e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2024; 16(12); 735-739

Original Research Article

Evaluation of Mean Platelet Volume Levels in Patients with Acute Myocardial Infarction

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Received: 27-10-2024 / Revised: 25-11-2024 / Accepted: 27-12-2024
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Conflict of interest: Nil

Abstract:

Background: Previous data suggests that only 1/3rd of patients presenting with chest pain to hospital requires hospitalisation and emergency care but in absence of segregation of these cases in the beginning physicians over admit such patients and it burns out precious resources and also reduces the quality of care for those who actually requires it. Platelet indices (MPV) is a simple economical tool which might be useful as an assisting rule out test in conjunction with other cardiac biomarkers in the early prediction of acute myocardial infarction in patients presenting with acute onset chest pain. The study was a hospital based observational cross-sectional study conducted in which patients admitted with diagnosis of acute myocardial infarction during the span of study period were enrolled in the study after their written consent. Total 61 patients of acute MI were included in our study. All patients' blood samples were taken on admission and Mean Platelet Volume was calculated. In our study the incidence of MI was found higher in males than in females. Prevalence of diabetes mellitus was found to be higher in males than in females as among 38 males 19 patients (50%) had history of DM as compared to only patients had history of DM among total of 23 females. Patients presented with history of DM had higher values of MPV (mean 10.708) as compared to non-DM patients (mean 10.43). Mean platelet values were found to be higher in males than the females. Conclusion: The study population MPV was also studied for correlation with the clinical presentation of patients. In all patients it was found that patients mean MPV values were lower in patients presented with chest pain, breathlessness, palpitation, pedal edema. But on performing t test the p values for chest pain, breathlessness, palpitation, and pedal edema were 0.459, 0.749, 0.771 and 0.086 respectively. All were >0.05 and statistically non-significant. So, although all symptoms had negative impact on MPV value the relation could not be established.

Keywords: Mean Platelet Volume Level, Acute Myocardial Infarction.

Introduction

Acute myocardial infarction is a condition due to imbalance of coronary blood flow and myocardial oxygen demand such that part of the cardiac muscle is not able to function properly or dies and that is a result of platelet rich coronary thrombus formation. [1] Platelets for long time have been implicated in the pathogenesis of cardiovascular diseases including atherosclerosis and its complications such as acute myocardial infarction, unstable angina and sudden cardiac death. Platelet hyperactivity and local platelet activation have been found to play a role in acute coronary events. [2] Activated platelets are larger in size and they can be measured by mean platelet volume (MPV). When plateletsangina, ina, er, they become metabolically and enzymatically active. Platelet indices correspond to functional status of platelets and is an emerging risk factor for atherothrombosis.[2] Increased platelet activation may also represent the net patho-physiological effects of a number of cardiovascular risk factors, such as smoking and dyslipidaemia, thus representing a broad marker of CVD risk. Platelet activation leads to a more spherical shape with increased platelet swelling and thereby leading to an increase in platelet mass and volume. [3] Large platelets are metabolically and enzymatically more active than smaller ones and secrete and express more mediators such as adhesive proteins (fibrinogen, thrombospondin, and fibronectin), growth factors (platelet derived growth factor, transforming growth factor, and basic FGF), and chemotactic and mitogenic factors (platelet factor 4, coagulation factors [factor V and factor XI], and cytokinelike factors [interleukin1 and CD40ligand]. [5] Larger platelets as measured by their volumes (MPV) may be useful markers in patients with acute myocardial infarction. Higher MPV may become useful marker for early detection of acute myocardial infarction along with other biomarkers. It could be used as a screening test to differentiate

the origin of chest pain. Unlike all other markers of platelet activation and reactivity, it is automatically calculated by most equipment for performing blood cell count. [5]

Thus, to determine the platelet size through MPV is a simple, extremely inexpensive, and readily available measure in hospital and outpatient settings. [5]

Mean Platelet Volume

Mean platelet volume (MPV) is a measure of the average size of your platelet, a type of blood cell that helps prevent bleeding. MPV is particularly important in determining the cause of thrombocytopenia (a low platelet count) or thrombocytosis (a high platelet count), and it can be a useful diagnostic tool even if your platelet count is normal. How the MPV Test Is Done, Mean platelet volume is measured as part of your complete blood count (CBC), a blood test used in health screening and for monitoring many health conditions.

Normal Ranges

- **Platelets:** 150,000 to 450,000 per milliliter
- **MPV:** 8.9 to 11.8 fL (femtoliters)
- **PDW:** 9.6 to 15.3 fL

A high MPV is usually a sign that there are more young platelets circulating in your bloodstream. A low MPV generally suggests that most of your platelets are older and that your bone marrow has slowed down production of platelets.

Materials and Methods

Study design: Cross sectional observational Study. Study setting (Exact place where the study is conducted): Department of General Medicine, Jannayak karpoori Thakur Medical College and hospital Madhepura, Bihar. Study duration is Two years.

Inclusion Criteria: All male and female patients > 18 years of age and willing to give consent for participation in the study and fulfilling the following criteria can be included in the study. Detection of rise or fall in CKMB with at least one value above the 99th percentile of upper limit together with at least one of the following: symptoms of ischemia, ecg changes suggestive of new ischemia, development of pathological Q wave in ECG.

Exclusion criteria

- Patients with severe hepatic or renal impairment suggested by deranged liver or renal function tests.
- Patients with myeloproliferative disorders and melignancy
- Patients with history of taking oral anticoagulants

All patients' medical history and general physical examination findings (heart rate, blood pressure, weight, height, body mass index, systemic examination of respiratory and cardiovascular system) are documented. A pre tested semi-structured questionnaire has been used for data collection. A blood sample from each patient has been collected from cubital vein for measuring complete blood count including mean platelet volume (done by ABX MICROS 60 analyser shown in figure 11), liver and renal function tests and level of CK-MB (which is routinely done in all acute myocardial infarction patients to confirm the diagnosis).

Results

Gender distribution: In our study group of total 61 patients, 38 were male as compared to 23 females. This signifies that the incidence of acute Myocardial Infarction is more in males (62%) as compared to females (38%).

Age distribution: The distribution of age in MI patients in our study of 61 patients ranges from 34 to 95 years. The mean age of study participants were 57.87 years and a SD of 14.379.

Diabetes mellitus: In our study of acute MI patients 19 male patients and 10 female patients were found to be having diabetes mellitus and 19 male and 13 females were non diabetic.

From table 1, calculation of t value with equal variances assumed suggests that MPV values do have higher mean in patients having history of DM but it is not statistically significant to establish a positive correlation between MPV and DM.

Table 1: Correlation of MPV with DM

	Levene's Test For Equality of Variances		**T-Test For Equality of Means**		
	F	SIG.	T	DF	SIG. (2-TAILED)
MPV	0.006	0.939	1.132	59	0.262

Distribution Of Hypertension: In our study we found that in males 26 patients (68.4%) and in females 9 patients (39.1%) were hypertensive as compared to 12 males (31.6%) and 14 females (60.9%) were non hypertensive.

Similar to DM, MPV values were found to be higher among the patients with history of hypertension but again it was not found to be statistically significant with p value of 0.353. Thus, the positive correlation cannot be confirmed between MPV and HTN.

Table 2: Correlation between MPV And Hypertension

	Levene's Test For Equality of Variances		T-Test For Equality of Means		
	F	SIG.	T	DF	SIG. (2-TAILED)
MPV	1.686	0.199	0.936	59	0.353

(*Equal variances assumed)

In our study out of 38 male patients, 9 had family history of cardiovascular disease and among 23 female patients 6 had positive family history.

Distribution of BMI: The distribution of BMI in acute MI patients ranges from 20.4 to 33.4. The mean BMI in female patients was 23.21 with a SD of 2.186 and in male mean BMI was 24.76 with a SD of 2.68. The distribution of BMI in male patients was clustered around range of 22.5 to 27.4 and in female it was clustered around the range of 20 to 25. Following table no 3 does show that MPV values are higher in patients with higher BMI and have direct statistically significant correlation.

Table 3: Correlation of MPV and BMI

		BMI
MPV	Pearson Correlation	0.297*
	Sig. (2-tailed)	*0.020
	N	61

(* 0.020 VALUE <0.05 is statistically significant)

Table 4: Distribution of Population according to MPV strata

MPV	Male	Female
	Value	Value
Minimum	9.35	9.24
Maximum	12.8	12.31
Mean	10.77	10.218
Standard deviation	1.008	0.786

In our study it was found that in male MPV values were distributed evenly over the range of 9 to 12 as compared to females in whom MPV values were found to be clustered around range of 9.5-10.5.

Clinical Profile

All patients were subjected to clinic-pathological correlation by estimation of incidence of chest pain, breathlessness, palpitation and pedal edema among the patients of acute MI and comparing the values of MPV in both the groups among them.

Table 5: Correlation Between MPV And Chest Pain

	Chest Pain	N (Sample Size)	Mean	SD
MPV	Yes	54	10.5293	0.94652
	No	7	10.8186	1.12233

	Levene's Test For Equality of Variances		T-Test For Equality of Means		
	F	SIG.	T	DF	SIG. (2-TAILED)
MPV	0.054	0.816	-.746	59	0.459

From above table it can be suggested than presence of chest pain in acute Myocardial Infarction does not affect the value of MPV as both are not having significant correlation.

Table 6: Correlation between MPV and Breathlessness

	Breathlessness	N	Mean	SD
MPV	YES	35	10.5280	0.95013
	NO	26	10.6088	0.99535

	Levene's Test For Equality of Variances		T-Test For Equality of Means		
	F	SIG.	T	DF	SIG. (2-TAILED)
MPV	0.004	0.952	-0.322	59	0.749

Patients of acute MI presented with breathlessness tend to have lesser MPV values in our study. But similar to chest pain, this correlation was not found statistically significant.

Table 7: Correlation between MPV and Palpitation

	Palpitation	N	Mean	SD
MPV	Yes	12	10.4892	0.94489
	No	49	10.5804	0.97529

	Levene's Test For Equality Of Variances		T-Test For Equality Of Means		
	F	SIG.	T	DF	SIG. (2-TAILED)
MPV	0.919	0.342	-0.292	59	0.771

(*Equal variances assumed)

MPV values in patients presented with palpitation and those who presented without palpitation were compared in above table showing that MPV values were lower in patients presented with palpitation. But it was found that there is no direct statistically significant correlation between MPV values and palpitation as the p value was >0.05.

Table 8: Correlation between MPV and Pedal Edema

	Pedal Edema	N	Mean	Std. Deviation
MPV	**Yes**	3	9.6333	0.14742
	No	58	10.6105	0.96238

	Levene's test for equality of variances			T-test for equality of means		
		F	SIG.	T	DF	SIG. (2-TAILED)
MPV	Equal variances assumed	4.837	0.032	-1.744	59	0.086
	Equal variances not assumed			-6.414	17.543	0.000

From above study we can conclude that MPV values were lower in the patients presented with pedal edema but it was not clinically significant.

Discussion

The total number of subjects included in my study was 61 among which 38 patients were male and 23 patients were female. All were diagnosed with acute myocardial infarction fulfilling the inclusion criteria of the study. In our study of total 61 patients 62.3% were male as compared to 37.7% female. Mean MPV among male was 10.77 with a SD of 1.006 and among female was 10.218 with a SD of 0.786. T test shows direct statistical correlation of MPV with gender with p value of 0.029. In their study of ACS where 66.7% patients were male and 33.33% patients were female and significant correlation was established with p value of <0.05 with DM, HTN an increased BMI as risk factor for acute MI. [6]

In our study the age of the study population varies from 34 to 95 years. The mean age of study participants were 57.87 years and a SD of 14.379 years. In male patients' majority of them were 41-50 years of age group (26.3%), followed by 61-70 years of age group (23.7%) and ≤40 years of age group (21.1%). In contrast to male, among 23 female patients majority of them were 61-70 years of age group (34.8%) followed by 51-60 years of age group (26.1%). Shukri M Al- Saif, Khalid F. Al Habib, Anhar Ullah had studied about age and relationship to acute coronary syndrome in a large Saudi population and found out that older patients have higher hospital mortality as they are treated less aggressively. [7] In male patients 19 patients (50%) had history of diabetes mellitus and in female 10 patients (43%) had diabetes mellitus. In our study MPV values were found to be higher in patients with DM as compared to non-DM but statistical significance could not be established as p value was 0.262. Where as in a study conducted by Zuberi BF, Akhtar N, Afsar S where total 612 patients (337 male and 275 female) were included, they found statistically significant correlation between MPV and DM with p value of 0.000.[8] In this study, among male patients 26 (68%) were hypertensive and 12 (32%) were non hypertensive. In female patients 9 (39%) were hypertensive and 14 (61%) were non hypertensive. Among the total 35 patients with HTN, MPV values were found to be higher as compared to non- hypertensive patients. T test does show positive correlation but it was not statistically significant as p value was 0.353. In contrast to our study, Abhijit Agarwal, Sunil kumar, Jahnavi Bhagwati has done a study of 1000 patients of ACS (601 male and 399 female) and they found significant correlation between MPV and systolic as well as diastolic blood pressure with p value of 0.027. [9] The distribution of BMI in our patients ranges from 20.4 to 33.4. The mean BMI among male patients was 24.76 with a SD of 2.68 and among female patients it was 23.21 with SD of 2.186. These BMI values were studied with MPV by pearson correlation and direct positive correlation could be established with p value of 0.020. Similar results were obtained in study done by E Coban in which 100 obese and 100 non-obese patients were subjected to MPV and BMI correlation and it was

found statistically significant with p value <0.05. [10,11]

In our study 54 patients came with chest pain and 7 patients did not have chest pain on presentation. Their mean MPV values were 10.529 in patients with chest pain as compared to 10.8186 in patients with n chest pain with no significant correlation (p value 0.459). Mohammadreza Deghnani has done study of total 862 patients (184 healthy controls, 249 non-ACS, 421 unstable angina and 192 acute MI) in which he found significant correlation of MPV with chest pain with p value of<0.001. [12] Similar to chest pain MPV was also subjected to breathlessness, palpitation and pedal edema. MPV values were found to be lower in all the patients who had presented with either of those symptoms and statistically significant correlation could not be established as p values were 0.749, 0.771 and 0.086 respectively for breathlessness, palpitation and pedal edema.

Conclusion

Incidence of MI is more in males than females as found in our study. Diabetes Mellitus, Hypertension, Body Mass Index, family history are additional risk factors for development of acute MI as all of those had positive correlation but only BMI (p value 0.020) was found significantly correlated with the value of MPV.MPV in patients with MI was significantly higher in males as compared to females. (p value 0.020). Presence of chest pain, breathlessness, palpitation, pedal edema on presentation had no statistically significant correlation with the values of MPV.

References

1. Mckaens SC, Smith. CJ, Payne VM, Doolittle DJ. Blood parameters associated with atherogenic and thrombogenic risk in smokers and nonsmokers with similar life styles. Mod Pathol 1995 May; 8(4); 434-40
2. Kumar V, Melhotra S, Ahuja Ret RC and Viash AK. Platelet and Acute Coronary Syndrome. J Fam Med. 2016; 3(4): 1063.
3. Jaya Manchanda, R M Potekar, SharanBadiger, Abhishek Tiwari. The study of platelet indices in acute coronary syndromes.Annals of Pathology and Laboratory Medicine, Vol. 02, No. 01, Jan-Mar 2015.
4. Akula, S., Krishna.K, V., J, R., Srinivas, B. and Damera, S. (2017). A Study of Platelet Indices in Acute Myocardial Infarction: An
5. Observational Study. IOSR Journal of Dental and Medical Sciences, 16(06), pp.10-13.
6. Bharihoke N, Subhedar V, Singh P, Gupta P. Mean Platelet Volume (MPV) & Other Platelet indices in Acute Myocardial Infarction (AMI) & Stable CoronaryArtery Diseases (SCAD). Journal of Evidence Based Medicine and Healthcare. 2014;1(15):1921-1926.
7. TejasMadavi, PragatiBhole, M P Holay. Mean platelet volume as a predictor of clinical outcomes in patients of acute myocardial infarction.
8. Al-Saif S, AlHabib K, Ullah A, Hersi A, AlFaleh H, Alnemer K et al. Age and its relationship to acute coronary syndromes in the Saudi Project for Assessment of Coronary Events (SPACE) registry: The SPACE age study. Journal of the Saudi Heart Association. 2012;24(1):9-16.
9. Zuberi BF, Akhtar N, Afsar S comparison of mean platelet volume in patients with overt diabetes mellitus, impaired glucose tolerance and non diabetic patients.
10. Abhijitagrawal, Sunil kumar, Jahnavibhagwati et al. Correlation of platelet indices with clinical profile in elderly patients: a study in rural teaching hospital.
11. E Coban et Al int J clin Pract. Mean platelet volume in patients with obesity. 2005
12. Dooley J, Chang A, A. Salhi R, Hollander J. Relationship Between Body Mass Index and Prognosis of Patients Presenting With Potential Acute Coronary Syndromes. Academic Emergency Medicine. 2013;20 (9):904910.
13. Mohammadreza Deghnani et al Diagnostic importance of admission platelet volume indices in patients with acute chest pain suggesting acute coronary syndrome.