

Original Research Article

Liver function tests to predict the severity of dengue fever in serologically positive children below 18 years of age

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Received: 28 November 2018

Accepted: 01 January 2019

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ABSTRACT

Background: Dengue fever presents with a diverse clinical spectrum. Although liver is not a major target organ, hepatic dysfunction is a well-recognized feature. In this study authors attempted to study the pattern of hepatic involvement in children with dengue and its association with disease severity.

Methods: This was a cross sectional study conducted at Cheluvamba hospital during the period of 1 year. Children <18 years of age with dengue Ns1 Ag and IgM positive were included in this study. After obtaining informed consent, a pre-structured proforma was used to record the relevant information from each subject. After detailed clinical examination and haematological investigation children were categorized into three groups as dengue fever with no warning signs (DNWS), dengue fever with warning signs (DWWS) and severe dengue fever (SDF) according to WHO classification. Statistical analysis was done to know the strength of association between different clinical and biochemical variables and outcome of the disease.

Results: The mean age of the study population was 8.65 years with male preponderance. The mean total bilirubin, serum albumin, SGOT, SGPT, ALP, PT and INR were 0.76 mg/dl, 3.8g/dl, 233.18U/L, 118.15U/L, 200.65 U/L, 12.9s and 1.09 respectively. The mean SGOT was significantly higher than SGPT. The degree of deranged LFTs was significantly more in SDF group than DNWS and DWWS groups. Serum albumin was significantly decreased in children with SDF group correlating with disease severity, prognosis and outcome.

Conclusions: Hepatic dysfunction was present in all forms of dengue infection, with SGOT rising significantly more than SGPT. All biochemical liver parameters were significantly deranged in patients with severe dengue fever indicating prolonged illness and poor prognosis.

Keywords: Dengue fever, Liver dysfunction, Severe dengue fever

INTRODUCTION

Dengue is the most rapidly spreading mosquito-borne viral disease of mankind, with 30-fold increase in global incidence over the last five decades. It is a major public health concern throughout the tropical and subtropical regions of the world. Almost half the world's population live in countries where dengue is endemic. According to World Health Organization (WHO), about 50–100

million new dengue infections are estimated to occur annually in more than 100 endemic countries, with a steady increase in the number of countries reporting the disease.¹ The origin of the word 'dengue' is not very clear, one of the theories is that, it is derived from a Swahili phrase "ka-dinga pepo", meaning "cramp like seizure caused by an evil spirit". The Swahili word "dinga" may possibly had its origin from the Spanish word "dengue", meaning fastidious or careful, which

describes the gait of a person suffering from the bone pain of dengue fever. The slaves in the West Indies who contracted dengue were said to have the posture and gait of “dandy” and hence the disease is also known as dandy fever.² Dengue viruses cause symptomatic infections or asymptomatic seroconversion. Symptomatic dengue infection is a dynamic systemic disease. It has a wide clinical spectrum that includes both severe and non-severe clinical manifestations. The key to a good clinical outcome is understanding the pathogenesis and being alert to the clinical problems that arise during the different phases of the disease, leading to a rational approach in the case management.³ Although dengue virus is a non-hepatotropic virus, hepatomegaly is commonly seen in dengue along with a rise in serum aminotransferases. The degree of liver dysfunction varies from a mild injury with elevation of aminotransferases to even fulminant hepatic failure. Hepatic dysfunction in dengue infection may be attributed to the direct effect of virus on liver cells or as a consequence of dysregulated host immune responses against the virus.⁴ An awareness regarding the hepatic manifestations in dengue may be helpful in arriving at an early diagnosis and help avoid morbidity and mortality. However, there are no large clinical studies documenting hepatic involvement in dengue infection, especially in children and liver functions tests are not routinely done to assess severity of dengue infection. Hence this study was taken up in Cheluvamba hospital, to assess the severity of dengue viral infection in Children through Liver function tests.

METHODS

Source of data

Children aged below 18 years who were diagnosed with dengue fever (NS1 Antigen positive and IgM positive) admitted to Cheluvamba Hospital, Mysore.

Method of collection of the data

All serologically confirmed dengue fever patients admitted to the Paediatric Department of Mysore Medical College (Cheluvamba Hospital) during the study period.

Duration of the study

1 year from December 2015 to November 2016.

Sample size: 60

Sample size was obtained by using the following formula:

$$n = Z^2 (pq) / d^2$$

where, $Z=1.96$, p is the prevalence of dengue fever in children in Cheluvamba hospital which is 4%, $q=(1-p)$, d is the confidence interval taken as 0.05.

Sampling method

Purposive sampling.

Type of study

Cross sectional study.

Inclusion criteria

- Serologically confirmed (NS1 Antigen Positive and IgM Reactive) dengue fever patients admitted to Cheluvamba hospital.
- Children <18 years irrespective of the sex.

Exclusion criteria

- NS1 Antigen negative and IgM non-reactive Dengue like illness.
- Children with history of pre-existing liver diseases.

Method of study

Purpose of the study was explained to the study subjects and their parents. Informed consent was obtained from all the patients/parents before conducting the study. A pre-structured proforma was used to record the relevant information from each subject.

A detailed clinical examination of the enrolled subjects was conducted in the Department of Paediatrics, Mysore Medical College, Mysore. After taking the due consent, venous blood was collected for Complete hemogram, LFT, PT/aPTT, INR, Dengue NS1 antigen and IgM antibodies. WHO guidelines were applied for categorization of patients into dengue fever with no warning signs (DNWS), dengue fever with warning signs (DWWS) and severe dengue fever (SDF) groups. The information was entered into the master chart and the results were analysed using SPSS version 20.0 for windows.

RESULTS

Out of 60 children enrolled in the study group, based on the clinical manifestations, as per WHO classification, 12 (20%) belonged to the group dengue fever with no warning signs (DNWS), 33 (55%) belonged to the group dengue fever with warning signs (DWWS) and 15 (25%) belonged to the group severe dengue fever (SDF). Out of 60 children, there were 2 (3.3%) children <1 year of age, 1 in each group of DNWS and DWWS and none in SDF group. There were 8 (8%) children between 1 to 5 year of age, of which 2 had DNWS, 4 had DWWS and 2 had SDF. There were 32 (53.3%) children between 6 to 10 years of age of which 5 had DNWS, 20 had DWWS and 7 had SDF. There were 18 (30%) children in the age group 11 to 18 years of which 4 had DNWS, 8 had DWWS and 6 had SDF.

Out of 60 children in the study population, 2 (3.3%) of them belonged to less than 1 year, 8 (13.3%) of them belonged to 1-5 years, 32 (53.3%) belonged to the age

group 6 to 10 years, 18 (30%) belonged to the age group 11 to 18 years (Table 1).

Table 1: Age distribution of the study group.

Age (years)	Dengue fever with no warning signs (DNWS) n=12	Dengue fever with warning signs (DWWS) n=33	Severe Dengue fever (SDF) n=15	Total n=60
<1	1 (8.3%)	1 (3%)	0	2 (3.3%)
2-5	2 (16.7%)	4 (12.1%)	2 (13.3%)	8 (13.3%)
6-10	5 (41.7%)	20 (60.6%)	7 (46.7%)	32 (53.3%)
11-18	4 (33.3%)	8 (24.2%)	6 (40%)	18 (30%)

Fever was present in all 60 children enrolled in the study group (100%). Next to fever, vomiting was the most common symptom seen in 39 (65%) children.

Pain abdomen, arthralgia, headache, abdominal distension was seen in 27 (45%), 10 (16.7%), 5 (16.7%) and 4 (6.7%) children respectively. CNS manifestations in the form of lethargy/irritability/restlessness/convulsions were seen in 7 (11.7%) of children while bleeding manifestation was seen in only 4 (6.7%) children. Fever

was seen in all 60 children. Headache was seen in 2 (16.7%) children with DNWS, 4 (12.1%) children with DWWS, 4 (26.7%) children with SDF. Vomiting was seen in 25 (75.8%) children with DWWS and 14 (93.3%) children with SDF; (p value < 0.05). Pain abdomen was seen in 8 (53.3%) children in SDF, 7 (51.5%) children with DWWS and 2 (16.7%) children with DNWS. Arthralgia was seen in 1 (8.3%) child with DNWS, 7 (21.2%) children with DWWS and 2 (13.3%) children in SDF (Table 2).

Table 2: Distribution of cases with varying severity of dengue based on symptomatology.

Symptoms	Dengue fever with no warning signs (n=12)	Dengue fever with warning signs (n=33)	Severe dengue fever (n=15)	p value
Fever	12 (100%)	33 (100%)	15 (100%)	0.106
Headache	2 (16.7%)	4 (12.1%)	4 (26.7%)	0.456
Vomiting	0	25 (75.8%)	14 (93.3%)	0.000
Pain abdomen	2 (16.7%)	17 (51.5%)	8 (53.3%)	0.087
Arthralgia	1 (8.3%)	7 (21.2%)	2 (13.3%)	0.546
Bleeding manifestations	0	0	4 (26.7%)	0.002
Abdominal distension	0	3 (9.1%)	2 (13.3%)	0.448
Lethargy/irritability/restlessness/convulsions	1 (8.3%)	2 (6.1%)	4 (26.7%)	0.110

Table 3: Distribution of cases with varying severity of dengue based on clinical signs.

Signs	Dengue fever with no warning signs (n=12)	Dengue fever with warning signs (n=33)	Severe dengue fever (n=15)	p value
Edema	0	1 (3.0%)	2 (13.3%)	0.213
Lymphadenopathy	1 (8.3%)	7 (21.2%)	1 (6.7%)	0.327
Petechiae	0	0	3 (20.0%)	0.009
Icterus	0	0	2 (13.3%)	0.045
Hepatomegaly	0	12 (36.4%)	11 (73.3%)	0.008

Bleeding manifestations was seen in 4 (26.7%) of children in SDF group; (p < 0.05). Abdominal distension was seen in 3 (9.1%) and 2 (13.3%) children in DWWS and SDF group respectively. CNS manifestations like lethargy/lethargy/restlessness/convulsions was seen

in 4 (26.7%), 1 (8.3%), 2 (6.1%) children with SDF, DNWS and DWWS respectively. Edema was seen in 2 (13.3%) children with SDF and 1 (3%) child with DWWS. Lymphadenopathy was seen in 1 (8.3%) child with DNWS, 7 (21.2%) children with DWWS and 1

(6.7%) child with SDF. Petechiae was seen only in 3 (20%) of children with SDF. Icterus was also seen in 2 (13.3%) children with SDF, Hepatomegaly was seen in

12 (36.4%) of children with DWWS and 11 (73.3%) of children in SDF (Table 3).

Table 4: Distribution of mean values of laboratory parameters in comparison with WHO classification of dengue fever.

Measurement	Dengue fever with no warning signs (n=12)		Dengue fever with warning signs (n=33)		Severe dengue fever (n=15)		p value
	Mean	SD	Mean	SD	Mean	SD	
Total leukocyte count (cells/ μ L)	5854.16	3335.83	4965.15	3410.79	5130.00	2856.97	0.722
	129698.33	38414.47	80985.45	43787.98	48358.00	25151.21	0.00
HCT%	39.24	4.23	39.15	6.10	37.74	7.21	0.733
SGOT (U/L)	116.25	84.62	174.12	121.21	456.66	157.79	0.00
SGPT (U/L)	88.33	25.80	92.36	33.4	198.73	126.57	0.00
Total bilirubin (mg/dl)	0.58	0.17	0.68	0.61	1.07	0.85	0.085
Serum proteins (g/dl)	6.25	0.31	6.22	0.84	3.84	1.45	0.00
Albumin (g/dl)	4.29	0.37	4.21	0.70	2.49	1.12	0.00
PT (seconds)	12.00	1.12	12.57	1.82	14.66	3.92	0.009
aPTT (seconds)	33.58	0.66	33.72	1.66	33.80	3.56	0.967
INR	1.09	0.07	1.07	0.10	1.16	0.13	0.028

Right hypochondriac tenderness was seen in (16.7%), (36.4%) and (73.3%) of children with DNWS, DWWS and SDF respectively. The mean $\pm$ SD leukocyte count in children with DNWS was 5854 ± 3335 cells/ μ L, in DWWS was 4965 ± 3410 cells/ μ L and in children with SDF was 5130 ± 2856 cells/ μ L ($p=0.722$). The mean $\pm$ SD platelet count in DNWS group was 129698 ± 38414 cells/ μ L; DWWS was 80985 ± 43787 cells/ μ L; SDF group was 48358 ± 25151 cells/ μ L ($p=0.00$).

The mean HCT was $39 \pm 4\%$, $39 \pm 6\%$, $37 \pm 7\%$ in DNWS, DWWS and SDF group respectively ($p=0.733$). The mean SGOT was 116 ± 84 U/L, 174 ± 121 U/L, 456 ± 157 U/L in DNWS, DWWS and SDF group respectively ($p=0.00$). The mean SGPT was 88 ± 25 U/L, 92 ± 33 U/L, and 198 ± 126 U/L in DNWS, DWWS and SDF group respectively ($p=0.00$).

The mean $\pm$ SD total bilirubin in DNWS, DWWS, SDF groups were 0.58 ± 0.17 mg/dl, 0.68 ± 0.61 mg/dl and 1.07 ± 0.85 mg/dl respectively (0.085). The mean $\pm$ SD serum total proteins in DNWS, DWWS, SDF was 6.25 ± 0.31 g/dl, 6.22 ± 0.84 g/dl and 3.84 ± 1.45 g/dl respectively ($p=0.00$). The mean $\pm$ SD serum albumin in DNWS, DWWS and SDF was 4.29 ± 0.37 g/dl, 4.21 ± 0.70 g/dl and 2.49 ± 1.12 g/dl respectively ($p=0.00$). The mean $\pm$ SD PT was 12 ± 1.12 s, 12.57 ± 1.82 s, 14.66 ± 3.92 s in DNWS, DWWS and SDF groups respectively ($p=0.009$). The mean $\pm$ SD INR was 1.09 ± 0.07 , 1.07 ± 0.10 , 1.16 ± 0.13 in DNWS, DWWS and SDF groups respectively ($p=0.028$). SGOT values were significantly higher in children with severe dengue fever with p value <0.05 . 80% of children in severe dengue fever group had SGOT elevations 6 to 10 times the

normal value. 10(83.3%) of children in DNWS group, 17(51.5%) of children in DWWS group and 1(6.7%) of children in SDF group had SGOT elevations less than 3 times the normal value. 1(8.3%), 6(18.2%) of children in DNWS and DWWS respectively had SGOT elevations between 4 to 5 times the normal value. 1(8.3%), 10(30.3%), 12(80%) of children in DNWS, DWWS and SDF groups had SGOT elevations between 6 to 10 times the normal value. 2(13.3%) of children in SDF group had SGOT elevations >10 times the normal value.

Children with higher SGOT levels had prolonged hospital stay ($p<0.05$). 14(50%) of children who had <3 times elevation of SGOT had <3 days of hospital stay. 10(35.7%) of children who had <3 times elevation of SGOT had 4 to 5 days of hospital stay and 4(14.3%) of children who had SGOT elevation <3 times had >10 days of hospital stay. 5(71.4%) of children who had SGOT elevation between 4 to 5 times had hospital stay between 4 to 5 days. 2(28.6%) of children who had SGOT elevation between 4 to 5 times had hospital duration between 6 to 10 days. 3(21.4%), 11(78.6%) of children who had SGOT elevation between 6 to 10 times the normal value had hospital stay between 4 to 5 days and 6 to 10 days respectively. 5(55.6%) of children who had SGOT elevation >10 times normal had >10 days of hospital stay (Table 4).

Two children who expired of severe dengue fever in present study, one of them had SGOT level more than 5 times elevated and another had more than ten times elevation of SGOT. Among two children who expired with dengue fever, one patient had SGPT levels elevated >6 times the normal and another patient had elevation of

SGPT more than 3 times the normal value. Total protein and serum albumin levels in comparison with duration of hospital stay in children with severe dengue fever. 60% of children with low protein levels had more than 6 days of hospital stay and 30% of children had more than 10 days of hospital stay ($p=0.07$). 1(7.7%), 8(61.5%), 4(30.8%) of children who had low serum albumin levels had stayed for duration in the hospital for 4-5 days, 6-10 days and >10 days respectively ($p=0.00$).

DISCUSSION

Dengue fever is a disease caused by an arbovirus, which has four related virus serotypes (DENV-1, DENV-2, DENV-3 and DENV-4). It is one of the most important arthropod transmitted viral disease in humans and constitutes an important worldwide health problem. It is estimated that 3 billion people live in endemic regions and 390 million infections (96 million symptomatic) and 20,000 deaths occur due to dengue fever annually.⁵ Dengue infection has varied clinical presentations, ranging from a non-specific febrile illness to a severe dengue fever. The viruses can affect many cell types with diverse clinical and pathological effects. Liver involvement is known in dengue fever since 1950s.

Hepatic involvement in dengue can occur in the form of hepatomegaly, elevated liver enzymes to fulminant hepatic failure. Thorough knowledge about these hepatic manifestations in dengue fever will certainly help in arriving at an early diagnosis and help avoid morbidity and mortality.⁶ Dengue fever primarily is a disease of infants and children, although many adults may be afflicted with severe disease.⁷ The mean age of presentation in children was 8.65 year in the present study, the range being 6 to 10 years. In studies done by Narayana et al and L Kabila et al, the common age of presentation was between 8-15 years.^{8,9}

Sex

In the present study, 65% were males and 35% were females. The Male:Female ratio was 1.8:1, which was comparable to the study by Renuka Jadhav et al (1.5:1).¹⁰ The sex ratio in other studies were between 1.5-1.8. In present study, males were more commonly affected with severe dengue fever than female children. This was comparable to the study done by B Manohar et al.¹¹

Incidence

The incidence of severe dengue fever in present study was 25% which was comparable to the study by Bokade C M et al (22.7%).¹² In present study, out of 60 cases, 20% of the children had dengue fever with no warning signs, 55% of the children had dengue fever with warning signs and 25% of children had features of severe dengue fever. These findings were comparable to the study done by Neelam Mohan et al (DNWS-37.6%, DWWS-49.4%, SDF-17.9%).¹³

Clinical features

Dengue infection may be asymptomatic or may present as undifferentiated fever or as a severe dengue fever. Infants and young children can develop febrile illness that can be accompanied by a maculopapular rash, decreased appetite, vomiting, pain abdomen. Older children may develop either a mild febrile syndrome or the classical dengue fever characterised by fever, headache, myalgia, arthralgia and retro-orbital pain.^{1,3,8,9,14-16}

In present study, fever was present in all children. This was similar to the studies done by Amrita et al and Bokade et al.^{11,17}

Headache was present in 16.7% of the children in the study group. 26% of the children who suffered from SDF had headache, in contrast to the findings in Bokade et al study who found that overall incidence of headache of 30.9% and that in children who suffered from SDF was 20%. The incidence of headache in the study by Neelam et al and Renuka Jadhav et al was 19.1% and 37% respectively.^{12,13,17} Vomiting was present in 65% of children in the study group. 93% of children who suffered from SDF had vomiting. The overall incidence of vomiting in present study was comparable to the studies by Renuka et al (60%) and Bokade et al (52%). The incidence of vomiting in children who suffered from SDF was 93% which was more compared to the incidence in studies done by Bokade et al (70%), Amrita et al (68.5%) and Renuka et al (51.5%).^{10,12,17}

The overall incidence of pain abdomen in present study was 45% while that in studies done by Bokade et al, Renuka et al and Amrita et al was 55%, 31.2% and 36% respectively. The incidence of pain abdomen in children who suffered from SDF in present study was 53.3% while that in studies done by Amrita et al and Bokade et al was higher (79.4% and 70% respectively).^{10,12,17}

The incidence of arthralgia in present study was 16.7% while that in studies by Bokade et al was higher (58%) and Renuka et al was lesser (12.5%). The incidence of bleeding manifestation in present study was 6.7% while that in study by Bokade et al was higher (15.4%) and 16% in study by Renuka et al. The incidence of bleeding manifestation in children who suffered from SDF was 26.7% in present study while this incidence was 34% in Bokade et al study and 32% in Renuka et al study.^{10,12} The incidence of abdominal distension in present study was 8.3% while that in the study by Renuka et al was 22.5%.¹⁰ The incidence of CNS manifestation in present study was higher compared to study by Amrita et al (11.3 vs 6.3%). The incidence of edema in present study was 5% in contrast to the study by Bokade et al in which the incidence was 40.9%.¹² Petechiae was seen only in 5% of the study population which was less compared to its incidence in Bokade et al (25.9%). Petechiae was seen in 20% of children in SDF group ($p<0.05$) while it was 31.5% in study by Amrita et al and 34% in Bokade et

al.^{12,17} 3.3% of the children in present study had icterus compared 7.2% in Bokade et al study. In present study all the children who had icterus were suffering from severe dengue fever ($p < 0.05$).¹² The incidence of icterus in SDF group of present study was 13.3% while that in Bokade et al study was 23%.¹² The incidence of hepatomegaly in present study was 38.3% while that in the study by Amrita et al and Renuka et al was 63.6% and 76.2% respectively.^{10,17} In present study 73.3% of children who suffered from SDF had hepatomegaly which was statistically significant ($p < 0.05$). The incidence of hepatomegaly in SDF group of Renuka et al and Amrita et al studies were 87.5% and 93% respectively.^{10,17}

The correlation between hepatomegaly and SGOT levels was statistically significant ($p < 0.05$) in present study. This observation was similar to study done by Bokade et al was contrasting to the study by Amrita et al.^{12,17} The right hypochondrial tenderness was seen in 41.9% of children in present study while its incidence was 57.5% and 28.6% in studies by Renuka et al and Bokade et al respectively. The incidence of right hypochondrial tenderness was seen in 73.3% of children in SDF group in present study which was statistically significant ($p < 0.05$). Its incidence was 56% in Bokade et al study and 80% in Renuka et al study.^{10,12,18}

Laboratory parameters

SGOT is primarily associated with hepatocytes. It has minimal activity in cardiac and skeletal muscles. It is also found in erythrocytes, kidney and brain tissues.¹⁹ The mean serum bilirubin, serum albumin, SGOT and SGPT levels in the present study were 0.7mg/dl, 3.8gm/dl, 253U/L, 118U/L respectively. The mean SGOT levels were higher compared to SGPT levels in children with dengue fever. It has been suggested that, it may be due to excess release of SGOT from damaged myocytes during infection.¹¹ The fact that SGOT is higher than SGPT, as reflected in present study also helps in differentiating dengue hepatitis from other viral hepatitis.¹¹

The Mean SGOT (253 U/L) levels in the present study were higher compared to the studies by Prakash et al (173U/L) and Wong M et al (163 U/L).^{11,13} Lesser compared to the studies done by Chhina R S et al (353U/L) and Amaresh patil et al (382U/L).^{20,21}

In present study, the mean SGOT level in SDF group (456U/L) was higher when compared to DWWS (174U/L) and DNWS (116U/L) groups; ($p < 0.05$), which was comparable to the study done by Amrita et al in which SGOT values in SDF, DWWS, DNWS were 687.8U/L, 125.9U/L and 87.67U/L respectively.⁷ The mean SGPT levels (118 U/L) were less when compared to studies done by Chhina RS et al (218.6U/L).²⁰ In present study, the mean SGPT level in SDF (198.73U/L) group was higher when compared to DWWS (92.6U/L) and DNWS (88.3U/L) groups; ($p < 0.05$), which was comparable to the study done by Neelam Mohan et al in

which SGPT values in SDF, DWWS, DNWS were 1852U/L, 104.6U/L and 60.66U/L respectively.¹³ The mean total bilirubin (0.7mg/dl) in present study was also less when compared to the studies done by Chhina R S et al (0.93mg/dl).²⁰ The mean value of total bilirubin was higher in SDF group (1.07mg/dl) than in DNWS (0.58mg/dl) and DWWS (0.68 mg/dl) groups which was comparable to the study done by Neelam Mohan et al in which total bilirubin values in SDF, DWWS and DNWS were 1.79mg/dl, 0.49 mg/dl and 0.03 mg/dl respectively.¹³

The mean ALP level in present study was 200.65 U/L and it did not differ among the 3 groups of dengue fever. It was not statistically significant in correlation with duration of hospital stay or outcome of children with dengue fever. This conclusion was similar to Chinna et al study.²⁰ A complex interaction between virus, host immune response and endothelial cells likely to impact the barrier integrity and function of endothelial cells leading to plasma leakage causing hypoalbuminemia. The mean serum albumin levels (3.8gm/dl) in present study was comparable to the study done by Chhina RS et al (3.2gm/dl).²⁰ The mean value of Serum albumin was lower in SDF group (2.49g/dl) than in DNWS (4.21g/dl) and DWWS (4.29 g/dl) groups; ($p < 0.05$), which was comparable to the study done by Mohan N et al in which serum albumin values in SDF, DWWS and DNWS were 2.47g/dl, 3.57g/dl and 3.88g/dl respectively.¹³ The mean PT, a PTT and INR was 12.9seconds, 33.7seconds and 1.09 respectively. The mean (14.6s) and INR (1.16) was higher in severe dengue fever group, results were comparable to the studies done by Renuka et al.¹⁰

Duration of hospital stay

Children with higher level of SGOT had prolonged duration of hospital stay. 78.6% of children who had >6 times elevation of SGOT had >6 days of hospital stay ($p < 0.05$). Children with higher levels of SGPT also had prolonged duration of hospital stay. 60% of children who had >3 times elevation of SGPT had >6 days of hospital stay ($p < 0.05$). These results were similar to the study done by Ahmed A et al.²³ Children who had low levels of albumin had prolonged duration of hospital stay. 61.5% of children who had hypoalbuminemia had >6 days of hospital stay; ($p < 0.05$). This was comparable to the studies by Bokade CM et al.¹²

Mortality

Two out of 60 serologically positive cases in present study expired due to severe dengue fever. In one of these cases, SGOT was elevated > 10 times the normal value and SGPT was elevated > 6 times the normal value. In the second case, SGOT levels were > 6 times the normal and SGPT levels were >3 times the normal; ($p < 0.05$). In both the above cases there were significantly low levels of total protein and serum albumin levels; ($p < 0.05$).

CONCLUSION

In this study, attempt has been made to understand the profile of hepatic involvement in dengue fever to predict disease severity. LFT derangement was seen in all forms of dengue fever and was significantly more common in severe dengue fever group. Higher SGOT and SGPT levels (SGOT>SGPT) predicts the disease severity, prolonged hospital stay and fatal outcomes. Low serum albumin serves as an indicator of vascular permeability alteration and correlates with disease severity, prognosis and outcome.

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: Raju YHN, Kumar R, Rudrappa S. Liver function tests to predict the severity of dengue fever in serologically positive children below 18 years of age. Int J Contemp Pediatr 2019;6:358-64.