ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 6 | June - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF PLATELET PARAMETERS IN ACUTE CORONARY SYNDROME

Pathology

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ABSTRACT

ACS is a set of signs and symptoms due to rupture of a plaque which is a consequence of platelet rich coronary thrombus formation. Thrombus leads to partial or complete coronary artery occlusion which inturn leads to myocardial ischemia and various clinical manifestation ranging from UA to acute myocardial infarction. Conventional risk factors include smoking, diabetes mellitus, hyperlipidemia, obesity and stress which either act singly or in combination increase the chances of developing coronary atherosclerosis.4 Platelet indices also vary in diseases like diabetes, hypertension, obesity, hyperlipidemia etc.,5 This study aims to study the role of platelet parameters in patients with acute coronary syndrome and those who are at higher risk in comparison with healthy individuals.

Conclusion: These larger platelets can be easily identified during routine hematological analysis. For this purpose, we think that MPV measurement, in which is a non-invasive and easily available test, it may be an important tool predicting an impending acute coronary event and helping in early intervention to manage such patients.

KEYWORDS

INTRODUCTION :

Thrombosis and its complications like embolism are a global pandemic contributing significantly to adult mortality worldwide. The spectrum of Acute Coronary Syndrome(ACS) includes ST elevation myocardial infarction (STEMI), non ST elevation myocardial infarction (NSTEMI), or unstable angina (UA).1 ACS is a set of signs and symptoms due to rupture of a plaque which are a consequence of platelet rich coronary thrombus formation.2 The most common symptom is chest pain, often radiating to the left shoulder or angle of the jaw, crushing, central and associated with nausea and sweating.3 Many people with acute coronary syndromes present with symptoms other than chest pain particularly, women, older patients, and patients with diabetes mellitus.3 It is well known that platelets are activated along the coagulation cascade at the onset of thrombosis. During activation platelets change their morphology, develop pseudopodia and release a number of substances enhancing the formation of thrombus. Larger platelets have dense granules and are metabolically and enzymatically more active than small platelets and they have higher thrombotic potential.1 Thrombus leads to partial or complete coronary artery occlusion which inturn leads to myocardial ischaemia and various clinical manifestation ranging from UA to acute myocardial infarction. Conventional risk factors include smoking, diabetes mellitus, hyperlipidemia, obesity and stress which either act singly or in combination increase the chances of developing coronary atherosclerosis.4 Platelet indices also vary in diseases like diabetes, hypertension, obesity, hyperlipidemia etc.,5 This study aims to study the role of platelet parameters in patients with acute coronary syndrome and those who are at higher risk in comparison with healthy individuals.

AIMS AND OBJECTIVES: To explore the significance of platelet parameters (PCT, MPV & PDW) in patients with acute coronary syndrome and risk factors when compared to healthy controls.

METHODS: A prospective hospital based study was carried out on 100 patients of OWAISI GROUP OF HOSPITALS, HYDERABAD from Sep 2017 to June 2018. Ethical clearance was obtained from institutional ethics committee. Informed consent was obtained from all the participants. Three groups were studied: Group A Includes 50 patients admitted in intensive coronary care unit cardiology department of OWAISI GROUP OF HOSPITALS, diagnosed as ACS based on symptoms of ischemia, new significant ECG changes, imaging evidence of regional wall motion abnormality and identification of intracoronary thrombus by angiography. The diagnosis of unstable angina was established by the presence of unstable chest pain and typical electrocardiographic findings in the absence of elevated troponin levels.

GROUP B includes 50 patients of both in patients and out patients visiting the Department of Medicine, DCMS for the treatment of Hypertension and Diabetes Mellitus. Relevant history of smoking, alcohol intake and family history of coronary artery disease was obtained from all the cases.

GROUP C includes 50 healthy controls with no associated risk factors. 2ml of blood samples was collected after taking aseptic precautions from anticubital vein using 5ml syringe in EDTA vacutainers. The sample was processed immediately within one hour of collection using HORIBA PENTA ES 60 and complete blood counts analysis of the sample was obtained including the platelet indices (MPV, PDW, Plateletcrit). Relevant investigations like electrocardiogram and Trop-T sensitive kit cardiac enzymes were done to analyze the confirm the diagnosis.

EXCLUSION CRITERIA: Critically ill patients (ACS with renal failure, hepatic failure, Myeloproliferative disease), Patients having any platelet disorder, bleeding disorder, sepsis & recent blood transfusion (6 wks) were excluded from the study. Patients on antiplatelet therapy were also excluded from the study.

STATISTICAL ANALYSIS: All the data from the patients and controls were analyzed and compared using Students t-test in Microsoft Excel. Differences were considered significant if P value was <0.05.

RESULT: 150 subjects comprising of 50 patients in Group A(ACS), 50 patients with Risk factors like HTN,DM etc., and 50 normal individuals as control group were included to the study. Demographic characteristics of patient and control groups are shown in Table 1. The mean age of the patient in group A was 58.24±14.74 years. In present study, 60% were males 40% were females. The number of males among group A were 31(62%) and 19(38%) were females. Among group A patients 10 (20%) had unstable angina, 18(36%) had NSTEMI and 22(44%) had STEMI.

The mean age of the patient in group B was 58.36±11.69 years, 62% were males 38% were females.

The most common risk factors noted in group A was hypertension followed by diabetes and smoking. 32(64%) were hypertensive and 22(44%) were diabetics, 23(46%) were smokers and 8(16%) had a family history of CAD.

Table 1: DEMOGRAPHICS

AGE (years)	GROUP A		GROUP B		GROUP C		TOTAL
	M	F	M	F	M	F	
31-40	4	2	2	1	3	2	14
41-50	10	5	8	5	12	8	48
51-60	5	4	9	5	10	7	40
61-70	4	2	6	7	4	2	25
71-80	7	5	3	1	1	1	18
81-90	1	1	1	2	0	0	05
TOTAL	31	19	29	21	30	20	150

TABLE 2: Comparison of platelet indices between group A and group C

Platelet parameters	Group A (n=50)	Group C (n=50)	P value	Significant/Not Significant
Platelet count (150-450)×103 /µl	297.52±104.63	282±66.08	0.282	Not significant
MPV(6-11)fl	8.862±1.487	8.306±0.714	0.011	Significant
PDW(11-18)fl	13.86±2.77	13.88±1.704	0.480	Not significant
PCT(0.150-0.5)%	0.49646±1.741	0.235±0.05	0.1524	Not significant

Table 2 shows that MPV of platelet indices between Group A(ACS) and Group C(controls) showed statistically significant increase in mean platelet volume(MPV) with P value of 0.011 compared to controls.

TABLE 3: Comparison of platelet indices between group B and group C.

PLATELET PARAMETERS	GROUP B (n=50)	GROUP C (n=50)	P VALUE	Significant/Not Significant
Platelet count(150-450)×103 /µl	262.1 ±93.869	282±66.08	0.0536	Not significant
MPV(6-11)fl	8.426±0.908	8.306±0.714	0.5	Not significant
PDW(11-18)fl	14.74±2.169	13.88±1.704	0.016	Significant
PCT(0.150-0.5)%	0.22±0.065	0.2350.05	0.11	Not Significant

Similar comparison between group B and group C shows statistically significant increase in PDW with P value of 0.016, shown in the table 3.

TABLE 4: Comparison of platelet indices between STEMI and group C

PLATELET PARAMETERS	STEMI (n=22)	GROUP C (n=50)	P VALUE	Significant/Not Significant
Platelet count(150-450)×103 /µl	297.52±106.4	282±66.08	0.244	Not significant
MPV(6-11)fl	8.697±0.99	8.306±0.714	0.01699	Significant
PDW(11-18)fl	14.05±2.04	13.88±1.704	0.25549	Not Significant
PCT(0.150-0.5)%	0.244±0.076	0.235±0.05	0.33781	Not Significant

The comparison of platelet parameters of STEMI patients with control group showed statistically significant increase in MPV, showed in table 4.

TABLE 5: Comparison of platelet indices between NSTEMI patients and group C

PLATELET PARAMETERS	NSTEMI (n=18)	GROUP C (n=50)	P VALUE	Significant/Not Significant
Platelet count(150-450)×103 /µl	293.51±109.62	282±66.08	0.3284	Not significant
MPV(6-11)fl	8.629±0.98	8.306±0.714	0.04239	Significant
PDW(11-18)fl	13.89±2.071	13.88±1.704	0.39891	Not Significant
PCT(0.150-0.5)%	0.239±0.078	0.235±0.05	0.49341	Not Significant

Table 5 showed that the comparison of NSTEMI patients with control group showed statistically significant increase in MPV.

TABLE 6: Comparison of platelet indices between UA and group C

PLATELET PARAMETERS	UA (n=10)	GROUP C (n=50)	P value	Significant/NON Significant
Platelet count(150-450)×103 /µl	260.76±104.05	282±66.08	0.4845	Not significant
MPV(6-11)fl	8.35±0.40	8.306±0.714	0.40176	Not Significant
PDW(11-18)fl	14.60±1.577	13.88±1.704	0.22566	Not Significant
PCT(0.150-0.5)%	0.216±0.086	0.235±0.05	0.08206	Not Significant

The comparison of UA patients with control group in table 6 showed no significance.

DISCUSSION:

Coronary artery diseases were the most important cause of mortality and morbidity in industrialized countries. Both endogenous and exogenous risk factors such as smoking, hypercholesterolemia, DM, and hypertension increase the risk of ACS.6 Nevertheless, these risk factors accounts for only a part of ACS cases.7 Therefore, it is needed to identify other related risk factors so as to predict individual risk in the development of ACS. While atherosclerotic plaque rupture starts the thrombogenic phenomenon in ACS, the activity of circulating platelets plays an important role for the progression of thrombus. 8 Platelets were heterogeneous cells in terms of size, density, and activity.9 Platelet volume is an important indicator for platelet function and activation. Larger platelets contain more secretory granules and mitochondria and are known to be more active than small platelets. Leading to the formation and dissemination of intracoronary thrombus, larger and hyperactive platelets may accelerate the emergence of clinical picture called as acute coronary syndrome.[10]

In a study by Yaghoubi et al10 study, MPV was increased significantly in MI patients compared to controls. Varol E et al11, Cemin R et al12, Yilmaz et Al13 and Mathumithra et al1 also found that MPV was significantly higher in patients with ACS groups than controls. They suggested that platelet volume was an important biological variable to determine platelet reactivity. Our study is in concordance with above studies and reveals that MPV was significantly higher in patients with ACS compared to controls. However, Pizzulli et al14, Halbmayeret al15, and Butkiewicz et al16 studies suggested that there was no such association.

Yet, the prognostic value of MPV still remains to be controversial. While a number of studies established an association between MPV and coronary artery disease, some other studies suggested that there was no such association.

A study by Biradar et al17 reveals that PDW was significantly higher in patients with ACS than controls. The present study showed that there is significant increase in PDW of group B when compared to controls. There is also significant increase in PDW of Group B when compared to Group C. However there is no significant increase in PDW of Group A when compared to Group C.

In a study by Pipliwal et al18 and Assiri et al19 showed significant lowering of plateletcrit in ACS patients compared to controls. In a study by Siva Prasad Akula et al20 showed significant increase in PCT in ACS patients. However the present is not concordant with previous studies.

Pervin S et al21 , Nandwani S et al22 and Khandekar MM et al23 described in their studies that all platelet volume indices including MPV, PDW and PLCR were increased significantly in patients with

ACS compared to controls.

Inspite of many studies demonstrating the utility of MPV as predictive marker, in reality, it is a parameter which is subject to biological and technical variations.[24]

In the present study, we detected that mean platelet volumes were increased in patients presenting with STEMI and NSTEMI. Based on these findings, we have concluded that larger platelet volumes may constitute a high risk for acute coronary syndrome and ischemic complications. For this purpose, we think that MPV measurement, which is a non-invasive and easy-to-perform method, may be an important tool for the follow-up of these patients. Nonetheless, conflicting results of other studies make this issue controversial, which warrants performing of more comprehensive studies in future.

CONCLUSION:

Larger platelets contribute to the pre-thrombotic state in acute ischemic syndrome and play a specific role in development of acute coronary syndrome and its complications. These larger platelets can be easily identified during routine hematological analysis. For this purpose, we think that MPV measurement, in which is a non-invasive and easily available test, it may be an important tool predicting an impending acute coronary event and helping in early intervention to manage such patients.

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