ORIGINAL RESEARCH PAPER

Internal Medicine

ASSOCIATION BETWEEN PLATELET INDICES AND ACUTE CORONARY SYNDROMES IN A TERTIARY CARE CENTRE – A COMPARATIVE STUDY

Dr. Rajesh Kumar Saini	Resident Doctor, Department of General Medicine, JMC Jhalawar, Rajasthan
Dr. Ashok Mosalpuri	Resident Doctor, Department of General Medicine, JMC Jhalawar, Rajasthan
Dr. Punit Gupta	Senior Medical Officer, Department of General Medicine, JMC Jhalawar, Rajasthan
Dr. Nitesh Kumar Sharma	Resident Doctor, Department of General Medicine, JMC Jhalawar, Rajasthan

ABSTRACT

Introduction: Platelets plays important role in progression of atherosclerosis. Alpha granules and dense granules of platelet contains many chemokines, cytokines and growth factors. Release of these factors along with interaction with endothelial cells and leukocytes promotes inflammation and atherosclerosis. There is scope to make better use of the platelet parameters generated, as patients with larger platelets can easily be identified during routine hematological analysis and could possibly benefit from timely treatment. The study was undertaken to account the efficacy of platelet parameters in Acute Coronary Syndromes. **Material And Methods:** The current study was a case control study carried out in the Department of Medicine, SRGH Hospital, which is affiliated with Jhalawar Medical College, from February 2022 to December 2022. The purpose of this study was to comparison between the platelet indices in patients with ACS and those with non cardiac chest pain. Approval from Institutional Ethical Committee of the Hospital was taken before the start of the study. A total 200 participants were included among them 100 were cases diagnosed with ACS and 100 controls with those with non cardiac chest pain were included. Data were analyzed in SPSS v- 24. Independent t-test and Chi-square test were applied. Pearson correlation coefficient was calculated. p value <0.05 was considered statistically significant. **Observation:** In the present study, no statistically significant difference in platelets count and plateletcrit (%) were found between both groups. However, a statistically significant high PDW, MPV and P-LCR were found among the cases compare to the controls. In the current study, accuracy of PDW, MPV, P-LCR and plateletcrit to detect ACS was found to be 95.7%, 92.2%, 94.4% and 46.7% respectively. **CONCLUSIONS:** The current study's findings appear to confirm and substantiate that higher platelet indices such as mean platelet volume (MPV), platelet distribution width (PDW), and platelet large cell ratio (P-LCR) contribute to the prothrombotic state in Acute coronary syndrome (ACS), and that larger platelets may also play a specific role in ACS.

INTRODUCTION

In developing countries, Ischemic heart diseases (IHD) is one of the leading causes of morbidity and mortality. The spectrum of presentation is wide and ranges from unstable angina to acute myocardial infarction. Major risk factors for coronary artery disease (CAD) are age, family history, obesity, mental stress, diabetes mellitus (DM), hypertension (HTN), elevated low-density lipoproteins (LDL) and smoking. The underlying pathology of CAD is atherosclerosis.[1] It initiates by second decade of life and progresses chronically to manifest as Acute Coronary Syndrome (ACS) in fourth and fifth decade of life. When this chronic atherosclerotic plaque ruptures, platelets play a crucial role in the prothrombotic events and forms a thrombus on this plaque and as a result coronary artery gets occluded causing ischemia and infarction. Approximately 70% of myocardial infarctions are caused by rupture of atherosclerotic plaque[2].

Platelets also plays important role in progression of atherosclerosis. Alpha granules and dense granules of platelet contains many chemokines, cytokines and growth factors. Release of these factors along with interaction with endothelial cells and leukocytes promotes inflammation and atherosclerosis[3]. Large platelets are metabolically and enzymatically more active than small platelets as assessed by in vitro aggregometry and have a higher thrombotic potential[4].

Larger platelets, as indicated by automated cell counters in the form of raised mean platelet volume (MPV), platelet distribution width (PDW) and platelet large cell ratio (PLCR) are found to be metabolically and enzymatically more active than smaller platelets by producing increased thromboxane A2[4-5]. Platelet activity and local platelet activation have been suggested to play a causal role in acute coronary thrombotic events, as indicated in various studies[6-7].

The most sensitive and specific biomarkers of myocardial damage are Troponin I and Troponin T, levels of both begin to rise at 2 to 4 hours and peak at 48 hours. Creatine Kinase enzymes begins to rise within 2 to 4 hours of the onset of myocardial infarction, peaks at about 24 hours and returns to normal within approximately 72 hours[8]. Platelet parameters can be detected earlier as compared to specific and nonspecific markers of Myocardial Infarction. Platelet indices are easily recorded by automated cell counter and are routinely available in most clinical laboratories. There is scope to make better use of the platelet parameters generated, as patients with larger platelets can easily be identified during routine haematologial analysis and could possibly benefit from timely treatment[9]. The study was undertaken to account the efficacy of platelet parameters in Acute Coronary Syndromes.

CASE STUDY

The current study was a case control study carried out in the Department of Medicine, SRGH HOSPITAL, which is affiliated with Jhalawar Medical College from February 2022 to December 2022. The purpose of this study was to comparison between the platelet indices in patients with ACS and those with non-cardiac chest pain. Approval from Institutional Ethical Committee of the Hospital was taken before the start of the study. A total 200 participants were included among them 100 were cases diagnosed with ACS and 100 controls with

those with non-cardiac chest pain were included. A detailed clinical history was taken and complete physical examination including vitals- blood pressure, pulse, respiratory rate, oxygen saturation, height, weight, waist circumference, investigations and platelets indices were ordered. Data were analysed in SPSS v- 24. Independent t-test and Chi-square test were applied. p value <0.05 was considered statistically significant.

RESULT
In our study, mean age in case and control was 55.1±11.4 years and 54.4±8.6 years and maximum were in age of 41-60 years among both the groups. In this study, 76 were male in cases and 67 were male in control group. (Table 1) In this study, out of the 100 cases of ACS, 89 were diagnosed as STEMI, 8 were diagnosed as NSTEMI and 3 cases of unstable angina (Figure 1) and no statistically significant difference in platelets indices was found between different types of ACS (Table 2). In the present study, no statistically significant difference in platelets count and Plateletcrit (%) were found between both groups. However, a statistically significant high PDW, MPV and P-LCR were found among the cases compare to the controls. (Table 3).

In the current study, accuracy of PDW, MPV, P-LCR and plateletcrit to detect ACS was found to be 95.7%, 92.2%, 94.4% and 46.7% respectively. (Table 4).

Table 1: Sociodemographic profile of study participants

	Case (n=100)		Control (n=100)		p-value
	n	%	n	%	
Age (Mean±SD)	5.07±11.4 years		54.4±8.6 years		0.660
Age Group					
20-40 years	9	5.0%	4	0.0%	0.239
41-60 years	68	57.9%	77	55.0%	
>60 years	23	37.1%	19	45.0%	
Gender					
Female	24	33.6%	33	20.0%	0.731
Male	76	66.4%	67	80.0%	

Figure 1: Distribution of cases according to diagnosis

- NSTEMI · STEMI · UA

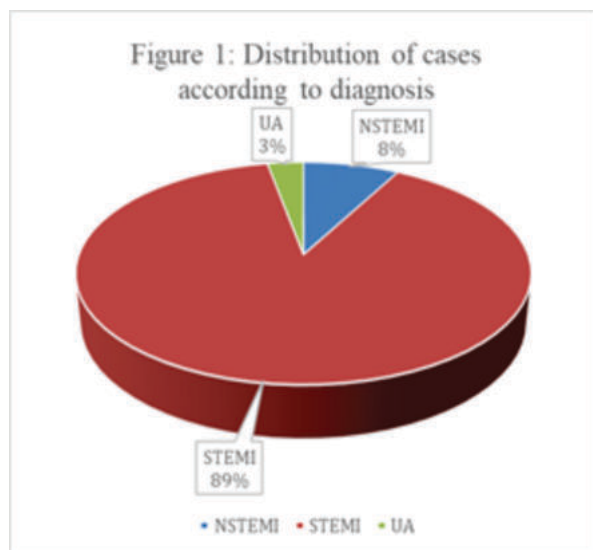**Table 2: Comparison of platelets indices among the type of MI in cases**

Diagnosis (Type)		PDW (fL)	MPV (fL)	P-LCR (%)	PCT (%)
NSTEMI	Mean	12.687	10.475	26.000	.2275
	SD	1.9780	1.1260	3.5388	.07382
STEMI	Mean	12.998	10.678	29.522	.2606
	SD	2.3615	.9005	7.6176	.06617
UA	Mean	14.000	11.067	33.633	.2633
	SD	1.6462	.8083	6.7352	.06429
p-value		0.705	0.630	0.263	0.405

Table 3: Comparison of platelets indices between case and controls:

Platelets indices	Case		Control		p-value
	Mean	SD	Mean	SD	
Platelets count (*10³/μL)	240.50	79.44	273.77	82.09	0.114
PDW (fL)	13.03	2.30	9.30	0.85	0.0001
MPV (fL	10.67	0.91	9.29	0.52	0.0001
P-LCR (%)	29.36	7.4	17.61	3.08	0.0001
Plateletcrit (%)	0.26	0.07	0.27	0.07	0.331

Table 4: Accuracy of platelets indices to detect cases

PDW				
Area	Std. Error	p-value	Asymptotic 95% Confidence Interval	
			Lower Bound	Upper Bound
.957	.012	.000	.933	.981
MPV				
.922	.019	.000	.885	.958
P-LCR				
.944	.017	.000	.911	.977
Plateletcrit				
.467	.041	.418	.387	.547

DISCUSSION
More reactive platelets will experience morphological alterations in the cell, generating pseudopodia and so contributing to the creation of thrombus. As a result, platelets grow larger and more reactive, raising platelet volume indicators such as MPV and PDW. Platelets and their activity play an essential part in the start of atherosclerotic lesions and the creation of coronary thrombus, which can lead to myocardial infarction. Larger platelets are metabolically and enzymatically more active and have a higher risk of thrombosis. MPV, PDW, and Platicrit platelet volume indices could be employed as indicators in diseases such as IHD. The MPV can reflect changes in either platelet stimulation or platelet production rate.

Mean platelet count was observed to be lower in cases (ACS) as compared to controls. This may be due to the immediate increased consumption of platelets at the site of plaque rupture. But, there was no significant difference among the mean platelet count of these two groups. This finding was supported by Khode et al[11], Rifat et al[12] and Alvitigala et al[13] but it was in contrast to the studies conducted by Majumder et al[14]. According to our study, mean MPV was significantly higher in cases than in controls. A significant difference was noted in the mean MPV of cases and controls (10.6 + 0.92fL and 9.2 + 0.51fL, respectively). In our study, accuracy of MPV to detect ACS was found to be 92.2% and it was statistically significant.

This was in concordance with the study of Walke et al[15], Manchanda et al[16], Patil et al[17] and Khode et al[11]. A possible explanation for an increased platelet volume is the increased platelet activity in response to plaque rupture.

In the current study, a highly significant difference was noted in the PDW among cases and controls. PDW was found to be significantly higher in cases (13.0 + 2.3fL) than in controls (9.3 + 0.85fL). In our study, accuracy of PDW to detect ACS was found to be 95.7% and it was statistically significant.

This result was in concordance with studies conducted by Manchanda et al[16], Patil et al[17] and Alvitigala et al[13]. This was in contrast with the study of Khode et al[11]. Studies showed that the platelet volume distribution provides a signature for a pre-thrombotic state in IHD. This may be the reason for increased PDW in ACS cases as it is an index of platelet heterogeneity.

There was a significant difference between mean P-LCR of cases and controls. The mean P-LCR was found to be higher in cases (29.4 + 7.4%) than in controls (17.6 + 3.1%). In our study, accuracy of P-LCR to detect ACS was found to be 94.4% and it

was statistically significant.

This was further supported by Patil et al[17]and Walke et al[15]. However, the study of Khode et al[11] did not find any significant difference in P-LCR among these groups.

CONCLUSION

The current study's findings appear to confirm and substantiate that higher platelet indices such as mean platelet volume (MPV), platelet distribution width (PDW), and platelet large cell ratio (P-LCR) contribute to the prothrombotic state in Acute coronary syndrome (ACS), and that larger platelets may also play a specific role in ACS.

As a result, we conclude that the use of platelet indices in laboratory routines could be a valuable supplement in the assessment and follow-up of cardiac patients, particularly in remote locations and in locations where cardiac serum markers are not readily available, because these indices are easily provided by automated equipment that is simple and cost effective.

REFERENCES

1. Ross R. Atherosclerosis-an inflammatory disease. New Eng J Med. 1999 Jan 14;340(2):115-26.
2. Oxman AD, Cook DJ, Guyatt GH, Bass E, BrillEdwards P, Browman G, et al. Users' guides to the medical literature:VI. How to use an overview. JAMA. 1994 Nov 2;272(17):1367-71.
3. Danesh J, Lewington S, Thompson SG, Lowe GD, Collins R, Kostis J, et al. Plasma fibrinogen level and the risk of major cardiovascular diseases and nonvascular mortality: an individual participant meta-analysis. JAMA. 2005;294(14):1799-809.
4. Milner PC, Martin JF. Shortened bleeding time in acute myocardial infarction and its relation to platelet mass. Br Med J (Clin Res Ed). 1985 Jun 15;290(6484):1767-70.
5. Dalby KS, Milner PC, Martin JF. Bleeding time and platelet volume in acute myocardial infarction. A 2 year follows up study. Thromb Haemost. 1988;59:353-6.
6. Smith NM, Pathansali R, Bath PM. Platelets and stroke.Vasc Med. 1999;4: 165-72.
7. Jasani J, Modi M, Vaishnani H, GhariaB, et al. Evaluation of platelet count and platelet indices in patients with coronary artery disease. IJBAR. 2014;5(11):553- 5.
8. Senaran H, Ileri M, Altinbas, et al. Thrombopoietin and mean platelet volume in coronary artery disease. Clini Cardiol. 2001;24:405-8.
9. Kumar V, Abbas AK, Fauselto N, Aster JC. Robbins and Cotran Pathologic Basis of Disease. Eighth edition. New Delhi.2010:547-558.
10. Khandekar MM, Khurana AS, Deshmukh SD, Kakrani AL, Katdare AD et al. Platelet volume indices in patients with coronary artery disease and acute myocardial infarction. J Clin Pathol 2006;59:146-149
11. Khode V, Sindhur J. Mean platelet volume and other platelet volume indices in patients with stable coronary artery disease and acute myocardial infarction: a case control study. J Cardiovasc Dis Res. 2012;3(4):272-275.
12. Rifat. Mean platelet volume in ST elevation and non ST elevation MI. Gulhane Tip Derg 2011;53:114-118.
13. Alvitigala BY. A study of association between platelet volume indices and ST segment elevation MI. IJC Heart & Vasculature 21(2018)7-10.
14. Majumder M. Study of platelet count and platelet volume indices in the spectrum of coronary artery diseases and its clinicopathological correlation. Nig J Cardiol 2018;15:63-6.
15. Walke A, Nelson SS. To study red cell indices and platelet indices in acute coronary syndrome. International Journal of Contemporary Medical Research 2018;5(2):B4-B8.
16. Manchanda J, Potekar RM. The study of platelet indices in acute coronary syndrome. Annals of pathology and laboratory medicine. 2015;2(1):A30- 35.
17. Patil KS, Karchi SD. A comparative study of platelet indices in acute coronary syndrome. International journal of contemporary medical research 2017;4(3):657-660.