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Original Research Article

A Study on Correlation of Renal and Liver Function Test Parameters with Platelet Counts in Dengue Viral Infection: A Prospective Study

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Abstract

Introduction: Dengue is an arbo-viral disease of tropical areas. WHO estimates almost half the world's population lives in countries where dengue infection is endemic. Various parameters have been used for assessing the severity, platelet are one such important predictors. Liver and kidney function abnormalities has also been noted in some patients.

Aims and Objectives: The present study aims to analyze the platelet counts and biochemical abnormalities of liver and renal involvement in dengue patients, also to see the correlation between platelet counts and LFT, RFT in predicting the disease course.

Materials and Methods: A total number of 102 cases positive for Dengue NS1/ Ig M antibodies were included in the study from department of pathology, MNR Medical College over a period of 10 months from March 2019 to December 2019. Blood counts, LFT and RFT were evaluated. Statistical analysis with p value of less than 0.05 was considered significant.

Results: A total of 102 confirmed cases of dengue were studied for various parameters. Patients from 15 years to 70 years of age with m:f ratio of 1.5:1, showed elevated Liver and renal function test parameters.

Conclusion: Alteration in AST, ALT levels was seen in all the cases. Renal function tests were elevated in only few people. Correlation between platelets count and LFT, RFT parameters showed inverse relation with statistical significance. Hence, these parameters can be utilized for monitoring the course of the disease.

Keywords: Biochemical abnormalities; Dengue; Platelet counts; Predictors of course.

Introduction

Dengue is an important tropical arboviral disease in the world today. The WHO estimates 50 million dengue infections to be occurring annually and almost half the world's population lives in countries where dengue infection is endemic.[1] Thrombocytopenia is the most common finding, and has been one of the criteria's used by WHO guidelines in potential indication of clinical severity. The Platelet counts tend to fall over the illness course, Lower counts (less than $50X10^9/L$) are seen frequently in severe disease,[2] increasing the risk of bleeding. Of the Biochemical parameters, liver and renal function abnormalities can helps predict severity of the respective organ injury[3,4] and thus the disease progress. High incidence of disease, complexity of diagnosis and higher morbidity

levels has evoked interest in the present study.

Aims and Objectives

The present study aims

1. To analyze the platelet counts and the biochemical abnormalities indicative of liver and renal dysfunction in dengue patients.
2. To study the correlation between platelet counts, liver function test and renal function test
3. And to ascertain their significance in predicting the course of the disease.

Materials and Methods

The present study was a prospective study undertaken at MNR medical college and hospital from March 2019 to December 2019. All serologically confirmed patients of dengue viral infection using NS1 Antigen/ELISA Ig M capture method underwent detailed clinical examination and laboratory investigations. Patients with co-infections, children less than 15 years of age and other causes of thrombocytopenia were excluded from the study. Approx. 5cc of blood samples were drawn in different vacutainer (EDTA for CBC, platelet counts, blood urea and plain tubes for renal function tests, liver function tests). Complete blood counts were carried out by automated cell counts analyzers (MINDRAYBC 3000 PLUS) along with a peripheral smear on slide, stained with Leishman to confirm platelets counts. Liver function tests and renal function tests were performed photometrical with standard kits with a routine fully automatic chemical analyzer. Statistical analysis was done by Microsoft excel spreadsheet formulation and p value of less than 0.05 was considered significant.

Results

A total of 102 confirmed cases of dengue by NS1 antigen/IgM antibodies were studied for various parameters. Patients from 15 years to 70 years age, presented with Fever and rash (87.2%), malena or epistaxis (*n*=21.8%), body pains (*n*=32.7%), abdominal pain (*n*=13.6%). Male to female ratio was 1.5:1.

Platelets counts showed moderate thrombocytopenia (between 50,000 and 1.0 lakh/cu.mm) in majority of cases (47.05%), and severe thrombocytopenia (<50,000/cu.mm) in 30.39% cases.

Table 1 shows platelets count comparison with AST, ALT, Blood urea, serum creatinine and urine proteins values in patients having platelets above 1.5 lakhs/cu.mm (8.8%) , mean platelet value was 2,23,556/cu mm, mild increase in AST, ALT levels were noted in all the patients, along with blood urea, serum creatinine in normal range without protienuria.

Correlation between platelets and AST in group 50,000 to 1.0 lakh/cu. mm was r=– 0.28,p value was 0.030418, that with ALT was r=– 0.31, p value was 0.526728. Blood urea levels showed r=– 0.16, p of value 0.523907, serum creatinine had r=– 0.18, p value 0.712636.

Table 1: RFT and LFT values in patients with platelets above 1.5lakhs/cu. mm.

Sl. No.	Parameter	Number	%	Mean	Minimum	Maximum
1	platelet counts> 1.5lakhs/cu.mm	9	8.8	2,23,556	1,70,000	3,00,000
2	AST (IU/ml)					
	mild increase(<80 IU/ml)	9	100	34.2	18	51
	moderate(81-160 IU/m)	0	–	–	–	–
	severe(>160 IU/ml)	0	–	–	–	–
3	ALT(IU/ml))					
	mild increase(<80 IU/ml)	9	100	25.2	12	34
	moderate(81-160 IU/m)	0	–	–	–	–
	severe(>160 IU/ml)	0	–	–	–	–
4	blood urea <45mg/dl	9	100	27.3	21	38
	>45mg/dl	0	–	–	–	–
5	creatinine <1.5mg/dl	9	100	0.9	0.6	1.2
	>1.5mg/dl	0	–	–	–	–
6	urine albumin-traces	9	–	–	–	–
	1+	0	–	–	–	–
	2+	0	–	–	–	–
	3+	0	–	–	–	–

Patients with platelets count in between 1.0lakh to 1.5 lakhs/cu. mm (*n*=14) showed mean platelet count of 1,33,785/cu. mm, AST was mildly increased (<80IU/ml) in 92.9%, moderate levels (81–160 IU/ml) in 7.1%. ALT levels in all patients were <80IU/ml. blood urea was in normal range, 1 patient had sr. creatinine more than 1.5 mg/dl. 9 people had nil/trace urine albumin, 1 + in 4 patients, 3 + proteinuria in 1 patient (Table 2).

Correlation between platelets and AST in group 1.0 lakh to 1.5lakh/cu. mm showed *r*=– 0.49,p value was 0.088552, that with ALT was *r*=– 0.57,p value was 0.0666488, blood urea correlation *r*=– 0.12, p of value 0.531556. Serum creatinine *r*=– 0.52, p value 0.258902.

Patients with platelets count in between 50,000 to 1.0 lakh/cu. mm (*n*=48) showed mean platelet count of 75,645/cu. mm, AST was mildly increased (<80IU/ml) in 85.4%, moderate (81–160 IU/ml) in 10.4%, severe in 4.2% cases. ALT levels mildly increased (<80IU/ml) in 89.6%, moderate (81–160 IU/ml) in 8.3%, severe in 2.1% of cases. Blood urea was elevated in 8.3% and sr. creatinine in 14.6%. 56.2% had nil/trace urine albumin, 4.1% patients had 3 + proteinuria (Table 3).

Correlation between platelets and AST in group 50,000 to 1.0 lakh/cu. mm was *r*=– 0.16,p value was 0.030418, that with ALT was – 0.35,p value was 0.045754. Blood urea correlation showed *r*=– 0.13,

Table 2: RFT and LFT values in patients with platelets 1.01 lakhs to 1.5 lakhs/cu. Mm.

Sl. No.	Parameter	Number	%	Mean	Minimum	Maximum
1	platelet counts 1.01 to 1.5lakhs/cu. mm	14	13.7	1,33,785	1,10,000	1,50,000
2	AST (IU/ml)					
	mild increase(<80 IU/ml)	13	92.9	50.46	21	77
	moderate(81-160 IU/m)	1	7	–	–	–
	severe(>160 IU/ml)	0	–	–	–	–
3	ALT(IU/ml))					
	mild increase(<80 IU/ml)	14	100	37.4	20	63
	moderate(81-160 IU/m)	0	–	–	–	–
	severe(>160 IU/ml)	0	–	–	–	–
4	blood urea <45mg/dl	14	100	28.2	20	37
	>45mg/dl	0	–	–	–	–
5	creatinine <1.5mg/dl	13	92.9	1.1	0.7	1.5
	>1.5mg/dl	1	7.1	–	–	–
6	urine albumin-traces	9	–	–	–	–
	1+	4	–	–	–	–
	2+	0	–	–	–	–
	3+	1	–	–	–	–

Table 3: RFT and LFT values in patients with platelets 50,000 to 1.0 lakhs/cu. mm.

Sl. No.	Parameter	Number	%	Mean	Minimum	Maximum
1	platelet counts 50,000 to 1.0 lakhs/cu. mm	48	47.1	75,645	50,000	1,00,000
2	AST (IU/ml)					
	mild increase(<80 IU/ml)	41	85.4	50.73	23	80
	moderate(81-160 IU/m)	5	10.4	105.4	90	130
	severe(>160 IU/ml)	2	4.2	195.5	180	211
3	ALT(IU/ml))					
	mild increase(<80 IU/ml)	43	89.6	40.9	14	78
	moderate(81-160 IU/m)	4	8.3	109.7	84	150
	severe(>160 IU/ml)	1	2.1	167	–	–
4	blood urea <45mg/dl	44	91.7	30.18	21	44
	>45mg/dl	4	8.3	97.5	80	116
5	creatinine <1.5mg/dl	41	85.4	1.05	0.6	1.4
	>1.5mg/dl	7	14.6	2.45	1.6	4.2
6	urine albumin-traces	27	–	–	–	–
	1+	13	–	–	–	–
	2+	6	–	–	–	–
	3+	2	–	–	–	–

Table 4: RFT and LFT values in patients with platelets <50000 lakhs/cu. Mm.

Sl. No.	Parameter	Number	%	Mean	Minimum	Maximum
1	platelet counts <50000 lakhs/cu. mm	31	30.4	29,129	5,000	49,000
2	AST (IU/ml)					
	mild increase(<80 IU/ml)	13	41.9	54.3	21	72
	moderate(81-160 IU/m)	8	25.8	113.3	84	145
	severe(>160 IU/ml)	10	32.3	216.4	176	316
3	ALT(IU/ml))					
	mild increase(<80 IU/ml)	18	58.1	49	20	77
	moderate(81-160 IU/m)	7	22.6	119.5	98	150
	severe(>160 IU/ml)	6	19.4	188.3	164	213
4	blood urea <45mg/dl	28	90.3	31.4	9	43
	>45mg/dl	3	9.7	85.3	56	124
5	creatinine <1.5mg/dl	26	83.9	1.15	0.7	1.5
	>1.5mg/dl	5	16.1	2.88	1.6	5.2
6	urine albumin-traces	8	–	–	–	–
	1+	10	–	–	–	–
	2+	6	–	–	–	–
	3+	7	–	–	–	–

p of value 0.846853, serum creatinine had *r*=– 0.12, *p* value 0.426152.

Patients with platelets count in less than 50,000/cu. mm (*n*=31) showed mean platelet count of 29,129/cu. mm, AST was mildly increased (<80IU/ml) in 41.9%, moderate (81–160 IU/ml) in 25.8%, severe in 32.3%. ALT levels mildly increased (<80IU/ml) in majority (58.1%) of cases. Blood urea was elevated in 90.3% and serum creatinine in 16.1%. 3 + proteinuria was seen in 22.5% patients (Table 4).

Correlation between platelets and AST in group 50,000 to 1.0 lakh/cu. mm showed *r*=– 0.28,p value was 0.030418, that with ALT was – 0.31,p value was 0.0526728. Blood urea correlation had *r*=– 0.34, *p* of value 0.09691, serum creatinine *r* was – 0.83 and *p* value 0.103051.

Discussion

Dengue infection is caused by arbovirus of various serotypes. Clinical spectrum ranges from asymptomatic cases to patients presenting with hemorrhagic manifestations eventually landing into shock. Many predictors have been used for assessing the course of the disease. Platelets are an important marker of disease progress/severity.[5] Some patients have shown abnormal biochemical values as a result of organ damage and dysfunction caused by vascular leakage and immune medicated injury to the host cells[6]. In an attempt to study the relation between platelets counts and various liver, renal function parameters the present study was undertaken.

Platelets counts showed moderate thrombocytopenia (between 50,000 and 1.0 lakh/cu.mm) in majority of cases (47.05%) and severe thrombocytopenia (<50,000/cu.mm) in 30.39% cases in the present study which was consistent with Elzinandes et al study.

All the patients had elevated levels of AST and ALT levels which were in mild category.[8] AST levels were more consistent with platelet counts decline than ALT similar to a study by Wong.[16] In patients with platelets between 1.0 lakh to 1.5 lakhs/cu. mm (*n*=14) AST was mildly increased (<80IU/ml) in 92.9%, moderate levels (81–160 IU/ml) in 7.1% to that of patients with count in between 50,000 to 1.0 lakh/cu. mm (*n*=48) where AST was mildly increased (<80IU/ml) in 85.4%, moderate (81–160 IU/ml) in 10.4%, severe in 4.2% cases. ALT levels mildly increased (<80IU/ml) in 89.6%, moderate (81–160 IU/ml) in 8.3%, severe in 2.1% of cases. As platelet counts declined to less than 50,000/cu mm, AST was mildly increased (<80IU/ml) in 41.9%, moderate (81–160 IU/ml) in 25.8%, severe in 32.3%. ALT levels mildly increased (<80IU/ml) in majority (58.1%) of cases. These findings were consistent with study by Kunal Gandhi.[9]

Correlation between platelets and AST, ALT levels showed negative correlation and had a statistical significance, which was 'similar to a study by kuo et al'.

Renal function tests were in the normal range in most of the cases, as the platelet counts decreased blood urea and serum creaininewere elevated. In patients with platelets count in between 1.0 lakh to 1.5 lakhs/cu. mm (*n*=14) blood urea was in normal

range, 1 patient had sr. creatinine more than 1.5 mg/dl. 9 people had nil/trace urine albumin, 1+ in 4 patients, 3 + proteinuria in 1 patient compared to Patients with platelets count between 50,000 to 1.0 lakh/cu. mm (n=48) where blood urea was elevated in 8.3% and sr. creatinine in 14.6%. 56.2% had nil/trace urine albumin, 4.1% patients had 3 + proteinuria. With decrease in platelets urinary albumin excretion was increased from 0 cases to 22.5%cases and showed similarity to Mahesh Eshwarappa study.[11]

Other study by Garcia et al showed protienuria in 21% cases with dengue hemorrhagic fever, which was similar to our finding.[12,13] None of the patients in the present study had hematuria, which did not coincide with a study where hematuria was seen in 12% cases.[14]

Correlation of platelet count with renal function tests, showed negative value and had no statistical significance between them.

Conclusion

To conclude, moderate thrombocytopenia is more common with counts in 50,000 to 1.0 lakh/cu mm range. Alteration in AST, ALT levels was seen in all the patients though it was mild in predominant cases. Renal function tests parameters were elevated in only few people with increase in incidence of proteinuria, elevated blood urea levels as the platelets counts declined. Correlation between platelets count and liver function test parameters showed inverse relation with statistical significance. However, renal function test parameters showed slight elevation with decline in platelet counts and were statistically insignificant. Hence, these parameters can be utilized for assessing severity of the disease and derangement in these values can be a cautious monitoring tool for course of disease.[15]

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