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Platelet indices in patients of acute coronary syndrome patients in tertiary care hospital

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Abstract
Acute coronary syndromes (ACS) encompass a spectrum of coronary artery disease, from unstable angina to transmural myocardial infarction. Despite the developments regarding its diagnosis and treatment in recent years, acute coronary syndromes (ACS) keep its place of the most important reason of morbidity and mortality. The frequency of ACS is increasing as the population ages, and therefore, knowledge of knowing who are at high risk is essential. Aim was to study Mean Platelet Volume and Platelet Count of acute coronary syndrome (STEMI, NSTEMI, Unstable Angina) patients. The present one year cross-sectional study was done in the Department of Medicine and Cardiology, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. A total of 400 patients of age more than 18 years who presented with Acute Coronary Syndromes were included in the study. Patients were subjected to clinical examination, necessary investigations including Complete Haemogram, platelet count, electrocardiogram and Mean Platelet Volume and Troponin-I/ck-mb the following observations were made. Result of the study revealed that majority of the patients were males (75.5%). The male to female ratio was 3.08:1. In the present study majority of the patients were MI patients (75.75%). In the present study majority of the patients were non hypertensives (60.5%). Hypertensives to non hypertensives ratio was 1.53:1. In the present study majority of the patients were diabetics (60.5%). Diabetics to non diabetic's ratio was 1.77:1. In the present study majority of the patients were </=64 years (68.5%). Age less than 65 years to more than 65 years patients' ratio was 2.17:1. In the present study majority of the patients were not taken anti platelet therapy outside (89%). None taken anti-platelet therapy to taken anti platelet therapy ratio was 8.09:1. In the present study majority of the patients were not thrombolysed (94.5%). Non thrombolysed to thrombolysed ratio was 17.18:1. In the present study majority of the patients were nonsmokers (84.75%), Non tobacco chewers (89.25%). The average values of MPV and platelet counts are 8.9+/-1.48 fl and 2.7+/-0.88 lacs in patients of acute coronary syndromes. Factors which were significantly associated with platelet count were male gender, age <65years.
Conclusion: Acute coronary syndrome

Keywords: Acute coronary syndrome, Platelet count, Mean platelet volume.

1. Introduction
Consensus guidelines on a universal definition of myocardial infarction have been issued recently by the International Federation of Clinical Biochemistry, European Society of Cardiology, the American College of Cardiology, and the American Heart Association and the World Heart Federation that recommend cardiac troponin I and cardiac troponin T (cTnT) measurements as the preferred biochemical cardiac biomarkers for diagnosing ACS [1].
Cardiac diseases have been known to be the number one cause of deaths since the beginning of twentieth century [2]. It has been observed that known cardiovascular risk factors such as smoking, diabetes mellitus, obesity and hypertension are associated with MPV [3, 4]. Hence, MPV has a potential as a marker of platelet activation and may represent a risk factor for MI, dependent or independent of other cardiovascular risk factors.
A recent genome-wide association study has identified three polymorphisms in three different candidate genes that could modify the process of platelet formation and each is strongly associated with MPV [5].
Platelets are heterogeneous in size, density, and activity [6]. Alterations of these parameters may be associated with pulling the trigger of acute coronary syndrome and its spread [7].

Large platelets are more adhesive and tend to aggregate more than smaller ones [8]. Increase of platelet volume may contribute to increased prothrombotic tendency of atherosclerotic plaque in acute coronary syndrome and increased risk of intracoronary thrombus formation in AMI cases [9].

Activated platelets play an important role in the pathogenesis of coronary artery disease. The central mechanism is the formation of a platelet fibrin plug at the site of a ruptured atherosclerotic plaque, potentially leading to myocardial infarction [10]. Platelet count, mean platelet volume, a simple and reliable indicator of platelet size that correlates with platelet activation might be an emerging cardiovascular risk marker and potentially helpful in stratifying cardiovascular risk. Studying the correlation may help us to understand better and reduce the chance of myocardial infarction in the apparently healthy subjects [11, 12].

Hence the present study was undertaken to know mean platelet volume and platelet count as an independent risk factor in acute coronary syndromes.

2. Methodology

The present study was conducted in the Department of Medicine, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum from January 2014 to December 2014. Sample Size was calculated using the formula: $z\alpha^2pq/d^2 = 4pq/d2$ where z=1.96constant), p-sensitivity (50)-as obtained from previous studies, q-(100-p), d-absolute error (05) hence 400 patients with complaints of chest pain and equivalents suggesting acute coronary syndrome above the age of 18 years attending Department of Cardiology and Medicine, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belagavi were enrolled.

Inclusion Criteria: Any patients admitted to cardio ward with STEMI, NSTEMI, Unstable angina in last six days.

Exclusion Criteria: Patients with bleeding disorders, pre-eclampsia, sepsis, recent blood transfusion, patients who have underwent recent major operation or trauma, previous myocardial infarction in 6mts. Data was obtained by interview regarding demographic status, history of present illness, other comorbid conditions, personal and treatment history. Further these patients underwent clinical examination followed by systemic investigations which includes Complete blood count, Blood urea nitrogen, Serum creatinine, Random blood sugar, 12 lead ECG, Troponin-I, CK-MB. (Whenever required). Based on clinical presentation, examination and investigations, patients were evaluated for; Symptom profile, Risk factors (HTN, DM-2, Smoking, tobacco, etc.), Clinical Examination, Haematological variations (including Mean Platelet Volume and Platelet count, Trop-I, CK-MB.), ECG, 2D- ECHO whenever necessary. To determine the effect of anti-platelet therapy on platelet count and mean platelet volume our study divided them into anti platelet therapy taken outside, i.e; after the onset of chest pain but before admission to hospital (anti-platelet therapy taken -YES) group and anti-platelet therapy taken after coming to the hospital(anti-platelet therapy taken-NO) group.

Statistical methods: The data obtained was coded and entered into the Microsoft Excel Spreadsheet. The categorical data was expressed in terms of rates, ratios and percentages and continuous data was expressed as mean ± standard deviation.

Ethical clearance: Prior to the beginning the study was approved by the Institutional Ethics Committee, Jawaharlal Nehru Medical College, Belagavi. Written informed consent was obtained from the patient before enrollment.

3. Results

Majority of the patients were males (75.5%). The male to female ratio was 3.08:1. 'p' value for platelet count when compared between male and female was statistically significant. (p, 0.001). In the present study majority of the patients were MI patients (75.75%). The MI patients to USA patients ratio was 3.123:1. The 'p' value between the two groups was not significant. Majority of the patients were non hypertensives (60.5%). Hypertensives to non hypertensives ratio was 1.53:1, MPV and Platelet counts were high in Hypertensives (8.927fl & 2.80 lacs) respectively. Majority of the patients were diabetics (60.5%). Diabetics to non diabetics ratio was 1.77:1, MPV and Platelet counts were high in Diabetics (8.979fl & 2.764 lacs) respectively.

In the present study majority of the patients were not taken anti platelet therapy outside (89%). None taken anti platelet therapy to taken anti platelet therapy ratio was 8.09:1. Statistically significant for platelet count. In the present study majority of the patients were not thrombolysed (94.5%). Non thrombolysed to thrombolysed ratio was 17.18:1. In the present study majority of the patients were nonsmokers (84.75%). Nonsmokers to smokers ratio was 5.55:1. In the present study majority of the patients were non tobacco chewers (89.25%). Non tobacco chewers to tobacco chewers ratio was 8.3:1. The average values of MPV and platelet counts are 8.9+/-1.48 fl and 2.7+/-0.88 lacs in patients of acute coronary syndromes.

We had 44(11%) patients who had taken anti-platelet therapy outside before admission and 356(89%) patients who had not taken anti platelet therapy outside and on comparison of platelet count and MPV between these two groups, 'p' value was 0.05 and 0.7 for platelet count and MPV respectively which was statistically significant for platelet count but not for MPV between these two groups, hence showing that platelet count is dependent on anti-platelet therapy but MPV is an independent risk factor.

We had 22 patients who were thrombolysed outside as compared to the 378 patients who were not thrombolysed and on comparison of platelet count and mean platelet volume between these two sub groups 'p' value for platelet count and mean platelet volume were 0.19 and 0.13 respectively, which were not statistically significant, showing that platelet indices are independent risk factors.

The present study revealed that although there was association seen between various factors like smoking, Tobacco chewing, prior treatment with antiplatelets as well as thrombolisation. The factors which showed statistically significant are between male to female platelet count. Age less than 65 years to more than 65 years 'p' value (p=0.011) was statistically significant for platelet count.

Table 1: Distribution of patients as per the MPV and Platelet count

Variables		Number	MPV(fl)	P value	Platelet count(lac/dl)	P value
Hypertension	Yes	158	8.927	1.001	2.800	1.022
	No	242	8.917		2.738	
Diabetes	Yes	256	8.979	1.010	2.764	1.001
	No	144	8.889		2.761	
Gender	Males	302	8.9+/- 0.95	0.856	2.6+/- 0.86	0.001
	Females	98	8.9+/- 0.85		3.1+/- 0.91	
Presentation	MI	303	8.9+/- 0.89	0.751	2.7+/- 0.91	0.992
	USA	97	8.9+/- 1.04		2.7+/- 0.86	
AGE	</= 64	274	8.9+/- 0.95	0.674	2.8+/- 0.94	0.011
	>65	126	8.9+/- 0.88		2.6+/- 0.75	
Anti platelet treatment taken prior to hospitalisation	Yes	44	8.9+/- 0.82	0.707	2.5+/- 0.85	0.054
	No	356	8.9+/- 0.94		2.8+/- 0.89	
Thrombolysed prior to hospitalisation	Yes	22	9.2+/- 0.90	0.139	2.5+/- 0.70	0.191
	No	378	8.9+/- 0.93		2.7+/- 0.91	
Smoking	Yes	61	8.9+/- 0.89	0.15	2.4+/- 0.68	0.14
	No	339	8.9+/- 0.92		2.8+/- 0.89	
Tobacco Chewing	YES	43	8.8+/- 0.51	0.17	2.7+/- 0.68	0.16
	NO	357	8.9+/- 0.28		2.8+/- 0.54	

4. Discussion

Despite the developments regarding its diagnosis and treatment in recent years, acute coronary syndromes (ACS) keeps its place of the most important reason of morbidity and mortality. Cardiac diseases have been known to be the number one cause of deaths since the beginning of twentieth century [2]. It has been observed that known cardiovascular risk factors such as smoking, diabetes mellitus, obesity and hypertension are associated with MPV [3, 4].

In this study the mean age group out of 400 acute coronary syndrome patients was 57.81 years. Amongst 97 females, the mean age group was 59.48 years. Amongst 303 males mean age group was 57.26 years Males were 74.5% and females were 24.5%, which was seen in accordance with Klovaite *et al* [10] where in males were 46% and females were 54% but in contrast to other study Slavka G *et al* [13] where in males were less, i.e; 43% and females(43.4%) respectively.

In our study we also showed that patients of age less than or equal to 64 years were more in number (68.5%) as compared to patients of age more than 65 years (31.5%), and also the platelet counts were high in patients of less than 64 years which was statistically significant. Klovaite *et al*, showed that a strong association of increased MPV with geriatric age, high BMI, diabetes mellitus, hypertension and smoking, but after adjustment for these factors, the association of MPV with risk of MI still persisted, showing that MPV was independently associated irrespective of these risk factors with risk of MI [10].

In our present study 40% of the patients were hypertensives and 60% were non hypertensive's with mean platelet volume of 8.92fl and 8.91fl respectively and platelet count of 2.80 lac and 2.73 lac respectively with no statistical difference amongst the two group and it is in accordance with Klovaite *et al*, where in they showed 58% of hypertensives and 42% were non hypertensives.

In our study there were 64% diabetics and 36% non-diabetics with mean platelet volume of 8.97fl and 8.88fl respectively and platelet count of 2.76 lac and 2.76 lac respectively with no statistical difference amongst the two group. Lippi G *et al*, suggests that MPV may be a risk factor for recurrent myocardial infarction independent of such established risk factors as hypertension, dyslipidemia, increased fibrinogen, white blood cell count, or plasma viscosity [11].

In our study among 400 acute coronary syndrome patients, 303 were myocardial infarction patients and 97 were unstable angina patients. There was no statistically significant difference between the two sub groups as seen in concordance with Mercan R *et al*. where the 'p' value for platelet count was 0.7 and for mean platelet volume was 0.9 respectively amongst the unstable angina and myocardial infarction sub groups.

Klovaite *et al*, investigated a probable modification of the observed association between MPV and risk of MI by use of antiplatelet therapy by dividing individuals into different groups based on use of antiplatelets and within these groups, in turn dividing into tertiles of MPV. Increased risk of MI as a result of increased MPV was observed in both those with and without antiplatelets and there was no evidence of an effect of interaction between MPV and antiplatelets on risk of MI [10].

The risk of MI associated with MPV was most pronounced in individuals with a platelet count above 248 * 10^9 /L. In prospective, multifactorially adjusted analyses, risk of MI increased by 38% (8–75%) in individuals with MPV =/>7.4 vs. < 7.4 fL [10].

Patients with diagnosed ACS, all of whom had cTnT values of 0.03 ng/mL or greater, showed significantly higher MPVs than non-ACS patients (n _ 1848; median, 8.0 fL [5th to 95th percentiles, 6.7–10.0 fL] versus median, 7.4 fL [5th to 95th percentiles, 6.5–9.5 fL]; *P* =0.001). Patients with an increased MPV (11.01 fL) are at higher risk of expiry due to ischemic heart disease, with hazard ratios as comparable to those reported for obesity and/or smoking. Average platelet count in MI patient was 228.5+/= 74.1 * 10^9 /L and in that of unstable angina was 239.6+/= 59.2 * 10^9 /L respectively, and for that of mean platelet volume in MI patients was 8.9+/-0.8 fl and in unstable angina was 9.0+/- 1.0 fl respectively. The cut-off values for Mean Platelet Volume when predicting AMI and CAD in patients were 9.25 fl (sensitivity 56.4%; specificity 45.9%) and 9.15 fl (sensitivity 54.2%; specificity 42.23%), respectively. Compared to our study results to other studies, our results are in concordance with other studies [11, 13, 14, 15].

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