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ORIGINAL RESEARCH

Liver Function Tests to Predict the Severity of Dengue Fever in Serologically Positive Children Below 18 Years of Age

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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 we attempted to study the pattern of hepatic involvement in children with dengue and its association with disease severity.

Materials and Methods: This was a cross sectional study conducted at 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.

Conclusion: 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.

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INTRODUCTION

Dengue is the most common arthropod-borne viral (arboviral) illness in humans. Globally, 2.5- 3 billion individuals live in approximately 112 countries that experience dengue transmission. Annually, approximately 50-100 million individuals are infected.[1]The incidence has increased manifold in India due to unplanned urbanization and migration of population to urban areas. Although initially reported from urban locales, dengue is now being reported from urban and rural backgrounds alike. Dengue is caused by infection with one of the four serotypes of dengue virus, which is a Flavivirus. Dengue virus (DENV) is a

mosquito-borne flavivirus that consists of four serotypes (1–4) circulating in endemic areas. Most DENV infections are asymptomatic. However, the clinical manifestation of DENV infections could be dengue fever (DF), dengue hemorrhagic fever (DHF), or dengue shock syndrome (DSS). Infection with one dengue serotype confers lifelong homotypic immunity to that serotype and a very brief period of partial heterotypic immunity to other serotypes, but a person can eventually be infected by all 4 serotypes.[2]Several serotypes can be in circulation during an epidemic. Dengue is transmitted by mosquitoes of the genus Aedes, principally Aedes aegypti.[3] Initial dengue infection may be asymptomatic (50-90%),â•´ may result in a nonspecific febrile illness, or may produce the symptom complex of classic dengue fever (DF). Classic dengue fever is marked by rapid onset of high fever, headache, retro-orbital pain, diffuse body pain (both muscle and bone), weakness, vomiting, sore throat, altered taste sensation, and a centrifugal maculopapular rash, among other manifestations. A small percentage of persons who have previously been infected by one dengue serotype develop bleeding and endothelial leak upon infection with another dengue serotype. This syndrome is termed dengue hemorrhagic fever (DHF).[2,3]

Dengue is one of the most rapidly evolving vector-borne infections, affecting 129 countries, 70% of the actual burden is in Asia, causing nearly 390 million affected patients each year, of which 96 million manifests clinically. The number of dengue cases reported to World Health Organization increased over eightfold during the last two decades, from 505430 cases in 2000 to over 2.4 million in 2010 and 4.2 million in 2019.[1,6,7]

Liver injury associated with DENV infection was first reported in 1967. The liver is one of the common organs involved in dengue infection. Hepatic complications were found in 60%-90% of infected patients included hepatomegaly, jaundice, elevated aspartate aminotransferase (AST), elevated alanine aminotransferase (ALT), and acute liver failure (ALF). All four serotypes have been associated with dengue-related liver injury, but DENV-1 and DENV-3 have more significant injuries. Abnormal liver function in DENV infections resulted from the direct viral effect on hepatocytes or a dysregulated immunologic injury against the virus.[8,9]

The exact clinical and laboratory profile is crucial for diagnosis as well as successful management of the patients.[10]

Objectives of study;

To assess the significance of Liver Function Tests (LFTs) to predict the severity ofDengue fever in serologically positive children.

MATERIALS & METHODS

Source of data: Children aged below 18 years who were diagnosed with dengue fever(NS1 Antigen positive and IgM positive) admitted in Pediatrics wards.

Method of collection of the data: Around 50 patients among serologically confirmed dengue fever patients admitted to the Paediatric Department , during the study period of 1 year . 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 hospital.
- Children<18years irrespective of the sex.

Exclusion criteria

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

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.

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. Continuous variables like age, laboratory parameters like serum bilirubin, serum albumin, ALT, AST were presented as mean ± standard deviation. Categorical variables like sex, symptoms and clinical signs were expressed in actual numbers and percentages. Categorical variables were compared across three groups by performing one-way ANOVA test. Pearson's chi-square test was used to compare outcomes with mortality. The Descriptives procedure displays univariate summary statistics for several variables in a single table and calculates standardized values (z scores). Variables can be ordered by the size of their means (in ascending or descending order), alphabetically, or by the order in which the researcher specifies. Descriptive statistics included mean, Standard deviation, frequency and percent. Inferential statistics Crosstabs (Cramer's V)

RESULTS

Out of 50 children enrolled in the study group, based on the clinical manifestations, as per WHO classification,10(20%) belonged to the group dengue fever with no warning signs (DFNWS), 30(60 %) belonged to the group dengue fever with warning signs(DFWS) and10(20%) belonged to the group severe dengue fever(SDF).

Out of 50 children, there were 2 (4 %) children <1 year of age, 1 in each group of DNWS and DWWS and none in SDF group. There were 8 (16%) children between 1 to 5 year of age, of which 2 had DNWS, 4 had DWWS and 2 had SDF. There were 30 (60%) children between 6 to 10 years of age of which 5 had DNWS, 20 had DWWS and 5 had SDF. There were 12 (24 %) children in the age group 11 to 18 years of which 2 had DNWS, 6 had DWWS and 4 had SDF. Symptoms:

Fever was present in all 50 children enrolled in the study group (100%).Next to fever, vomiting was the most common symptom seen in 30 (60%) children. Pain abdomen, arthralgia, headache, abdominal distension was seen in 24 (48%), 12(24 %), 5(10%) and 4(8%) children respectively. CNS manifestations in the form of lethargy/irritability/restlessness/convulsions were seen in 7 (14 %) of children while bleeding manifestation was seen in only 4 (8%) children.

10(20%) belonged to the group dengue fever with no warning signs (DNWS), 30(60 %) belonged to the group dengue fever with warning signs(DWWS) and 10(20%) belonged to the group severe dengue fever(SDF). Headache was seen in 5(50%) children with DNWS,4(12 %) children with DWWS, 4 (40%) children with SDF. Vomiting was seen in 25 (75%) children with DWWS and 8 (80%) children with SDF;(p value<0.05).Pain abdomen was seen in 8(80%) children in SDF,7 (21.5%) children with DWWS and 2 (20%) children with DNWS. Arthralgia was seen in 1(10%) child with DNWS,6 (30%) children with DWWS and 2(20 %) children in SDF. Bleeding manifestations was seen in 4(40 %) of children in SDF group; (p<0.05).Abdominal distension was seen in 3(10 %) and 2(20 %) children in DWWS and SDF group respectively. CNS manifestations like lethargy/lethargy/restlessness/ convulsions was seen in 4(40%), 1(10%), 2(6.6%) children with SDF, DNWS and DWWS respectively.

Clinical signs:
Out of 50 children, 25(50 %) presented with right hypochondriac tenderness,23 (46%) children presented with hepatomegaly. Lymphadenopathy was seen in 9(18%) of children. Petechiae and edema was seen in 3(6%) of children each. Icteruswas seen only in 2 (4%) of the study group.

Table 1: Distribution of clinical signs in the study population.

Signs	**n=50**
Edema	3(6%)
Lymphadenopathy	9(18%)
Petechiae	3(6%)
Icterus	2(4%)
Hepatomegaly	23(46%)
Right hypochondrial Tenderness	25(50%)

Edema was seen in 2 (20 %) children with SDF and 1(10%) 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. Right hypochondriac tenderness was seen in (16.7%), (36.4%) and (73.3%) of children with DFNWS, DFWS and SDF respectively.

Laboratory parameters:
The mean ±SD Total Leukocyte Count in the study population was 5200±3100 cells/µL; the range being 1295 to 15620 cells/µL. The mean ±SD HCT was 39.2 ±6.12%; the range being 24.80% to 55.60%.The mean platelet count was 82571±47073 cells/µL; the range being 12590 to174200 cells/µL. The mean ± SD Serum total bilirubin was 0.76± 0.64 mg/dl, the range being 0.10 to 3.2 mg/dl. The mean ±SD serum proteins was 5.44 ±1.12 g/dl; the range being 2.50 to 8.80 g/dl. The mean ± SD SGOT was 240.18±180 U/L; the range being 58 to 640 U/L. The mean ±SD for SGPT was 120.20 ±84.08 U/L; the range being 46 to 460 U/L. The mean ±SDfor PT was 12.44 ±2.28; the range being 10 to 24. The mean ±SD for aPTT was 32.74±2.2 4; the range being 31 to 48.
The mean± SD for INR was 1.12 ±0.14; the range being 0.90 to 1.65.
The mean ±SD leukocyte count in children with DNWS was 5860 ±3510 cells/µL, in DWWS was 4885±3420 cells/µL and in children with SDF was 5150±2860 cells/µL (p=0.712). The mean±SD platelet count in DNWS group was 130098±35550 cells/µL; DWWS was 80920±43880 cells/µL; SDF group was 48362 ±2520 cells/µL(p=0.00). The mean HCT was 37±4%, 38±6%, 36.5±7% in DNWS, DWWS and SDF group respectively (p=0.710). The mean SGOT was 118±84U/L, 174±120 U/L, 456±147U/L in DNWS, DWWS and SDF group respectively (p=0.00). The mean SGPT was 88±23 U/L, 92±28 U/L, and 198±120 U/L in DNWS. DWWS and SDF group respectively (p=0.00). The mean±SDtotalbilirubin in DNWS, DWWS, SDF groups were 0.5 ±0.17mg/dl, 0.64±0.60 mg/dl and1.07±0.88 mg/dl respectively (0.080). The mean±SD serum total proteins in DNWS, DWWS, SDF was 6.25±0.31g/dl, 6.12 ±0.82 g/dl and 3.94±1.42 g/dl respectively (p=0.00). The mean±SD serum albumin in DNWS, DWWS and SDF was 4.32 ±0.34 g/dl, 4.20 ±0.70g/dl and 2.52 ±1.10 g/dl respectively (p=0.00). The mean±SDPT was 12.2 ±1.12s, 12.66 ±1.82s, 14.46±3.82s in DNWS, DWWS and SDF groups respectively (p=0.009). The mean±SD INR was 1.09±0.06, 1.07±0.10, 1.16±0.12 in DNWS, DWWS and SDF groups respectively (p=0.024). SGOT levels in comparison with clinical classification of dengue feverSGOT

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. 8(80%) of children in DNWS group, 17(51%) of children in DWWS group and 1(10%) of children in SDF group had SGOT elevations less than 3 times the normal value. 1(10%), 6(18 %) of children inDNWS and DWWS respectively had SGOT elevations between 4 to 5 times the normal value. 1(10 %), 10(33%), 8(80%) of children in DNWS, DWWS and SDFgroups had SGOT elevations between 6 to 10 times the normal value. 2(20%) of children in SDF group had SGOT elevations >10 times the normal value.

SGOT levels in comparison with outcome of children with dengue fever.

Two children who expired of severe dengue fever in our study, one of them had SGOT level more than 5 times elevated and another had more than ten times elevation of SGOT.

SGPT levels in comparison with clinical classification Children in DNWS and DWWS had SGPT elevations <6 times the normal. 33% of children in SDF group had SGPT elevations more than 6 times the normal (p<0.05). 9(90% %) of children in DNWS, DWWS and SDF groups respectively had SGPT elevation <3 times the normal. 1(10 %), 4(12 %), 5(50 %) of children in DNWS, DWWS and SDF groups respectively hadSGPT levels elevated between 4 to 5 times the normal. 5(50 %) of children of SDFgroup had SGPT elevation between 6 to 10 times the normal. Overall 45(90 %), 10(20 %) and 5(10 %) of children had SGPT levels elevation <3 times, 4-5 times and 6-10 times the normal value respectively.

SGPT levels in comparison with outcome of dengue fever 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 hospitalstay in children with severe dengue fever. 60% of children with low protein levels had more than 6 days of hospital stayand 30% of children had more than 10 days of hospital stay(p=0.07). 1(10%), 8(80 %), 2(20 %) of children who had low serum albumin levels had stayed for duration in the hospital for 4-5days, 6-10days 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.[10-12]

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.[13]

Age: Dengue fever primarily is a disease of infants and children, although many adults may be afflicted with severe disease.66The mean age of presentation in children was 8. 14 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.[15,16]

Sex: In the present study, 60% were males and 40% were females. The Male:Female ratio was 1.8:1,which was comparable to the study by Gowda S et al(1.5:1).[17] The sex ratio in other studies were between 1.5-1.8. In our 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.[18]

Incidence: The incidence of severe dengue fever in our study was 25% which was comparable to the study by Bokade C M et al (22.7%).[19] In our study, Out of 50 children enrolled in the study group, based on the clinical manifestations, as per WHO classification,10(20%) belonged to the group dengue fever with no warning signs (DFNWS), 30(60 %) belonged to the group dengue fever with warning signs(DFWS) and 10(20%) belonged to the group severe dengue fever(SDF).

These findings were comparable to the study done by Neelam Mohan et al (DNWS-37.6%, DWWS-49.4%, SDF-17.9%).[20]

Out of 50 children, there were 2 (4 %) children <1 year of age, 1 in each group of DNWS and DWWS and none in SDF group. There were 8 (16%) children between 1 to 5 year of age, of which 2 had DNWS, 4 had DWWS and 2 had SDF. There were 30 (60%) children between 6 to 10 years of age of which 5 had DNWS, 20 had DWWS and 5 had SDF. There were 12 (24 %) children in the age group 11 to 18 years of which 2 had DNWS, 6 had DWWS and 4 had SDF.

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.[1,3,12,14-18]

In our study, fever was present in all children. This was similar to the studies done by Amrita et al and bokadeet al.[19]

Headache was seen in 5(50%) children with DNWS,4(12 %) children with DWWS, 4 (40%) children with SDF. Vomiting was seen in 25 (75%) children with DWWS and 8 (80%) children with SDF;(p value<0.05).Pain in contrast to the findings in Bokade et al 19 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 Gowda S, et al was 19.1% and 37% respectively.

Vomiting was seen in 25 (75%) children with DWWS and 8 (80%) children with SDF;(p value<0.05). And was comparable to the studies by Gowda S et al(60%) and Bokade et al.[19] (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%) 19, Amrita et al(68.5%) and Gowda S et al (51 .5%).

The overall incidence of Pain abdomen was seen in 8(80%) children in SDF,7 (21.5%) children with DWWS and 2 (20%) children with DNWS. while that in studies done by Bokade et al,[19] Gowda S 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 our study was 53.3% while that in studies done by Amrita et al and Bokade et al was higher (79.4% and 70% respectively).

The incidence of Arthralgia was seen in 1(10%) child with DNWS,6 (30%) children with DWWS and 2(20 %) children in SDF. while that in studies by Bokade et al 19was higher(58%) and Gowda S et al was lesser(12.5%). The incidence of Bleeding manifestations was seen in 4(40 %) of children in SDF group; while that in study by Bokade et al was higher (15.4%) and 16% in study by Gowda S, et al. The incidence of bleeding manifestation in children who suffered from SDF was 26.7% in our study while this incidence was 34% in Bokade et al 19 study and 32% in Gowda S, et al study.[28]

The incidence Abdominal distension was seen in 3(10 %) and 2(20 %) children in DWWS and SDF group respectively. while that in the study by Gowda S, et al was 22.5%.[28]

The CNS manifestations like lethargy/lethargy/restlessness/ convulsions was seen in 4(40%), 1(10%), 2(6.6%) children with SDF, DNWS and DWWS respectively. in our study was higher compared to study by Amrita et al (11.3 vs 6.3%).
The incidence of Edema was seen in 2 (20 %) children with SDF and 1(10%) child with DWWS. in contrast to the study by Bokade et al,[19] in which the incidence was 40.9%.71
Petechiae was seen only in 6 % 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.[19]
3.3% of the children in our study had icterus compared 7.2% in Bokade et al study.[19]
In our study all the children who had icterus were suffering from severe dengue fever($p<0.05$).
The incidence of icterus in SDF group of our study was 18 %while that in Bokade et alstudy was 23%.The incidence of hepatomegaly in our study was 46% while that in the study by Amrita et al and Gowda S, et al was 63.6% and 76.2% respectively.[19]
In our study Hepatomegaly was seen in 12(36.4%) of children with DWWS and 11(73.3%) of children in SDF. which was statistically significant($p<0.05$). The incidence of hepatomegaly in SDF group of Gowda S, et al and Amrita et al studies were 87.5% and 93% respectively.[19]
The correlation between hepatomegaly and SGOT levels was statistically significant ($p<0.05$) in our study. This observation was similar to study done by Bokade et al 19 was contrasting to the study by Amrita et al.[19]
The right Right hypochondriac tenderness was seen in (16.7%), (36.4%) and (73.3%) of children with DFNWS, DFWS and SDF respectively children in our study while its incidence was 57.5% and 28.6% in studies by Gowda S et al and Bokade et al respectively. The incidence of right hypochondrial tenderness was seen in 73.3% of children in SDF group in our study which was statistically significant($p<0.05$). Its incidence was 56% in Bokade et al 19 study and 80% in Gowda S, et al study.

Laboratory parameters

Dengue virus alters liver function. Liver injury may be due to direct effects of virus or immune response of host and/or hypoxia caused by hypotension or localised vascular damage inside the liver.
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.
The mean serum bilirubin, serum albumin, SGOT and SGPT levels in the present study were 0.76mg/dl, 3.8gm/dl, 240/L, 120.20 U/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.70The fact that SGOT is higher than SGPT, as reflected in our study also helps in differentiating dengue hepatitis from other viral hepatitis.
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 and lesser compared to the studies done by Chhina R S et al 29 (353U/L) and Amareshpatil et al(382U/L) 30.
In our study, the The mean SGOT was 118±84U/L, 174±120 U/L, 456±147U/L in DNWS, DWWS and SDF group respectively ($p=0.00$). 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.
The mean SGPT levels (120 U/L) were less when compared to studies done by Chhina R S et al 29 (218.6U/L) aM et al(144.85U/L). In our 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 al20 in which SGPT values in SDF,DWWS,DNWS were 1852U/L,104.6U/L and 60.66U/L respectively. 32,33

The mean total bilirubin (0.7mg/dl) in our study was also less when compared to the studies done by Chhina R S et al 29 (0.93mg/dl) and Wong M et al(1.62 mg/dl).13,81 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 20 in which total bilirubin values in SDF,DWWS and DNWS were 1.79mg/dl,0.49 mg/dl and 0.03 mg/dl respectively. The mean ALP level in our 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 and Prakash et al studies.11,14 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 our study was comparable to the studies done by Chhina RS et al(3.2gm/dl) and Wong M et al(3.8gm/dl).

The mean value of Serum albumin was lower in SDF group(2.52g/dl) than in DNWS(4.32g/dl) and DWWS (4.20 g/dl)groups;($p<0.05$),which was comparable to the study done by Neelam Mohan et al in which serum albumin values in SDF,DWWS and DNWS were 2.47g/dl,3.57g/dl and 3.88g/dl respectively.[19]

The mean PT, aPTT and INR was 12.2 seconds, 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 Gowda S, et al.

Mortality: Two out of 60 serologically positive cases in our study expired to 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

The clinical manifestations, laboratory, and pathological findings suggest that liver involvement is very common in DHF. The extent of liver damage may range from asymptomatic with slightly elevated AST and ALT to ALF. Hepatic injury in DHF could be from the direct cytopathic effects of DENV and caused hepatocytes apoptosis. Moreover, the immune-mediated hepatocytes injury by CD4 lymphocyte induced hepatitis and cytokine storm are also crucial factors.

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.

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