



Association of Mean Platelet Volume and severity of thrombocytopenia in patients with Dengue fever

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Abstract

Background: Mean platelet volume is the volume of the average circulating platelet in femoliters.¹ It's measured using optical technology. If such a simple and widely available test can improve the assessment of severity or help prognosticate in the setting of Dengue fever, it will go a long way in improving the health care of our country.

Methods: After due ethical clearance, all patients above the age of 5 years admitted with Dengue ELISA positive in the year 2018-19 were selected. Platelet count and mean platelet volume were entered into a standardized pro forma. Participants were grouped based on platelet count and respective MPV were compared with the clinical outcome of the patients.

Results: A weak correlation of MPV with deranged transaminases with a value of 0.041 is observed. However, there is no significant correlation between MPV and severity of thrombocytopenia.

Conclusions: Mean Platelet Volume is not associated with severity of thrombocytopenia in patients with Dengue fever.

Keywords: Dengue IgM ELISA, MPV (Mean Platelet Volume), Thrombocytopenia

INTRODUCTION

Dengue fever caused by Dengue virus of flaviviridae affects population of all ages and have severe manifestations like Dengue Hemorrhagic fever and Dengue shock syndrome². In various studies it has been proven that thrombocytopenia is an important prognostic indicator in Dengue fever³. Therefore early prediction of severity of thrombocytopenia is evident. Bowles et al studied 473 patients with thrombocytopenia and concluded that there is a strong correlation between MPV and thrombocytopenia in absence or presence of bone marrow disease⁴. Hence in this study we compare mean platelet volume and thrombocytopenia with severity, complications and outcome of patients with Dengue fever and infer whether MPV can be used as a prognostic indicator in Dengue fever.

METHODOLOGY

STUDY DESIGN:

- STUDY TYPE: retrospective type
- STUDY SETTING: Yenepoya Medical College Hospital and Yenepoya Speciality Hospital
- STUDY DURATION: December 2019- January 2020

MATERIALS AND METHODS: After due ethical clearance, all patients above the age of 5 years admitted with Dengue ELISA positive in the year June 2018-December 2019 will be selected retrospectively without any bias. Platelet count and mean platelet volume will be entered into a standardized pro forma. The severity and outcome of the disease will be correlated with mean platelet volume.

SOURCE OF STUDY:

Patients with Dengue fever above age of 5years admitted in ICU and wards of Yenepoya Medical College Hospital.

STUDY SAMPLE SIZE: 87

INCLUSION CRITERIA:

RESULTS

1. Patients aged above 5years with Dengue IgM ELISA positive.

EXCLUSION CRITERIA:

1. Any other known cause of thrombocytopenia other than Dengue fever.

Table 1: platelet count and MPV

		PLATELET COUNT							
		THROMBOCYTOPENIA						NORMAL	
		SEVERE		MODERATE		MILD			
		N	%	N	%	N	%	N	%
MPV	8 – 11	16	37.2%	6	14.0%	10	23.3%	11	25.6%
	> 11	23	52.3%	12	27.3%	5	11.4%	4	9.1%
	Total	39	44.8%	18	20.7%	15	17.2%	15	17.2%

According to this table, 23 patients with severe thrombocytopenia had MPV of more than 11fL.

Table 2: Correlation of MPV with other parameters

		MPV			
		7-11fL		>11fL	
		Count	Row N %	Count	Row N %
Age	10 and below	6	75.00%	2	25.00%
	11 – 20	11	50.00%	11	50.00%
	21 – 30	14	60.90%	9	39.10%
	31 – 40	4	23.50%	13	76.50%
	41 – 50	5	45.50%	6	54.50%
	>50	3	50.00%	3	50.00%
	Total	43	49.40%	44	50.60%
Gender	Male	29	51.80%	27	48.20%
	Female	14	45.20%	17	54.80%
	Total	43	49.40%	44	50.60%
day of fever	5 and below	35	50.70%	34	49.30%
	> 5	8	44.40%	10	55.60%
	Total	43	49.40%	44	50.60%
HEMORRHAGIC MANIFESTATION	Present	5	38.50%	8	61.50%

	Total	43	49.40%	44	50.60%
SEROSITIS	Present	10	47.60%	11	52.40%
	Total	43	49.40%	44	50.60%
HYPOTENSION/ SHOCK	Present	4	30.80%	9	69.20%
	Total	43	49.40%	44	50.60%
GASTRITIS	Present	8	50.00%	8	50.00%
	Total	43	49.40%	44	50.60%
ARDS	Present	1	50.00%	1	50.00%
	Total	43	49.40%	44	50.60%
ENCEPHALOPATHY	Present	0	0.00%	2	100.00%
	Total	43	49.40%	44	50.60%
MODS	Present	2	100.00%	0	0.00%
	Total	43	49.40%	44	50.60%
DERANGED TRANSAMINASES	Present	16	38.10%	26	61.90%
	Total	43	49.40%	44	50.60%
OUTCOME	1	40	49.40%	41	50.60%
	2	2	66.70%	1	33.30%
	Total	43	49.40%	44	50.60%

Among different age group, MPV was found to be elevated in age group of 31-40 years while the other age group had almost equal distribution.

44 patients had MPV more than 11fL out of which 27 were male and 17 were female.

Most of the patients had history of fever within 5 days of presentation with no much difference in MPV.

13 patients had hemorrhagic manifestations out of which 61.5% had MPV >11fL. 21 patients had serositis, 16 of them had gastritis, 2 ARDS and there was no much difference with MPV whereas among 13 patients with hypotension had 69% of MPV >11fL. Both 2 patients with encephalopathy and 26 patients out of 42 with deranged transaminases had MPV >11fL. However there were no significant changes in outcome with respect to MPV.

Table 3: Chi square test of MPV with various parameters

MPV with Following parameters	chi square/Fishers exact test p	
Age	0.160	
Gender	0.554	
day of fever	0.635	
HEMORRHAGIC MANIFESTATION	0.391	
SEROSITIS	0.849	
HYPOTENSION/SHOCK	0.145	
GASTRITIS	0.959	
ARDS	0.987	
ENCEPHALOPATHY	0.157	
MODS	0.148	
DERANGED TRANSAMINASES	0.041	sig
OUTCOME	0.716	

Chi square test showed a weak correlation of MPV with deranged transaminases with a value of 0.041.

Table 4: Test Result Variable(s): MPV

Positive if Greater Than or Equal To(a)	Sensitivity	1 – Specificity
7.100	1.000	1.000
8.200	.986	1.000
8.600	.986	.933
8.950	.972	.933
9.050	.958	.867
9.200	.958	.800
9.350	.958	.733
9.450	.931	.667
9.600	.917	.600
9.750	.903	.600
9.850	.889	.600
9.950	.875	.533
10.050	.861	.533
10.150	.806	.467
10.250	.750	.467

10.400	.694	.467
10.600	.681	.400
10.750	.667	.267
10.850	.597	.267
10.950	.556	.267
11.050	.528	.267
11.150	.486	.200
11.250	.389	.200
11.350	.361	.200
11.450	.319	.133

This concludes that MPV is neither specific nor sensitive in determining severity of thrombocytopenia in patients with Dengue fever.

DISCUSSION

Dengue fever is a re-emerging disease since 20 years with a wide geographic distribution of both mosquito vectors and viruses, epidemicity, hyperendemicity and dengue hemorrhagic fever in new geographic regions⁵. Thrombocytopenia, coagulopathy and vasculopathy are hematological abnormalities in Dengue fever related to platelet and endothelial dysfunction⁶. Hence there is a need of better prognostic marker for early prediction of such devastating complications and thereby warranting early prevention and treatment of catastrophic bleeding manifestations in Dengue fever.

Sharma et al in Jaipur conducted a prospective study in 200 patients and evaluated it for platelet counts and MPV⁷. Categorical data were presented as numbers (percent) and were compared among groups using Chi-square test. Groups compared for demographic data were presented as mean and standard deviation and were compared using student t-test, ANOVA and Post-Hoc Test, Tukey Test using SPSS, version 20 for Windows. 68% cases were of DF, 23% DHF & 9% DSS i.e. classical dengue fever was most common presentation. Maximum (44%) cases were in age group of 15-24 years. Fever was the presenting complaint in all cases (100%). 98% cases of dengue had thrombocytopenia. MPV showed no significant correlation with severity, serology & treatment outcome, thus excluding its role in dengue cases. Thus concluding that mean platelet volume is not important as prognostic parameter in dengue fever. Khatri et al did a hospital-based cross-sectional study between

April and September 2014, among dengue patients with thrombocytopenia using platelet histograms⁸. The study population included all the laboratory confirmed cases of dengue infection with thrombocytopenia admitted at Kasturba Medical College, Manipal, Karnataka during the study period. The blood samples collected from serologically confirmed dengue patients with thrombocytopenia were analyzed using automated analyzer within 2 h of venipuncture. The platelet histograms (MPV, PDW, Plateletcrit) generated by the Beckman Coulter counter LH755™ and LH780™ series were assessed in dengue fever cases with thrombocytopenia. The mean platelet volume (MPV) was observed to be 9.01 fL (SD = 0.09). The mean platelet distribution width and median plateletcrit were 17.2% (SD = 0.98) and 0.47 (IQR 0.2-0.8) respectively. None of the study participants presented with bleeding manifestations. The present study revealed no significant changes of platelet parameters in dengue cases with thrombocytopenia. Hence we can infer that MPV is not a reliable parameter in predicting severity of thrombocytopenia.

CONCLUSION

A total of 87 patients with Dengue ELISA positive who are above 5 years of age were studied retrospectively and Mean Platelet Volume was correlated with Severity of thrombocytopenia in such patients. The study concludes that there is no significant association between Mean Platelet Volume

and severity of thrombocytopenia in patients with Dengue fever.

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