dengue hemorrhagic fever (DHF) is a more severe form of the viral illness. Manifestations include headache, fever, rash, and evidence of hemorrhage in the body. Petechiae (small red or purple blisters under the skin), bleeding in the nose or gums, black stools, or easy

bruising are all possible signs of hemorrhage. This form of dengue fever can be life-threatening and can progress to the most severe form of the illness, dengue shock syndrome (DSS).<sup>3</sup> Dengue is prevalent throughout the tropics and subtropics. The virus is contracted from the bite of *Aedes aegypti* mosquito that has previously bitten an infected person. The mosquito flourishes during rainy seasons but can breed in water-filled flower pots, plastic bags, and cans year-round. The virus is not contagious and cannot be spread directly from person to person. There must be a person-to-mosquito-to-another-person pathway. After being bitten by a mosquito carrying the virus, the incubation period ranges from three to 15 (usually five to eight) days before the signs and symptoms of dengue appear. Dengue starts with chills, headache, pain upon moving the eyes, and low backache. Painful aching in the legs and joints occurs during the first hours of illness. The temperature rises quickly as high as 104 F (40°C), with relative low heart rate and low blood pressure. The eyes become reddened. A flushing or pale pink rash comes over the face and then disappears. The lymph nodes in the neck and groin are often swollen. Fever and other signs of dengue last for two to four days, followed by defervescence with profuse sweating. This precedes a period with normal temperature and a sense of well-being that lasts about a day. A second rapid rise in temperature follows. A characteristic rash appears along with the fever and spreads from the extremities to cover the entire body except the face. The palms and soles may be bright red and swollen.<sup>4</sup> Because dengue fever is caused by a virus, there is no specific medicine or antibiotic to treat it. For typical dengue, the treatment is purely concerned with relief of the symptoms. Early diagnosis is a big challenge in Dengue. In this study attempt has been made to record clinical and laboratory parameters for early diagnosis and prompt intervention to prevent lethal progression of the disease and to save precious lives.

The purpose of present study was to analyse the natural history, clinical profile, haematological and hepatic dysfunction and outcome of patients (>14years) admitted with dengue fever.

## METHODS

The period of data collection was from August 2014 to July 2015.

Eighty two patients of age >14years presented with symptoms and signs suggestive of dengue fever as per WHO criteria were included in the study, between August 2014 to July 2015.

### Inclusion criteria

- Age: More than 14 years.
- Sex: Both males and females were selected for the study.
- Patients admitted with history of acute fever.

- Family member given informed consent.

### Exclusion criteria

- Other causes of fever like Malaria, Leptospirosis, Enteric, Respiratory and Urinary tract Infections were excluded by appropriate tests.
- Informed consent not given by family member.

### Study measures

Patients admitted with history of acute fever, headache, myalgia and retro orbital pain were evaluated with clinical features (signs of spontaneous bleeding in skin & mucous membrane, tachycardia, hypotension and signs of plasma leakage) and lab investigations [total leukocyte /TC, differential count/DC, platelet count, Hb%, PCV (packed cell volume), LFT (Liver Function Test), USG abdomen]. Patients with Clinical Features, lab evidences and positive for dengue antibodies (IgM & IgG by Rapid immuno- chromatography test) and Antigen NS1) were classified according to WHO (World Health Organization) classification and their outcome was noted.

## RESULTS

### Age and gender

The study revealed that majority of the cases was in the age group of 15-30 years, (69.5%). The mean age was 27 years, the youngest in the series was 17 years old and eldest one was 70 years old. DHF and DSS are seen most commonly in the 15-30 years group (Table1).

**Table 1: Age distribution of study population (n=82).**

Age	No of cases	Percentage	DF	DHF	DSS
15-20	20	24.39	16	4	0
21-30	37	45.12	24	9	4
31-40	16	19.51	13	2	1
41-50	8	9.76	8	0	0
>51	1	1.22	1	0	0
Total	82	100.00	62	15	5

Out of 82 patients 63 (77%) were male (M) and 19 (23%) were females (F). The ratio of M:F was 3.3:1. DF/DHF cases were more among males than to females. DSS cases were seen only in males.

### Outcome

The present study had DF 62 (75.6%), DHF 15 (18.3%) and DSS 5 (6%) cases among total of 82 cases. The overall outcome of patient care was good with all the patients recovering completely (100%). Out of 82 only 18 (22%) cases required blood transfusion Out of 82, 35 (43%) cases required platelet transfusion. The average days of hospital stay was 4.4 days range (1-10).

### Clinical features

Fever was the most common presenting symptoms in this study. Other symptoms and signs are shown in 'Table 2'. Retro orbital pain was present in 5% of cases and ascites was least common manifestations. The mean duration of fever was 5.8 days and ranges from 0-20 days. Maximum number of cases came with duration of fever between 4-10 days. In bleeding manifestations, melaena was most common and hematemesis was least (Table 3). The maximum no of patients having pulse pressure between

31-50 mm of Hg. 80% of DSS patients having pulse pressure less than 20 mm of Hg. A tourniquet test assesses fragility of capillary walls and is used to identify thrombocytopenia. A blood pressure cuff is applied and inflated to a point between the systolic and diastolic blood pressures for five minutes. The test is positive if there are 10 or more petechiae per square inch. In DHF the test usually gives a definite positive result with 20 petechiae or more. The tourniquet test was positive in one third of total cases and 100% in both DHF and DSS (Table 4).

**Table 2: Distribution of clinical features of dengue fever in study population.**

Symptom	No of cases	Percentage	DF	DHF	DSS
Fever	81	98.78	62	14	5
Chills/Rigor	43	52.44	33	9	1
Body ache	41	50.00	31	8	2
Headache	17	20.73	12	4	1
Vomiting/nausea	27	32.93	19	7	1
Red urine	5	6.10	2	3	0
Joint pain	11	13.41	8	2	1
Loose stool	8	9.76	7	1	0
Rash	8	9.76	5	2	1
Cough	5	6.10	3	1	1
Hematemesis	3	3.66	1	2	0
Epistaxis	8	9.76	0	6	2
Melena	14	17.07	3	9	2
Abd pain	9	10.98	6	3	0
Retro orbital pain	4	4.88	2	2	0
Petechiae	5	6.10	1	4	0
Subconjunctival haemorrhage	4	4.88	2	2	0
Conjunctival congestion	22	26.83	14	6	2
Hepatomegaly	8	9.76	6	1	1
Splenomegaly	5	6.10	4	1	0
Ascites	2	2.44	1	0	1

**Table 3: Prevalence of bleeding manifestations in study population.**

Symptom	No of cases	Percentage	DF	DHF	DSS
Red urine	5	6.10	2	3	0
Rash	8	9.76	5	2	1
Hematemesis	3	3.66	1	2	0
Epistaxis	8	9.76	0	6	2
Melaena	14	17.07	3	9	2
Petechiae	5	6.10	1	4	0
Subconjunctival haemorrhage	4	4.88	2	2	0

**Table 4: Tourniquet test result in the study population.**

Test	No of cases	Percentage	DF	DHF	DSS
Positive	24	29.27	4	15	5
Negative	58	70.73	58	0	0
Total	82	100.00	62	15	5

### Hematological abnormality

The haemoglobin level ranges from 8-17.4gm%, with a mean level of 12.2 gm%. Most of the patients of DF/DHF had haemoglobin level between 10-14gm/dl. The hematocrit ranged from 17.7 -48.5% with a mean value of 36.6%. In DSS the mean hematocrit level lies in the upper limit of normal range. The hematocrit level more than or equal to 46 is seen in 6 cases out of which 2 were DHF and 4 were DSS.

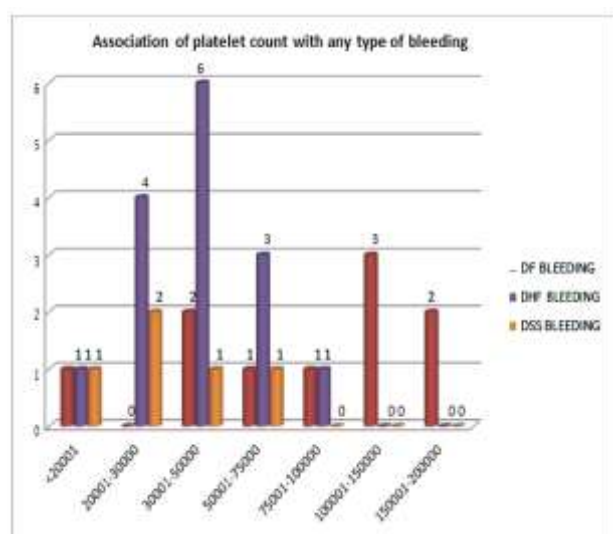
Out of 82 patients 56 (68.3%) patients had platelet count less than 100,000 and of which 32 had platelet count less

than 50,000. Most of the DHF and DSS patients presented with platelet count less than 50,000 (Table 5).

Bleeding was more frequent with low platelet count in DHF, DSS group compared to DF group (Figure 1). The range of platelet count at admission was 5000 – 186000/cmm, with a mean value of 80195/cmm. The WHO criteria of low platelet count of <10,000/cmm was seen in all 68.29% cases. The mean platelet count of DHF and DSS patients were 41800/cmm and 32800/cmm respectively. The range of total leukocyte count varied from 1300-20700 / cmm with a mean count of 5309/cmm.

**Table 5: Distribution of platelet count dengue in study population.**

Platelet count	No of cases	Percentage	DF	DHF	DSS
<20001	5	6.10	3	1	1
20001-30000	7	8.54	1	4	2
30001-50000	20	24.39	13	6	1
50001-75000	13	15.85	9	3	1
75001-100000	11	13.41	10	1	0
100001-150000	18	21.95	18	0	0
150001-200000	8	9.76	8	0	0
Total	82	100.00	62	15	5



**Figure 1: Association of platelet counts with bleeding**

### Hepatic profile

The range for aspartate transaminase (AST) was 26-1104 U/L (AST normal range: 12-38U/L) with a mean of 130 U/L. Out of 82 cases more than 100IU/L of AST level was documented in 29 (35.36%) cases. The range for Alanine transaminase (ALT) was 10-372 U/L with a mean of 79.6 U/L. (ALT Normal range: 7-41U/L). The range for serum alkaline phosphatase was 48-268 U/L with a mean of 145.1 U/L.

### Serology

Out of 82 patients almost 80% were NS1 positive, 35% were IgM positive (Table 6).

**Table 6: Serological prevalence of the dengue fever in study population.**

Clinical spectrum	NS1+ve	IgM +ve	IgG+ve
DF	47	23	9
DHF	13	5	2
DSS	5	1	1
Total	65	29	12

### DISCUSSION

Dengue fever is the most important arboviral infection and has become a major global public health problem. In India, epidemics are becoming more frequent. The spectrum of disease due to dengue infection ranges from a subclinical or mild illness to a severe form of haemorrhagic fever which may prove fatal.<sup>5</sup> Classical dengue fever is an acute febrile illness, but in a small percentage of dengue infection, a more severe form of disease known as DHF and DSS occurs.<sup>6</sup> Early recognition and meticulous management are very important to save precious lives from this killer disease.

This study revealed the mean age of distribution was 27 years, which correlates with several previous studies.<sup>7</sup>

The male to female ratio in this study was 3.3:1. The difference in distribution among both sexes is due to their greater population and greater exposure to the vector due to more outdoor activities of males as compared to females.

The present study had maximum numbers of cases in the months of September, October and November. This is in concordance with several other study done in north India.<sup>8</sup>

In the present study almost all cases had fever (99%). The typical 2-7 days fever as described by WHO was found in 67 cases (80.73%). The mean duration of fever is 5.8 days (range 0-20). In case the temperature was not measured; only subjective perception of high temperature was taken into account. Two men presented with a low grade fever of 20 days duration. No cases had 'saddle back' presentation of fever, which has been described in dengue.

Severe bodyache, which is reported as prominent symptoms in dengue in adults, was also seen in this study (50%). Retro-orbital pain which is generally considered as a cardinal feature of dengue fever was not so in our studies. It was seen only in 4 (5%) cases. Other common clinical features included chills and rigor, vomiting and nausea, conjunctival congestion, headache, melena, joint pain, abdominal pain, rashes, loose stool, petechiae, splenomegaly, hepatomegaly in that order. This is very similar with several other studies done in various other parts of India.<sup>9-12</sup>

In bleeding manifestations, melaena (17%) was most common followed by rashes (10%) epistaxis (10%) and petechiae (6%), hematuria (6%), subconjunctival haemorrhage (4.8%) and hematemesis (3.66%). This is in concordance with several studies done in India or outside.<sup>9,13</sup>

Hepatomegaly was observed in (10%) patients in this study, compared to 17.6%–20.4% in other Indian studies. In this study, abdominal pain was found in 11% of cases which was much lesser compared to Cuban epidemic of 63% and in Delhi epidemic of 49% of cases.<sup>11,14,15</sup>

The mean hemoglobin and hematocrit in the present study were 12.2 gm% and 36.6% respectively. Several other study reported the same to be around 10.8 gm% and 33.2% respectively.<sup>9</sup> The classical description of >20% rise in the hematocrit is difficult to establish, as the reference standards have not been documented for Indian population. Hence the rise in hematocrit was not taken as a diagnostic criterion. Gomber et al had defined cut off hematocrit value as 36.3% to be diagnostic of dengue hemorrhagic fever in Indian population in their study at Delhi.<sup>10</sup> Taking this value, patients in the present study came under the category of DHF, but the value did not correlate with clinical staging. The mean haemoglobin levels were 12.2±1.7 g% and this did not consistently

relate to the symptoms. Although leucopenia has been reported in a number of studies, the present study had a mean total leukocyte count of 5309/cmm. The lowest and highest TLC were 1300 and 20700 respectively. Leucopenia (<3000 wbc/cmm) was seen in 15 (18.3%) patients.

Platelets counts carry one of the most important key for diagnosis. On taking the WHO limit of less than 100000/mm<sup>3</sup> for low platelet count, 68.3% patients had platelet count less than 100,000 and of which 37.2% had platelet count less than 50,000, while 6.1% patients had counts <20,000/mm<sup>3</sup>. Most of the DHF and DSS patients presented with platelet count less than 50,000. Bleeding manifestations were more frequent with low platelet count. The mean platelet count in the present study was 80195/cmm with the range of 5000 to 186000/cmm. The mean platelet count of DHF and DSS patients were 41800/cmm and 32800/cmm respectively. Although thrombocytopenia was a common finding, there was poor correlation between thrombocytopenia and bleeding tendencies, an observation similar to the one made by Sharma et al.<sup>16</sup> The platelet counts at admission were neither an indicator of prognosis nor of bleeding tendencies or progression of the disease. This suggests that other factors like platelet dysfunction or disseminated intravascular coagulation may have role in bleeding in dengue fever cases. However studies which included only DHF cases shows correlation between low platelet count and bleeding manifestations. The studies by Gomber et al and Narayanan et al have documented the same opinion.<sup>9,10</sup> But platelet count provides a very useful means of diagnosis at the screening level. Hence the platelet count was a sensitive indicator for diagnosis but it did not correlate with the outcome.

The mean AST level was 130 IU/L and ALT level was 79.6 IU/L, although transaminases are said to be non-specific for infections and stress. A significant rise of more than 100 IU/L of AST level was documented in 35.36% cases. They are not of any prognostic value, but serve as useful marker for diagnosis. Many studies have also noted high transaminases levels Loke Kuo et al, Mohan et al, Narayanan et al.<sup>9,17,18</sup> The mean value of AST was significantly higher than the mean ALT value. The degree of rise of AST and ALT was more in DHF and DSS, as compared to DF but not statistically significant. In epidemics or in endemic areas, dengue fever infection should be considered in the differential diagnosis of anicteric hepatitis. The high incidence of vomiting, hepatomegaly and elevated liver enzymes can score as markers of suspicion of dengue during an epidemic.

The dengue NS1 antigen serology, with clinical presentation and other investigations formed the mainstay of diagnosis. NS1 antigen test is a test for dengue made by Bio-Rad Laboratories and Pasteur Institute, introduced in 2006. It allows rapid detection on the first day of fever, before antibodies appear which is usually seen around 5



or more days later. NS1 antigen detection kits which are now becoming commercially available can be used in laboratories with limited equipment and yield results within a few hours. IgM antibodies are the first immunoglobulin isotype to appear. These antibodies are detectable in 50% of patients by days 3-5 after onset of illness, increasing to 80% by day 5 and 99% by day 10. IgG positive cases in our study were 15%, indicating high infection rate in our area. These patients must have had dengue infection sometime in their life, which probably remained undiagnosed.<sup>19-21</sup>

The present study had DF 62 (75.6%), DHF 15 (18.3%) and DSS 5 (6%) cases among total of 82 cases. Out of the 82 patients 18(22%) cases needed blood transfusion and 35(43%) cases needed platelet transfusion. The average days of hospital stay was 4.4 days range (1-10). Blood transfusion and platelet transfusion was given in patients whose platelet count less than 40,000 and in patients with bleeding manifestations.

The overall outcome of patients was good with all the patients recovering completely (100%). This was probably due to early diagnosis, prompt treatment and unwavering dedication of our team. The importance of early investigation (NS1 antigen detection) and diagnosis is being emphasized here because all the patients improved mainly by proper fluid management and timely transfusion of platelets and whole blood as and when needed.

## CONCLUSION

The elucidation of the exact clinical profile is important for patient management and thus crucial for saving life. The present study is an attempt to describe the salient clinical as well as laboratory findings of serologically confirmed hospitalized cases of dengue fever.

The present study highlights the importance of fever to clinicians in the areas of epidemiology, manifestations, complications and outcome of the disease. The study has the limitations inherent to a hospital based study, so meteorological and entomological data, information, education and communication (IEC) strategies and vector control measures initiated by the government are not correlated. Community awareness, early diagnosis and management and vector control measures need to be strengthened, during and post-monsoon period, in order to curb the increasing number of dengue cases.

India is one of the seven identified countries in the South-East Asia region regularly reporting dengue fever (DF)/dengue hemorrhagic fever (DHF) outbreaks and may soon transform into a major niche for dengue infection in the future with more and more new areas being struck by dengue epidemics. The importance of early investigations and diagnosis is being emphasized here because most of these patients improved only by proper fluid management. Clinicians in rural areas need

to have a high index of suspicion so that early referral can be made for proper management of these cases.

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