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Original Research

A STUDY OF MEAN PLATELET VOLUME IN PATIENTS WITH ACUTE CORONARY SYNDROME IN A TERTIARY CARE HOSPITAL.

Ajay Peter Topno[1], Sermili Rini Singnarpi[2], Dr. Jacquiline D Shira[3*]
[1]*Assistant Professor, Dept. of Medicine, Nagaon Medical College.*
[2]*Assistant Professor, Dept. of Dermatology, Lakhimpur Medical College.*
[3]*Assistant Professor, Dept. of Medicine, Nagaon Medical College.*

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Abstract
Background: Platelets have been implicated in the pathogenesis of cardiovascular disorders including atherosclerosis and its complications such as Acute Coronary Syndrome (ACS) and sudden cardiac death. Platelet indices, especially the mean platelet volume correlate with functional status of platelets and are an emerging risk marker for atherothrombosis. *Aim:* To study the Mean platelet volume in the spectrum of Acute Coronary Syndrome and to assess their usefulness in predicting acute coronary events. *Materials and Method:* An observational cross-sectional hospital based study was carried out on 100 cases diagnosed with Acute Coronary Syndromes (ACS) and 100 Non-ACS patients from June 2021 to May 2022 considering the inclusion and exclusion criteria. The Mean Platelet Volume (MPV) was compared between ACS and Non-ACS patients as well as among the spectrum of ACS. *Observations:* Mean Platelet Volume was significantly higher in ACS patients in comparison to Non-ACS group ($p<0.001$). In patients with ACS, the mean value of MPV was 12.32 fL and in the Non-ACS group it was 10.9 fL. *Conclusion:* Mean Platelet Volume, one of the platelet indices can be used as simple and cost effective predictive parameters to predict ACS. Their use in a risk stratification system to predict ACS and in response to intervention are worthy of consideration.

Keywords: *Platelets, Acute Coronary Syndrome, Platelet Indices, Mean Platelet Volume.*

Introduction

Cardiovascular diseases accounts for approximately 12 million deaths annually and is the commonest cause of death globally. Acute coronary syndrome (ACS) includes the full spectrum of clinical manifestations from unstable angina (UA) to non-ST elevation myocardial infarction (MI) and ST-segment elevation MI. Platelets are heterogeneous blood elements with diverse sizes and densities. Platelet activation is a hallmark of acute coronary syndrome. It has been seen that mean platelet volume (MPV), which indicates platelet size is a marker of platelet function and is positively associated with indicators of platelet activity.

An increased MPV, an indicator of larger and more reactive platelets, has been associated with myocardial damage in ACS and has been found to be predictive of an unfavorable outcome among survivors of AMI , . Platelet activation leads to the formation of free arachidonic acid, which can be transformed into prostaglandins, such as thromboxane A2, one of the most potent vasoconstriction and platelet-aggregating substances, or into leukotrienes, which can amplify the acute inflammatory response . Platelet function and size correlate because larger platelets, produced from activated megakaryocyte in the bone marrow, are likely to be more reactive than normal platelets. There are more secretory granules and mitochondria in the larger platelets and are therefore known to be more active than small platelets.

Address for Correspondence Dr. Jacquiline D Shira, Assistant Professor, Dept. of Medicine, Nagaon Medical College.
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Materials and Methods

This observational cross-sectional study was conducted in the Dept. of Medicine, Lskhimpur Medical College and Hospital, Lakhimpur from 1st June 2021 to 31st May 2022 on 200 patients presenting in Outdoor and Emergency room with chest pain. The patients were classified as having STEMI, NSTEMI, Unstable angina and Non-ACS based on the ECG and Cardiac Biomarker reports. Patients who are unwilling for investigations or from whom a valid consent could not be obtained, who were less than 18 years of age, who were receiving anti-platelet drugs, anticoagulant therapy, who had bleeding disorders or other blood dyscrasias, who were diagnosed with cancer or severe liver and renal disease were excluded from the study. Written informed consent was taken from all the patients. The socio-demographic data, clinical history and details about the risk factors of CAD were collected using a semi-structured questionnaire and interview method. 5ml of venous blood samples were drawn at the time of admission before initiation of treatment from the median cubital vein into EDTA vials. It was analysed using an automated analyser SYSMEX XN 550 for Mean Platelet Volume.

Statistical Analysis:

Values were expressed as mean ± standard deviation. The means of continuous variables were compared with independent samples t-test (between two groups) and the one way analysis of variance (ANOVA) test (among the three study groups). Chi-square tests were used to compare categorical variables, such as status of smoking, diabetes, gender, hypercholesterolemia and hypertension. All of the tests were two-tailed; $p<0.05$ was considered statistically significant. SPSS 20.0 was used for data analysis.

OBSERVATIONS

A total of 200 subjects were included in the study of which 100 were diagnosed to have ACS and the rest 100 were non-ACS patients. Out of the 100 patients with ACS, 37 had STEMI, 35 had NSTEMI and 28 had Unstable angina. The mean age of ACS and Non-ACS patients were 60.55 ± 11.29 and 60.37 ± 10.53 years respectively.

Table 1: General Characteristics of the Patients

Patient characteristics	ACS	STEMI	NSTEMI	UA	Non-ACS	p value
Sex (male/female)	74/26	26/11	28/7	20/8	69/31	0.434
Smoker	40	20	13	7	38	0.115
Diabetes Mellitus	42	15	18	9	39	0.451
Hypertension	63	10	17	10	36	0.000*
Hypercholesterolemia	34	16	8	10	11	0.000*

The baseline characteristics viz., gender, hypertension, diabetes mellitus, smoking, were not significantly different among ACS and non-ACS patients except for Hypercholesterolemia and Hypertension which were significantly higher among ACS than Non-ACS patients.

Table 2: Difference in MPV in ACS and Non-ACS

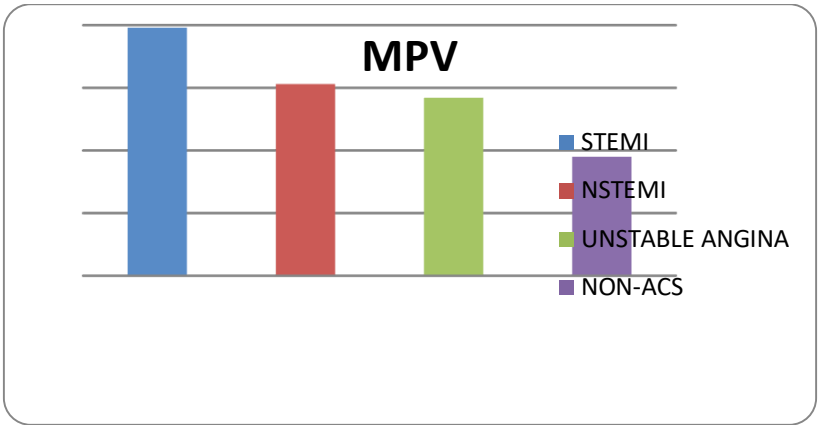
Group	Number	Mean	Std. Deviation	P value
ACS	100	12.32	1.230	<0.001
NON-ACS	100	10.9	1.0939	

Table 2: Comparison of MPV between groups

Group	MPV	P value
STEMI	12.96 ± 1.010	0.002
NSTEMI	12.06 ± 1.172	
STEMI	12.96 ± 1.010	0.000
UNSTABLE ANGINA	11.84 ± 1.216	
NSTEMI	12.06 ± 1.172	0.219
UNSTABLE ANGINA	11.84 ± 1.216	
ACUTE MI (STEMI+NSTEMI)	12.63 ± 1.215	0.002
UNSTABLE ANGINA	11.84 ± 1.216	

The primary aim was to see the difference of MPV values between ACS and Non-ACS. There was significant ($P<0.05$) difference in MPV values between case group and control group. The obtained mean value of MPV of 12.32±1.230 in case group was greater than the mean value of MPV of 10.9±1.0939 in control group and it is statistically significant.

One secondary aim was to look for a significant difference in MPV values between patients with STEMI, NSTEMI and Unstable Angina. The obtained mean value of MPV in STEMI is 12.96 ± 1.010 fl , NSTEMI is 12.06 ± 1.172 fl and Unstable Angina is 11.84 ± 1.216 fl and their difference is statistically significant ($P<0.05$).



Graph 1: Comparison of mean MPV values among the study groups.

Discussion

The mean MPV of the ACS group was significantly higher than the Non-ACS group.

Lippi et al in their study conducted in 2304 patients reported that patients with ACS had significantly higher MPV values than patients without ACS. Ranjith et al in their study conducted in India found similar results showing mean MPV values in ACS and Non-ACS groups as 10.97±0.58 fl and 9.12±0.63 fl respectively.

We also found a significant difference in MPV amongst the ACS spectrum i.e. STEMI and NSTEMI, STEMI and Unstable Angina. Although there was no significant difference in MPV between NSTEMI and Unstable Angina groups. Rifat et al found that the difference in MPV was statistically significant in STEMI and NSTEMI patients, which was 8.7±1 and 7.9±0.7 fl ($p<0.01$) respectively, which was in concordance with this study. The results of a study conducted by Sermin et al were also not in discordance with the results obtained in this study.

When putting the STEMI and NSTEMI patients into one group as Acute Myocardial Infarction (AMI) and then comparing with the Unstable Angina, it was seen that the difference in MPV in the two groups was statistically different. This finding is supported by a study conducted by Chu et al , who found that MPV values were higher in patients with acute myocardial infarction (AMI) as compared with patients with unstable angina (UA) (11.06±0.79 fl vs 10.66±0.87 fl, $p=0.027$). Although Dehghani et al and Biradar et al did not find any significant difference in MPVs between AMI and UA..

Conclusion

Mean Platelet Volume in patients with ACS was significantly increased when compared to Non-ACS patients. Mean Platelet Volume can be utilised as simple and cost effective predictive parameters with other laboratory tests (particularly in remote centres) to predict impending cardiovascular events especially acute coronary events.

LIMITATIONS:

As the study was cross sectional, no follow up details are available and the prognostic utility of the values cannot be elucidated.

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