



**THE RELATIONSHIP BETWEEN BIOCHEMICAL
CHANGES IN THE LIPID PROFILE AND LIVER FUNCTION TEST
AND THE SEVERITY OF DENGUE INFECTION; A CROSS-
SECTIONAL, OBSERVATIONAL STUDY.**

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ABSTRACT

DF is caused by a mosquito-borne virus and normally resolves itself. This disease is caused by one of four dengue viruses. Blood aminotransferases and transaminases are elevated in DF patients due to liver dysfunction. Reactive hepatitis and virus-induced hepatocyte injury raise enzyme levels. Hepatitis may cause bleeding, renal failure, encephalopathy, and acalculous cholecystitis. Thrombocytopenia and liver dysfunction induce bleeding. As a result, we've made the decision to include monitoring of LFT and LF in our study of DF patients. SDF affected liver function tests and fasting lipid profiles in this study. Total cholesterol, HDL and LDL levels all decrease, suggesting a lipid infection. Thus, we conclude that severe infection tests may improve dengue treatment by early triaging patients.

Keywords: Dengue fever, HDL, lipid profiles, liver function .

INTRODUCTION

DF is caused by a mosquito-borne virus that usually goes away on its own. The virus is a single-stranded RNA virus. It is carried by the Flaviviridae mosquitoes *Aedes aegypti* and *Aedes albopictus*. DSS/DHF symptoms vary from low fever to life-threatening shock and bleeding. Studies have shown that DF has spread to 112 nations in South and Southeast Asia, Africa, South and North America, and the Mediterranean region as a consequence of its rapid worldwide expansion. DF causes 45–105 million cases of hemorrhagic fever, 550,000 cases, and 13,000 deaths per year. 90% of dengue fatalities occurred in children under the age of 14.¹ Though DF is a viral disease that self-limits, it may lead to life-threatening consequences in a very significant number of patients, especially during the critical phase of illness.¹ Most DF patients have liver involvement with increased blood aminotransferases and transaminases. Reactive hepatitis as well as virus-induced hepatocyte damage raise enzymes. Pstudies have shown that patients with hepatitis have a higher risk of bleeding, renal failure, encephalopathy, and acalculous cholecystitis. Deranged liver function causes bleeding in addition to thrombocytopenia.² Thus, in our study we have decided to monitor liver function and lipid profiles in the management of patients with DF.

AIMS

The goal of this study was to evaluate the correlation between severity liver function and lipid profile in terms of DF.

INCLUSION CRITERIA

1. Patients with age group of more than 15 years of age were included in the study.
2. Patients who had DS Positive (NS1 Antigen positive, IgM Positive , IgG Positive) .
3. Both male & female were included in the study.

EXCLUSION CRITERIA

1. Patients who are suffering with chronic liver disease , viral hepatitis (Hep A,C,B,E) , Leptospirosis, Malaria, Typhoid were excluded from the study.
2. Patients who all were pregnant.
3. Patients who all are chronic alcohol abusers.
4. Patients on lipid lowering drugs , corticosteroids.
5. Patients who have taken oral contraceptives in past or present.

MATERIALS & METHOD

TYPE OF STUDY - We have conducted a cross –sectional & observational study for our research.

STUDY SETTING – We have included patients who were diagnosed with dengue fever & reported to the hospital of Krishna Hospital & Medical Reserach Centre, Karad for around 18 months in total.

DURATION OF STUDY- Our study was conducted for over a period of 18 months starting from October, 2018 to March, 2020.

ETHICAL CLEARANCE – We had applied & received ethical clearance from our college & university committee. After taking the clearance, permission was taken from head of departments .

SAMPLE SIZE- A total of 75 patients were included for our present study.

INFORMED CONSENT

All those patients who were full filling the selection criteria were briefly explained about the nature of the study & included in the study after obtaining a written & informed consent from the patients .

DATA COLLECTION

Patients who satisfied the selection criteria were selected for the study. Patients were interviewed for age, gender, symptoms and diagnosis. Patients underwent for clinical examination, vital signs and systemic findings. These findings were reported on a pre-made and tested proforma.

INVESTIGATION

Patients underwent CBC,LFT,LP, DF IgM , IgG & Ag serology test. DT are done by rapid diagnostic kit (Dengue card rapid) of Mitra company using solid phase ICT for detection of DF Ns 1 antigen & differential detection IgM/ IgG antibodies to DF virus. LFT were done in the serum sample (Transasai v2 analyser). Furthermore, fasting blood sample was taken for lipid analysis on an automated chemical analyser, the serum LP in the form of TC, HDLC , LDLC , VLDLC and TGL was analysed on the same day of the withdrawal of blood.

STATISTICAL ANALYSIS

For the statistical analysis, we utilized the trial version of SPSS 23 from IBM, Inc. After being recorded on a study pro forma sheet, the collected data was fed into statistical analysis software. In the form of frequency and percentage, qualitative data were represented. Using the mean, standard deviation, and median, numerical data was represented. In order to do a frequency analysis, the data was organized into tables and graphs. A 'p' value of 0.05 was considered statistically significant by testing with Chi-square test and the student's 't' test.

RESULT

AGE

Age	Frequency	Percent
< 20 years	16	17.8%
21 to 30 years	37	41.1%
31 to 40 years	18	20.0%
41 to 50 years	11	12.2%
51 to 60 years	8	8.9%

Total	90	100.0%
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TABLE 1 :AGE DISTRIBUTION.

In our study we have found that, most common age group was 21 to 30 years with 37 patients (41.1%), followed by 31 to 40 years with 18 patients (20%), 16 patients of age less than 20 years (17.8%), 11 patients of age 41 to 50 years (12.2%), 8 patients of age 51 to 60 years (8.9%). We observed the mean age of 31.39 ± 11.65 years respectively.

GENDER

Gender	Frequency	Percent
Female	40	44.4%
Male	50	55.6%
Total	90	100.0%

TABLE 2: GENDER DISTRIBUTION

In our study we have found that , there were total 50 males with 55.6% & 40 female with 44.4% patients out of 90 patients in our study . The male: female ratio was 1.25 : 1 respectively in our study.

SEVERITY OF DISEASE

	Frequency	Percent
DF	49	54.4%
DHF	34	37.8%
DSS	7	7.8%
Total	90	100.0%

TABLE 3: SEVERITY OF DISEASE.

In our study we have found that, majority of the patients were diagnosed as DF, 49 cases with (54.4%), 34 cases had DHF (37.8%) and 7 cases had DSS (7.8%) respectively.

PLATELET COUNTS

Platelet Counts	Frequency	Percent
< 20,000	5	5.6%
20,000 to 50,000	44	48.9%
50,000 to 1,00,000	24	26.7%

> 1,00,000	17	18.9%
Total	90	100.0%

TABLE 4 : PLATELET COUNT.

In our study we have found that , total of 5 patients had platelet counts less than 20,000 (5.6%), 24 patients had 20,000 to 50,000 (26.7%), 44 patients in majority had counts 50,000 to 1,00,000 (48.9%) and 17 cases had platelets more than 1,00,000 (18.9%). Mean Platelet count was 51288.889 ± 8640.21 respectively.

LFT & SERUM ALBUMIN

	Frequency	Percent
ALT Raised	67	74.4%
AST Raised	76	84.4%
Total Bilirubin Raised	14	15.6%
S. Albumin Reduced	51	56.7%

TABLE 5 : LFT & SERUM ALBUMIN.

In our study we have found that , when we evaluate the patients based on LFT, we found that 67 patients had raised ALT (74.4%), 76 patients had raised AST (84.4%), 14 patients had raised total bilirubin (15.6%) and 51 patients had decreased serum albumin (56.7%) respectively.

DEARANGED LIPID PROFILE

	Frequency	Percent
Total Cholesterol Decreased (<100)	26	28.9%
TG Decreased (<100)	35	38.9%
LDL Cholesterol Decreased (<80)	40	44.4%
HDL Cholesterol Decreased (<40)	67	74.4%

TABLE 6 : DERANGED LIPID PROFILE.

In our study we have found that, 67 patients had decreased HDL cholesterol (74.4%), 40 patients had decreased LDL cholesterol (44.4%), 35 had decreased TG (38.9%) and 26 cases had decreased total cholesterol (28.9%) respectively.

ALT & AST LEVELS

	ALT Levels	AST Levels
< 50	42	31
50 to 150	19	25
150 to 250	21	13
>250	8	21
Total	90	90

TABLE 7 : ALT & AST LEVEL.

In our study we have found that, 42 patients (46.7%) with ALT less than 50 and 31 patients (34.4%) with AST less than 50, 19 patients (21.1%) with ALT 50 to 150 and 25 patients (27.8%) with AST 50 to 150 , 21 patients (23.3%) with ALT 150 to 250 and 13 patients with AST 150 to 250 (14.4%) , 8 patients (8.9%) with ALT more than 250 and 21 patients (23.3%) with AST more than 250 respectively.

LFT & SDF

Tests	DF (49)	DHF (34)	DSS (7)	Total (90)	Chi Square Test, DF =2
ALT Raised	26	34	7	67	$X^2= 25.85$, 'p'< 0.001, Significant
AST Raised	35	34	7	76	$X^2 = 13.87$, 'p'< 0.001, Significant
T. Bili Raised	0	8	6	14	$X^2= 36.24$, 'p'< 0.001, Significant
S Alb. Decreased	11	33	7	51	$X^2= 51.31$, 'p'< 0.001, Significant

TABLE 8 : LFT & SDF.

In our study we have found a statistically significant association between the LFT and SDF (p<0.05). Here, out of total 49 cases of DF, 26 had ALT raised (53.1%), 35 had raised AST (71.4%), serum albumin was decreased in 11 cases (22.4%). Out of 34 cases of DHF, all had raised ALT and raised AST (100%), 8 had raised total bilirubin (23.5%), 33 cases had

decreased serum Albumin (97.1%). Out of 7 cases of DSS, all 7 had raised ALT, AST, and reduced Albumin (100%) and 6 had raised total Bilirubin(85.7%) respectively.

LP & SDF

Tests	DF (49)	DHF (34)	DSS (7)	Total (90)	Chi Square Test, DF = 2
TC Decreased	5	14	7	26	$\chi^2 = 28.05$, 'p' < 0.001, Significant
TG Decreased	11	17	7	35	$\chi^2 = 18.39$, 'p' < 0.001, Significant
LDL Decreased	10	23	7	40	$\chi^2 = 27.62$, 'p' < 0.001, Significant
HDL Decreased	27	33	7	67	$\chi^2 = 21.18$, 'p' < 0.001, Significant

TABLE 9: LP & SDF.

In our study we have found that, stastically significant association was seen between the LP and SDF ($p < 0.05$). Out of total 49 cases of DF, 5 had TC decreased(10.2%), 11 cases had TGL (22.4%), 10 cases had LDL (20.4%) and 27 had decreased HDL (55.1%). Out of total 34 cases with DHF 14 had TC decreased (41.2%), 17 cases had TGL decreased (50%), 23 cases had LDL decreased (67.6%) and 33 had decreased HDL (97.1%). All 7 cases of DSS (100%) had TC decreased, TGL decreased, LDL and HDL decreased respectively.

MEAN ALT LEVEL & SDF

		No.	Mean	SD	P Value
ALT	DF	49	43.34	35.67	<0.001, Significant
	DHF	34	156.00	63.46	
	DSS	7	311.14	63.93	

TABLE 10 : MEAN ALT LEVEL & SEVERITY.

In our study we have found that, there was a significant stastical difference between mean values of ALT & SDF .

MEAN AST LEVELS & SDF

		No.	Mean	SD	P Value
AST	DF	49	52.63	43.18	<0.001, Significant
	DHF	34	216.67	93.86	
	DSS	7	412.28	50.99	

TABLE 11 : MEAN AST LEVEL & SEVERITY OF DF.

In our study we have found that , there was a stastically significant difference seen between the mean values of AST & SDF.(p<0.001).

MEAN TOTAL CHOLESTEROL & SDF

		No.	Mean	SD	P Value
TC	DF	49	144.02	25.05	< 0.001, Significant
	DHF	34	114.11	25.55	
	DSS	7	91.14	3.62	

TABLE 12 : MEAN TOTAL CHOLESTEROL & SDF.

In our study we have found that, there was a stastical significant difference seen between mean values of total cholesterol in SDF.(p<0.001).

MEAN LDL CHOLESTEROL & SDF

		No.	Mean	SD	P Value
LDL	DF	49	94.04	20.49	< 0.001, Significant
	DHF	34	73.61	21.65	
	DSS	7	57.00	8.30	

TABLE 13: MEAN LDL CHOLESTEROL & SDF.

In our study we have found that, there was a stastically significant difference seen between the mean values of LDL cholesterol & SDF (p< 0.001).

MEAN HDL CHOLESTEROL & SDF

		No.	Mean	SD	P Value
HDL	DF	49	37.91	8.78	< 0.001, Significant

DHF	34	29.50	6.03
DSS	7	23.42	3.40

TABLE 14 : MEAN HDL & SDF

DISCUSSION

Various past studies have proved that DF is a recurring public health problem, mainly in Southeast Asia, and its spectrum encompasses mild febrile illness, DHF & DSS.³ Studies have shown that biochemical alterations, may act as early indications of DF.^{4,5} Thus, in our study, we reviewed data from a total of 90 people diagnosed with dengue fever to see how the illness affects liver function and lipid profiles and to see whether there is a link between these findings and the severity of the condition.

AGE & GENDER

In our study proportions of DF, DHF and DSS were 54.4%, 37.8%, and 7.8%, respectively. 31.39 and 11.65 years were the mean ages of patients. Furthermore, most affected age group was 21–30 years (41.1%), followed by 31–40 (20%), 20 (17.8%), 41–50 (12.2%), and 51–60 (8.9%). In this study, males made up 55.6% of patients and females 44.4%, for a male-to-female ratio of 1.25:1. No association was found between age and dengue severity. Males had a higher proportion of DHF ($p = 0.028$). Similar findings as that of our study was reported in a study by Ahmed et al., where the proportions of DF, DHF, and DSS were 89.82%, 6.79%, and 3.39%, respectively.⁶ The mean age of patients with DF was 37.12 15.45 (4–80 years). 245 males to 108 females (69.4 to 30.6) The proportion of DF to DHF is 84.9 to 15.1, as reported by Villar-Centeno et al.,⁷ With a mean age of 26.4±171 years, males (49.8%) and females (51.2%) had similar proportions. In a Mohd Yaseen et al. study, DF, DHF, and DSS proportions were 81%, 15%, and 4%. Patients had a mean age of 30.41±11.4 years, with males making up 59% and females 41%.⁸ Chaudhuri, N. et al. reported DF, DHF, and DSS proportions of 75%, 16.66%, and 7.1%. Patients had a mean age of 34.63 13.28 years, with 53.33% female and 46.66 percent male. Researchers found no association between age or gender and dengue fever severity.⁹ Santhosh et al., reported a proportion of DF, DHF, and DSS of 48%, 34%, and 18%, with the mean age of patients with DF being 55–15 years.¹⁰ Their study included 31 females (62% of the total) and 19 males (38%). In Rajoo et al.'s study, the patients' mean age was 31.6 years old, ranging from 15 to 80. These findings are due to tiny sample sizes.¹¹

LFT

In our study we found that on evaluating LFT ,ALT was raised in 74.4% of patients. DF, DHF, and DSS had mean ALTs of 43.34±35.67, 156.00 ±63.46, and 311.14± 63.93. DF, DHF, and DSS had mean ASTs of 52.63±43.18, 216.67±93.86, and 412.28±50.99. DF had 1.02±0.28, DHF 2.05±0.19, and DSS 3.72±0.61. DF had 3.72 ±0.28, DHF 3.06 ±0.19, and DSS 1.72± 0.61. Abnormal liver function was shown to increase with dengue severity ($p < 0.05$). The severity of the fever was reflected in changes in liver function tests ($p < 0.05$). Rajoo

et al., concluded the mean ALT levels in DF, DHF, and DSS as 174.6 ± 11 , 254.5 ± 80 , and 819 ± 431.5 ; mean AST levels as 277.18 ± 20.5 , 478.4 ± 163.5 , and 1234.7 ± 787.6 . The severity of the fever was reflected in changes in liver function tests ($p < 0.05$).¹¹

LP

The patients' lipid profiles in our study indicated that 39% DF patients had elevated TGL, 29% fewer patients had up HDL levels and 28.9% patients had lowered TC. In DF, DHF, and DSS, the mean TC was 144.02 ± 25.05 , 114.11 ± 25.55 , and 91.14 ± 3.62 respectively. TGL had a mean of 114.77 ± 25.12 , 101.76 ± 18.46 , and 81.85 ± 4.22 . 94.04 ± 20.49 , 73.61 ± 21.65 , and 57.00 ± 8.30 were the mean LDL cholesterol levels in DF, DHF, and DSS, respectively. The mean HDL levels were 37.91 ± 8.78 , 29.50 ± 6.03 , and 23.42 ± 3.40 . LP changes were significantly associated with SDF ($p < 0.05$). TC, LDL cholesterol, HDL cholesterol, and TGL mean levels were all significantly different between SDF groups ($p < 0.001$). Santhosh et al., found that the average values for total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides were 189 ± 17.16 , 140.95 ± 15.9 , and 91.86 ± 23 , respectively; 132 ± 47 , 171 ± 70 , and 255 ± 57 for DF, DHF, and DSS, respectively; 119 ± 12.94 , 74.84 ± 19.9 , and 42.29 ± 17.44 .¹³ The severity of the fever was reflected in changes in the lipid profile ($p < 0.05$). TG levels were shown to be inversely associated with the severity of Dengue infection, as reported by Villar-Centeno et al.⁷ Durán A et al., reported lipid profile changes in severe Dengue patients: total cholesterol was decreased in all forms, LDL was dramatically decreased in severe Dengue, and triglycerides were elevated in severe cases.¹⁴

CONCLUSION

DF is one of the most commonly hospitalized viral infections. It may cause mild symptoms, a low fever, severe bleeding, shock, ARDS and death. The current study examined the effects of SDF on liver function tests and fasting lipid profiles. Biochemical changes like increased AST, ALT, decreased total cholesterol, HDL and LDL indicate a lipid infection. These screenings for severe infection may enhance dengue therapy by triaging patients early.

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