

## Original Research Article

# Clinical and laboratory profile of dengue fever in children during an outbreak - one year study at tertiary care hospital, Chennai, Tamilnadu, India

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**Received:** 20 September 2016

**Accepted:** 21 October 2016

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## ABSTRACT

**Background:** Dengue fever is a mosquito borne arboviral disease which is of global concern. It is endemic in tropical countries with annual incidence of 7.5 to 32.5 million cases. It commonly affects the young adults and paediatric cases of Dengue haemorrhagic fever has high mortality. The objective of this study was to assess the clinical and laboratory profile and outcomes of dengue fever in children of less than 18 years of age. The study was conducted for a period of one year during an outbreak, in a tertiary care hospital of Chennai, Tamilnadu, India.

**Methods:** This was a prospective cross sectional study and 200 cases of dengue fever were enrolled and classified as per WHO guidelines. The clinical profile and demographic profile was recorded in a structured questionnaire form. Haematological parameters were recorded and followed till the day of discharge. The duration of stay was recorded and outcomes were noted.

**Results:** A total of 200 cases with 113 males and 87 females, 177 non severe dengue cases and 23 severe cases of dengue fever were classified. The mean age of admission was 9 years and mean duration of stay in hospital was 4.61 days. Fever was most common presenting symptom (100%) and hepatomegaly (58.5%) was common clinical finding. Bleeding manifestations were seen in severe dengue cases. Statistical significance was seen in rise in SGOT levels, rise in haematocrit and pleural effusion with severe dengue cases and non-severe dengue cases. The case fatality rate was zero.

**Conclusions:** Understanding the knowledge of presentations and associated features would help to predict the severity of the disease. In children, if symptoms like fever, pain, rashes, and vomiting are associated with Hepatomegaly and elevated SGOT in context of low total platelet count, a strong possibility of dengue fever is present, especially in an epidemic setting. Early suspicion and effective management can reduce the severity.

**Keywords:** Dengue fever, Dengue haemorrhagic fever, Haematocrit, SGOT

## INTRODUCTION

Dengue a mosquito borne arboviral disease is caused by one of the serotypes of dengue virus (DEN-1, DEN-2, Den-3, DEN-4) belonging to the family *Flaviviridae*. These serotypes are antigenically distinct but closely

related to each other. Globally 50 million dengue infections are reported annually with annual incidence of 7.5 to 32.5 million cases in India.<sup>1</sup> The first case of dengue fever was reported from Vellore and dengue haemorrhagic fever from Kolkata.<sup>2</sup> The disease is endemic in more than 100 tropical and sub-tropical

countries and 2.5 billion people live in these countries which is of major international public health concern. The case fatality in Dengue fever is roughly around 5%.<sup>3</sup> Mortality is more reported in cases of dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS). Mortality can be reduced to 1% in cases with early intervention.

Dengue fever presents as a common fever with dangerous complications. Infection with dengue virus (DENV) provides lifelong immunity to the serotype affected providing partial and transient protection against re-infection with the other three serotypes. Studies have documented that sequential infection with different DENV serotypes increases the risk of DHF.<sup>4</sup> The common clinical presentations in dengue fever are High grade fever, myalgia, headache, and vomiting, retro bulbar pain which are similar to many viral illnesses. But these manifestations are variable from adults and children. Children in addition to normal signs and symptoms present with epistaxis, melena and Hepatomegaly. More cases of DHF are reported from children than adults. Dengue remains as a puzzling disease in many aspects such as virus - host relationship and clinical expression variability.<sup>5</sup> Hence the present study was conducted to assess the clinical profile and laboratory variability in confirmed cases of dengue fever in children less than 18 years of age attending a tertiary care hospital. The outcome of the patients also was observed in the study.

## METHODS

The present study was an observational, cross-sectional study conducted by Department of Paediatrics at Saveetha Medical College and Hospital, a tertiary care hospital of Chennai, Tamilnadu, India. The study period was from July 2015 to June 2016. All the probable cases suspected with clinical signs and symptoms of dengue fever were admitted in the paediatric ward. All the children below 18 years of age were screened and confirmed with NS1 antigen and Ig M and Ig G rapid antibody detection serological test. (Mithra J and Co. Pvt Ltd) all the positive cases of dengue were enrolled in the study. Informed consent was obtained from all the cases and written consent from the parents or guardians in the study after explanation.

### Exclusion criteria

Cases confirmed as malaria, typhoid, chikungunya and other causes were excluded from the study.

The demographic and clinical profile of the enrolled cases was collected in a pre-designed structured questionnaire sheet. The clinical profile included duration of fever, bleeding manifestations, retro orbital pain, myalgia, vomiting and others. All the admitted cases were followed regularly and haematological parameters like Hb%, total platelet count (TPC), haematocrit,

haemogram, Prothrombin time (PT), activated partial thrombin time (aPTT), Total lymphocyte count (TLC), liver function test were evaluated regularly during follow-up. Ultra-sonogram of abdomen, chest X-ray were done in cases where required. 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.<sup>6</sup> The total duration of stay was noted in each enrolled case. The frequency of signs and symptoms and laboratory parameters were compared between non-severe and severe dengue cases. The patients were treated as per WHO guidelines by paracetamol, inotropes, I.V. fluids and whole blood, platelet transfusions where required.<sup>7</sup> Outcomes of patients were recorded.

### 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 clearance was obtained for the study.

## RESULTS

A total of 200 cases were enrolled in the study, with 113 (56.5%) males among which 98 were suffering with non-severe dengue and 15 cases were with severe dengue, 87 (43.5%) were females with 79 non-severe and 8 severe dengue cases. In both severe and non-severe cases the incidence of males was higher. The male to female ratio was 1.3:1. The most common age group affected was between 8-11 years, 93 cases (46.5%), with 83 non-severe and 10 severe dengue cases, with 55 males and 38 females. The mean age of hospitalized patients was 9 years. 65% of cases remained in the hospital for 3-6 days, 22.5% of cases for <3 days and 12.5% for >6 days. Out of 25 cases admitted for >6 days, 21 cases were of severe dengue and 4 cases of non-severe dengue. The mean duration of hospital stay was 4.61 days. In severe dengue cases the mean duration of stay was 4.64 days. The mean delay in hospitalization after appearance of fever was 4.1 days. Out of total 200 cases enrolled in the study, 8.5% were undifferentiated dengue fever, 80% were dengue fever with or without warning signs and 11.5% were of severe dengue (DHF and DSS) (Table 1).

The incidence of cases was higher in 2<sup>nd</sup> half of year from July to December with 79% of cases and 21% in 1<sup>st</sup> half between January to June. The peak of admissions was observed in the month of August (34.5%) followed by July (18.5%). None of the cases were reported in months of April and May.

Fever was the most common finding in all cases (100%) followed by vomiting (87%), myalgia and abdominal pain (84%) and retro orbital pain was seen in 77% of cases. Hepatomegaly was observed in 58.5% of cases. Petechiae (74.5%) and bleeding manifestations like

epistaxis, gastro intestinal bleeding was seen in 71.5% of cases of both severe and non-severe dengue cases. 73.9% cases of severe dengue cases had bleeding manifestations (Table 2).

Normal leukocyte count was observed in 44% of cases with 43.5% among non-severe and 47.83% in severe dengue cases. Leukopenia was seen in 36% of cases and leukocytosis in 20% of cases. In liver enzymatic profile, SGOT was raised in 22.5% of cases with 78.26% rise seen among severe dengue cases and 15.25% in Non severe cases. SGPT was raised in only 12.5% of cases with 13.04% in severe dengue cases and 12.43% in non-severe cases. Significant P value was observed in both SGOT (P value: 0.002) and SGPT (P value: <0.0001) in severe dengue cases than in Non severe dengue cases. SGOT >1000 IU/L was observed in 5 cases of severe

dengue and SGPT >1000 IU/L was observed in 2 cases of severe dengue. One child in the study had both elevated and was suffering with cirrhosis. Prothrombin time (PT) and activated partial thromboplastin time (aPTT) was abnormal in 21.5% of cases. Severe thrombocytopenia (<50,000/mm<sup>3</sup>) was seen in 19% of total cases with 82.61% among severe dengue and 10.73% in non-severe dengue cases, moderate thrombocytopenia (50,000-100000/mm<sup>3</sup>) was seen in 50.5% of total cases with 17.4% in severe dengue cases and 54.8% in non-severe dengue cases. 30.5% of total cases had platelet counts >100000/mm<sup>3</sup>. Raised haematocrit ≥36.3% was seen in 55% of total cases with 30.43% in severe and 58.2% in non-severe dengue cases. Statistical significance (P value: <0.001) for thrombocytopenia and haematocrit (P value: 0.012) was seen in severe dengue cases than in non-severe dengue cases.

**Table 1: Epidemiological and demographic parameters.**

| Parameter                 | Variables  | Numbers | %    | Non severe dengue | Severe dengue | Statistics              |
|---------------------------|------------|---------|------|-------------------|---------------|-------------------------|
| Age                       | <3 years   | 7       | 3.5  | 4                 | 3             | Mean age<br>8.995 years |
|                           | 4 -7 years | 54      | 27   | 48                | 6             |                         |
|                           | 8-11 years | 93      | 46.5 | 83                | 10            |                         |
|                           | >11 years  | 46      | 23   | 42                | 4             |                         |
| Gender                    | Male       | 113     | 56.5 | 98                | 15            |                         |
|                           | Female     | 87      | 43.5 | 79                | 8             |                         |
| Duration of hospital stay | 0-3 days   | 45      | 22.5 | 45                | 0             | Mean stay<br>4.61 days  |
|                           | 4-6 days   | 130     | 65   | 128               | 2             |                         |
|                           | >6 days    | 25      | 12.5 | 4                 | 21            |                         |
| Day of admission          | 0-3 days   | 74      | 37   | 63                | 11            | Mean day<br>4.095       |
|                           | 4-6 days   | 113     | 56.5 | 102               | 11            |                         |
|                           | >6 days    | 13      | 6.5  | 12                | 1             |                         |
| Classification            | UDF        | 17      | 8.5  |                   |               |                         |
|                           | DF         | 160     | 80   |                   |               |                         |
|                           | Severe DHF | 23      | 11.5 |                   |               |                         |

**Table 2: Clinical profile of patients.**

| Signs and symptoms      | Non severe dengue (n = 177) (%) | Severe dengue (n=23) (%) | Total (n = 200) (%) |
|-------------------------|---------------------------------|--------------------------|---------------------|
| Fever                   | 177 (100%)                      | 23 (100%)                | 200 (100%)          |
| Myalgia                 | 148 (83.62%)                    | 20 (86.96%)              | 168 (84%)           |
| Vomiting                | 155 (87.57%)                    | 19 (82.61%)              | 174 (87%)           |
| Abdominal pain          | 148 (83.62%)                    | 20 (73.91%)              | 168 (84%)           |
| Petechiae               | 132 (74.58%)                    | 17 (73.91%)              | 149 (74.5%)         |
| Bleeding manifestations | 126 (71.19%)                    | 17 (73.91%)              | 143 (71.5%)         |
| Retro orbital pain      | 137 (77.40%)                    | 17 (73.91%)              | 154 (77%)           |
| Hepatomegaly            | 98 (55.37%)                     | 19 (82.61%)              | 117 (58.50%)        |

Pleural effusion was detected in 29.5% of cases with 20.34% among non-severe dengue and 100% in severe dengue cases. 12% of cases had right sided effusion with 17.4% in severe and 11.3% among non-severe cases. Left sided effusion was noticed in only 6% of cases with 8.7%

among severe and 5.65% in non-severe cases. Bilateral effusion was noticed in 11.5% of total cases with 73.91% in severe dengue cases and 3.4% in non-severe dengue cases. Statistical significance (P value: 0.0002) was observed in cases of severe dengue cases to non-severe

dengue cases (Table 3). In this study, 9% of cases were positive for NS1 antigen and all were of non-severe dengue cases. 36.5% cases were positive for Ig M only with 56.52% among severe dengue and 34% among non-severe cases. Both NS1 and Ig M are positive in 54.5% of cases, 43.48% in severe dengue cases and 55.93% among non-severe cases. All the patients in our study were managed with paracetamol, I.V. fluids, and whole blood and platelet transfusions as per WHO standard guidelines.

70% of cases received intra venous fluids and majority 78.26% were of severe dengue cases and 68.93% were of non-severe dengue cases. 56.52% of cases received platelet transfusion, all of severe dengue cases. Whole blood transfusion in 3.5% of cases, all were of severe dengue cases. Two children received dopamine and both were of severe dengue. In our study all the cases were followed and discharged after proper management, no mortality was recorded (Table 4).

**Table 3: Laboratory parameters in the study.**

| Investigations               | Variations                                      | Non severe dengue (n = 177) | Severe dengue (n = 23) | Total (n = 200)   | P value  |
|------------------------------|---|-----------------------------|------------------------|-------------------|----------|
| <b>Total leukocyte count</b> | Leukopenia (<4000 cells/mm <sup>3</sup> )       | 70 (39.55%)                 | 2 (8.70%)              | 72 (36%)          | 0.002    |
|                              | Leukocytosis (>11000 cells/mm <sup>3</sup> )    | 30 (16.95%)                 | 10 (43.48%)            | 40 (20%)          |          |
|                              | Normal TLC (4000 -11000 cells/mm <sup>3</sup> ) | 77 (43.50%)                 | 11 (47.83%)            | 88 (44%)          |          |
| <b>Liver enzymes</b>         | <b>Rise in SGPT (IU/L)</b>                      |                             |                        |                   | < 0.0001 |
|                              | <b>Total</b>                                    | <b>22 (12.43%)</b>          | <b>3 (13.04%)</b>      | <b>25 (12.5%)</b> |          |
|                              | 50 -200U  | 18                          | 0                      |                   |          |
|                              | 200-1000U                                       | 4                           | 1                      |                   |          |
|                              | >1000U  | 0                           | 2                      |                   |          |
|                              | <b>Rise in SGOT (IU/L)</b>                      |                             |                        |                   | 0.002    |
|                              | <b>Total</b>                                    | <b>27 (15.25%)</b>          | <b>18 (78.26%)</b>     | <b>45 (22.5%)</b> |          |
|                              | 50 -200U  | 23                          | 7                      |                   |          |
| 200-1000U                    | 4   | 6                           |                        |                   |          |
| >1000U                       | 0   | 5                           |                        |                   |          |
| <b>Total platelet count</b>  | > 100000  | 61 (34.46%)                 | 0                      | 61 (30.5%)        | < 0.0001 |
|                              | 100000 - 50000                                  | 97 (54.80 %)                | 4 (17.39%)             | 101 (50.5%)       |          |
|                              | <50000  | 19 (10.73%)                 | 19 (82.61%)            | 38 (19%)          |          |
| <b>Haematocrit</b>           | ≥36.3%  | 74 (41.81%)                 | 16 (69.57%)            | 90 (45%)          | 0.012    |
|                              | >36.3%  | 103 (58.19%)                | 7 (30.43%)             | 110 (55%)         |          |
| <b>Chest X-ray</b>           | Pleural effussion                               | 36 (20.34%)                 | 23 (100%)              | 59 (29.5%)        | 0.0002   |
|                              | Right   | 20 (11.30%)                 | 4 (17.39%)             | 24 (12%)          |          |
|                              | Left  | 10 (5.65%)                  | 2 (8.70%)              | 12 (6%)           |          |
|                              | Both  | 6 (3.39%)                   | 17 (73.91%)            | 23 (11.5%)        |          |
| <b>Dengue serology</b>       | NS1   | 18 (10.17%)                 | 0                      | 18 (9%)           | 0.056    |
|                              | Ig M  | 60 (33.9%)                  | 13 (56.52%)            | 73 (36.5%)        |          |
|                              | Both  | 99 (55.93%)                 | 10 (43.48%)            | 109 (54.5%)       |          |

**Table 4: Management of patients.**

| Mangement               | Non severe dengue (n = 177) (%) | Severe dengue (n = 23) (%) | Total (n = 200) (%) |
|-------------------------|---------------------------------|----------------------------|---------------------|
| Anti pyretics           | 177                             | 23                         | 200                 |
| I. V. fluids            | 122 (68.93%)                    | 18 (78.26%)                | 140 (70%)           |
| Platelet transfusion    | 0                               | 13 (56.52%)                | 13 ( 6.5%)          |
| Whole blood transfusion | 0                               | 7 (30.43%)                 | 7 (3.5%)            |
| Dopamine                | 0                               | 2 (8.70%)                  | 2 (1%)              |

## DISCUSSION

Dengue fever is an important arboviral disease of global concern causing major outbreaks with mortality and

morbidity in endemic countries. Our study was done to determine the clinical and laboratory profile of children during an outbreak and after for a total period of one year. 200 cases were included in the study, of which male

preponderance was seen. This finding was on par with the findings of many studies and explained by the traditional full covering of the surface of skin in females when compared with male children. Males are exposed more to the mosquitoes during playing outside in open fields.<sup>8</sup> The most common age group affected was 8-11 years indicating the school activity of these group and exposure to breeding places of mosquitoes during playing. Increased number of cases in September and August is explained by more rainfall during the months and it's the breeding season of *Aedes* mosquitoes the vector in dengue fever.<sup>9</sup>

In this study, cases were classified based on WHO TDR guidelines 2009 into non severe dengue which included undifferentiated fever and dengue fever (with or without warning signs) and severe dengue which included Dengue Hemorrhagic fever (DHF) and Dengue shock syndrome (DSS). In our study 177 (88.5%) were categorized as Non severe and 23(11.5%) as severe dengue cases. The duration of stay of hospitalization was almost same in both severe and non-severe cases, where some studies reported duration of stay more in severe cases.<sup>10</sup> Fever was the most common symptom followed in order by vomiting, myalgia, abdominal pain and retro orbital pain was found less commonly. These findings are on par with many studies in India and abroad, however some of the studies reported headache as the most common symptom.<sup>11</sup> The most common bleeding manifestations were petechiae and rash followed by others like gum bleeding, melena, gastro intestinal bleeding, haematemesis. These bleeding manifestations are more commonly observed in cases of severe dengue fever in our study. However findings in studies of Kobilan et al, Mishra B et al reported bleeding manifestations in non-severe cases of dengue also.<sup>12,13</sup> Thrombocytopenia was a common feature observed in all severe and few cases of non-severe dengue fever. In our study bleeding manifestations were correlating with platelet counts, severe thrombocytopenia were seen in all cases with gastro intestinal bleed, melena and hematemesis. But study by Harris et al, Murge et al reported no significant correlation between platelet count and bleeding manifestations.<sup>14,15</sup> Various other factors apart from thrombocytopenia lead to bleeding manifestations, which are decreased platelet function, fibrinogen consumption, prolongation of PT/PTT, and vasculopathy.<sup>16</sup> Hepatomegaly was observed in majority of cases of severe dengue in our study, as reported in studies of Joshi R, Srivastava VK et al.<sup>17,18</sup> 55% of cases in our study had raised haematocrit, with only 7 cases of severe dengue fever. But findings of Agarwal et al reported much lower incidence of cases with raised haematocrit which does not coincide with our findings.<sup>19</sup> The percentage increase in haematocrit is an accurate indicator of vascular permeability and plasma leakage.

Elevation of SGOT was more when compared to SGPT in our study and was significant association between severity of infection and mortality. Many other studies

reported the same finding with rise in SGOT than SGPT in their studies. Rise in SGOT may be due to involvement of myocytes.<sup>20</sup> Pleural effusion was noted in 29.5% of all cases and 100% in severe dengue cases. Presence of pleural effusion indicates severity of the disease and was found statistically significant. Findings of our study are on par with findings of Pushpa et al and Malavige et al.<sup>21,22</sup>

## CONCLUSION

Dengue is one of the dreaded fevers of paediatric age group with variable presentations and complications. Understanding the knowledge of presentations and associated features would help to predict the severity of the disease. In our study, we listed all the probable clinical data and laboratory parameters that can help in establishing the severity of the fever. Rise in SGOT levels, pleural effusion, Hepatomegaly are significant findings in distinguishing severe from non-severe cases of dengue fever. Knowledge about these will help in better outcome of dengue cases..

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Sharma NL, Balasubramanyam V, Kandati J, Ponugoti M. Clinical and laboratory profile of dengue fever in children during an outbreak - one year study at tertiary care hospital, Chennai, Tamilnadu, India. *Int J Contemp Pediatr* 2017;4:110-5.