

A Prospective Observational Study of Comparison of Lipid Profile with Liver Function Tests in Dengue Fever

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Abstract

Introduction: Dengue is an acute viral infection hyper-endemic in tropics where significant population is at risk. The World Health Organization (WHO) estimated that 50 million dengue infections occur annually, making it as the most rapidly spreading arbo viral infection

Materials and Methods: This prospective observational study was taken up involving 40 adults diagnosed with dengue fever and admitted to Maheswara Medical College between December 2017 to December 2018. Patients were classified according to WHO criteria based on the severity of presentation and were grouped as: Group 1 Dengue fever (DF), Group 2 Dengue Haemorrhagic Fever (DHF), Group 3 Dengue Shock Syndrome (DSS). All patients were included into the study after obtaining written informed patient consent. Ethical clearance was obtained from the Institutional Ethics Committee. Sample size has been taken based on the convenience of the study

Results: The study population comprised of 40 Dengue seropositive cases amongst whom 21 were females and 19 males. The average age of the cases was 55 ± 15 years. The study subjects were divided into 3 groups: Group I 14 cases of dengue fever, Group II 17 cases of dengue haemorrhagic fever, Group III 9 cases of dengue shock syndrome. The cholesterol reduced with increasing severity of infection and on subsequent estimation, the serum total cholesterol levels showed improvement signifying recovery of the patient. The liver functions especially the liver enzymes were altered during admission and improved on day 5. This was statistically significant change in all 3 groups. The total protein and albumin showed statistically significant changes in dengue fever and dengue haemorrhagic fever as compared to dengue shock syndrome. This signifies that extent of damage is more in group three and thus the recovery is slow.

Conclusion: Lipid profile changes accompany dengue infection, some of which may indicate severity and guide therapy. Consecutive estimation of the same parameters on day five of hospitalization showed statistically significant differences in total cholesterol levels across the three groups. The lipid profile of subjects showcased the tendency to approach normal levels during recovery phase. This reversible trend suggests dengue fever as a potential cause for lipid alteration. These abnormal values may serve as indicators for recognition of patients at increased risk for DHF and DSS, thus serving as prognostic markers of the dengue infected individuals.

Key words: Dengue, haemorrhagic fever, dengue shock syndrome,

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I. Introduction

Dengue is an acute viral infection hyper-endemic in tropics where significant population is at risk.¹ The World Health Organization (WHO) estimated that 50 million dengue infections occur annually, making it as the most rapidly spreading arbo viral infection.² Dengue is caused by RNA virus of the genus Flavi virus. There are four distinct serotypes called dengue virus (DENV) type 1 to 4 and it is transmitted to humans through the bites of infected Aedes mosquitoes, mainly by female Aedes Aegypti as well as Aedes Albopictus.³

The nonspecific febrile illness with mild flu-like syndrome is known as dengue fever (DF). Infection with any of the DENV serotypes can result in a wide spectrum of symptoms, characterized by coagulopathy, increased vascular fragility and permeability, leading to manifestation of capillary leak and haemorrhage, known as dengue haemorrhagic fever (DHF). In severe cases, the increased vascular permeability leads to circulatory compromise and the patient may develop potentially life-threatening dengue shock syndrome (DSS).⁴ The more complicated forms of dengue also present with fever and initial symptoms are indistinguishable from the benign DF thus leading to delayed diagnosis of DHF and DSS. Hence, it is important to explore prognostic markers of severe disease during acute phase of the infection. The morbidity and the mortality of DHF can be reduced by early diagnosis, hospitalization and symptomatic care.^{5,6}

II. Materials And Methods

This prospective observational study was taken up involving 40 adults diagnosed with dengue fever and admitted to Maheswara Medical College between December 2017 to December 2018. Patients were classified according to WHO criteria based on the severity of presentation and were grouped as:

Group 1 Dengue fever (DF)

Group 2 Dengue Haemorrhagic Fever (DHF)

Group 3 Dengue Shock Syndrome (DSS)

All patients were included into the study after obtaining written informed patient consent Ethical clearance was obtained from the Institutional Ethics Committee. Sample size has been taken based on the convenience of the study

Inclusion Criteria: Adults diagnosed as having dengue fever on basis of IgM ELISA test for dengue fever.

Exclusion Criteria:

- Patients with diabetes mellitus and hypertension.
- Patients on lipid lowering drugs, corticosteroids, oral contraceptives, antitubercular therapy.
- Patients with history of ischemic heart disease, congestive cardiac failure, chronic renal failure, chronic liver disease.
- Pregnant women.
- Alcoholic liver disease.
- Blood coagulation disorders.
- Nephrotic syndrome.

Detailed history was taken and meticulous clinical examination was carried out according to the pre-texted protocol. Information from all patients regarding any co-morbid conditions, medications being taken and past dengue infection was also collected. Fasting serum lipid profile and liver functions was tested on Day of admission, Day 1. Second estimation of all the same parameters was done on Day 5 of hospitalization. Serum triglycerides, cholesterol, HDL were estimated. LDL and VLDL were calculated using Friedwald's formula. Methodology The data was presented as mean and standard deviation. Statistical analysis was done using SPSS 16.0 version, IBM.

III. Results

The study population comprised of 40 Dengue seropositive cases amongst whom 21 were females and 19 males. The average age of the cases was 55 ± 15 years. The study subjects were divided into 3 groups:

Group I 14 cases of dengue fever.

Group II 17 cases of dengue haemorrhagic fever.

Group III 9 cases of dengue shock syndrome.

S.No		At Admission	Recovery Phase
1	Haematocrit	43.56	44.54
2	Haemoglobin(g/dL)	11.65	14.32
3	Red Blood Cell Count	4.85	5.05
4	White Blood Cell Count	5.64	7.32
5	Platelet Count	58.2	186.43

Table 1: Comparison of Hematological Parameters

S.No	Parameters	At Admission	On day 5
1	Total protein	6.35±0.54	6.84±0.42
2	Albumin	3.68±0.78	3.72±0.32
3	Total Bilirubin	2.15±1.2	3.72±0.41
4	Direct Bilirubin	1±0.6	0.52±0.3
5	AST	114±56	36±19
6	ALT	78±47	30±18
7	ALP	117±42	68±20
8	creatinine	0.92±0.11	0.85±0.08
9	Blood Urea Nitrogen	35.2±12.2	25.4±9.10
10	Total Cholesterol	174±16.54	190±18.65
11	Triglycerides	128±46	128±42
12	HDL	39±12	37±8
13	LDL	118±11.32	120±16.5
14	VLDL	28±8	26±9

Table 2: Biochemical Investigations of Dengue Fever Patients on Day 1 and Day 5 Wilcoxon Summed Rank Test

S.No	Parameters	At admission	On Day 5	P value
1	Total Protein	6.25±0.65	6.5±0.65	0.001
2	Albumin	3.57±0.27	3.75±0.35	0.000
3	Total Bilirubin	4.45±2.45	1.54±0.85	0.001
4	Direct Bilirubin	2.32±1.60	1.08±1.05	0.001
5	AST	320±201	114±123	0.001
6	ALT	213±120	63±50	0.001
7	ALP	164±112	113±67	0.001
8	Creatinine	1.08±0.23	0.92±0.15	0.001
9	Blood Urea Nitrogen	48.2±14.8	33.2±14.28	0.001
10	Total Cholesterol	140.60±12.6	156±16.25	0.001
11	Triglycerides	169±69	165±62	0.001
12	HDL	35±6	42±8	0.001
13	LDL	75.65±18.7	82.65±22.17	0.001
14	VLDL	32±16	34±17	0.001

Table 3: Biochemical Investigations of Dengue Haemorrhagic Fever Patients at Admission and On Day 05

S.No	Parameters	At admission	On Day 5	P value
1	Total Protein	6.25±1.15	6.23±1.03	0.001
2	Albumin	3.35±0.56	3.24±0.47	0.000
3	Total Bilirubin	7.50±2.6	2.7±1.3	0.001
4	Direct Bilirubin	2.5±1.2	2.1±4.1	0.001
5	AST	743±232	301±116	0.001
6	ALT	568±201	325±175	0.001
7	ALP	165±28	116±37	0.001
8	Creatinine	1.08±0.27	0.87±0.18	0.001
9	Blood Urea Nitrogen	44.6±22	29.7±11	0.001
10	Total Cholesterol	90.76±22	106.13±19	0.001
11	Triglycerides	243±56	203±90	0.001
12	HDL	34±16	37±10	0.001
13	LDL	43±16.32	55±12	0.001
14	VLDL	52±10	41±19	0.001

Table 4: Biochemical Investigations of Dengue Shock Syndrome Patients at Admission and On Day 05

The cholesterol reduced with increasing severity of infection and on subsequent estimation, the serum total cholesterol levels showed improvement signifying recovery of the patient. The liver functions especially the liver enzymes were altered during admission and improved on day 5. This was statistically significant change in all 3 groups. The total protein and albumin showed statistically significant changes in dengue fever and dengue haemorrhagic fever as compared to dengue shock syndrome. This signifies that extent of damage is more in group three and thus the recovery is slow.

The renal functions were also altered with increasing severity of dengue infection. Serum creatinine and blood urea nitrogen showed statistically significant changes in group I and II denoting the faster recovery amongst these patients.

S.No	Parameters	DF	DHF	DSS
1	Total Protein	6.46±0.56	6.27±0.73	6.02±1.16
2	Albumin	3.58±0.76	3.37±0.38	3.34±0.46
3	Total Bilirubin	2.13±1.2	2.6±1.3	7.43±2.6
4	Direct Bilirubin	2.4±1.1	2.1±3.8	2.6±1.3
5	AST	745±234	304±116	748±237
6	ALT	576±210	316±172	582±205
7	ALP	165±24	116±38	165±29
8	Creatinine	1.07±0.26	0.91±0.15	11.09±0.23
9	Blood Urea Nitrogen	45.9±19	48.3±14.2	44.6±2.1
10	Total Cholesterol	90.65±21	138.86±14.8	92.6±21
11	Triglycerides	245±54	169±63	254±56
12	HDL	34±14	35±6	35±13
13	LDL	41.45±16.32	16.34±18.5	42.19±16.34
14	VLDL	48±12	32±10	50±12

Table 5: Kruskal Wallis Test at The Time of Admission Between Dengue Fever, Dengue Haemorrhagic Fever and Dengue Shock Syndrome

IV. Discussion

The lipid profile showed alterations which correlated with the dengue infection. The total cholesterol reduced, and triglycerides elevated with severity of illness. The consecutive readings of lipid profile showed changes towards normalcy when compared with the values obtained on admission. Alterations in the liver function tests reflected the severity of the fever. The renal dysfunctions were also noted with increased severity of dengue.⁷

Severity of dengue increases with increasing age, serotype, genotype of the virus and the genetic background of the host.⁸ Dengue is more commonly seen in females, individuals with high body-mass index (BMI), infection with certain virus strains, or individual genetic susceptibility.⁹ Age is undoubtedly a significant factor in outcome from serious illness as amplified inflammatory response is associated with elderly patients.

The total cholesterol in this study population was seen to be negatively correlated, reduced with increasing severity of the disease. This finding was in agreement with the studies by Suvarna et al and Villar-Centeno et al.¹⁰ Cholesterol is required for metabolism of flavivirus which may be one of the causes for relative hypocholesterolemia with increased viral load. TNF- α and IL-1 released during inflammation as a result of dengue infection influence HMG CoA reductase, thereby causing lowering of serum cholesterol with increased infection. The serum cholesterol concentration is lowest in DSS patients, in whom the mortality rate is highest amongst all dengue cases. In this study the triglyceride concentrations are elevated with increased severity of infection which is in agreement with Gorp et al. Cytokines such as TNF- α , IL-1 and IF released during viral infection activate β adrenergic system and in turn increase lipolysis. This leads to elevation of fatty acid levels and triglyceride formation.¹¹

V. Conclusion

Lipid profile changes accompany dengue infection, some of which may indicate severity and guide therapy. Consecutive estimation of the same parameters on day five of hospitalization showed statistically significant differences in total cholesterol levels across the three groups. The lipid profile of subjects showcased the tendency to approach normal levels during recovery phase. This reversible trend suggests dengue fever as a potential cause for lipid alteration. These abnormal values may serve as indicators for recognition of patients at increased risk for DHF and DSS, thus serving as prognostic markers of the dengue infected individuals.

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