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A study of Red Cell and Platelet Indices in acute myocardium infarction: A prospective study

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Abstract
Background: *Platelets are known to be key factors of cardiovascular disease. Red cell indices and platelet volume indices are better indicators of acute myocardium infarction (AMI) and can play a major role in preventive measures of AMI.*
Aims and Objective: *To study the red cell indices and platelet indices in AMI.*
Materials and Methods: *One hundred and thirty seven AMI patients were studied. Diagnosis of AMI was confirmed by electrocardiogram (ECG) and Creatinine Phosphokinase-MB (CPK-MB) and patients were divided in to ST-segment elevation myocardial infarction (STEMI), non-ST-segment elevation myocardial infarction (NSTEMI) and unstable angina. Platelet indices including mean platelet volume (MPV), Platelet large cell ratio (PLCR), platelet distribution width(PDW), plateletcrit (PCT) and red blood cells including Red Blood cell distribution width (RDW), mean corpuscular volume (MCV),mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC)were estimated for all the patients.*
Results: *Majority of the patients belong to age group of 50-69 years (57.65%) with male preponderance (62%).MPV(10.34 ±1.28) and PLCR(38.79 ±10.49) were significantly higher (P<0.0001) in ST-segment elevation myocardial infarction (STEMI) patient as compared to the non-ST-segment elevation myocardial infarction (NSTEMI) (MPV, 9.52 ±1.13; PLCR, 33.15 ±8.83) and unstable angina (MPV, 9.21 ±1.09; PLCR, 30.92±7.82). Mean RDW and MCHC was highest in STEMI patients while mean MCH and MCV was highest in NSTEMI subjects (P>0.05).*
Conclusion: *MPV, PDW and PLCR may be considered as prognostic markers for acute coronary syndrome.*
Keywords: *ST-segment elevation myocardial infarction, acute myocardial infarction, ECG.*

Introduction
ACS includes the STEMI, NSTEMI, and UV life-threatening situations which occur when blood supply to the heart is blocked due to the destabilization of a stable atherosclerotic plaque and causes the dysfunction of heart muscles and sudden cardiac arrest due to ischemia-induced tachyarrhythmia. [1]

Causes of ACS are tobacco smoking, abnormal lipid profiles, high blood pressure, diabetes, abdominal obesity and stress, low intake of fruits and vegetables and lack of physical exercise.[2] ACS known to be a very common complication of coronary heart diseases, affecting more than 3 million people globally every year. More than 15% diagnosed patients died in the first 6 months and 50% deaths within 30 days.[3] Recent clinical studies have established that the RDW is associated with the cardiac adverse events (MACE), in patients with heart failures.[4]

RDW is normally reported as part of the complete blood count (CBC) for the diagnosis of anemia. Platelet playsa major role in the pathogenesis of ACS, in which plaque rupture is followed by platelet activation and thrombus formation. Electronic cell counters have made it possible to measure PVI, MPV and PDW which is a simple and cost-effective method of identifying these larger platelets.[1, 2]

Current study conducted to understand the severity and extent of myocardial injury in patients of ACS based on echo cardiography and its association with the red cell indices and platelet indices.

Material and Method

This prospective cross sectional study was conducted on 137newly diagnosed AMI patients. Diagnosis of AMI was confirmed by ECG and Creatinine Phosphokinase-MB (CPK-MB). An informed written consent was obtained from all subjects before starting the study.

Under aseptic condition blood samples were taken at the time of admission and were analyzed after 120 minutes of venipuncture. Blood samples were analyzed for Red cell indices (MCV, MCH, Mean Corpuscular hemoglobin concentration (MCHC), RDW) and Platelet Indices (Pateletcrit (PCT), MPV, PDW, Platelet large cell ratio (PLCR). Complete blood count was estimated by Mindray (3 part) Automated Blood cell counter. 2D ECHO was done to access myocardial damage in patients with AMI.

Earlier diagnosed cases of ACS, who had hematological disease involving red blood cells and platelets, patients of chronic kidney disease (CKD), chronic liver disease, chronic obstructive pulmonary disease and cerebrovascular accident and referred patient who were thrombolysed or who had given loading dose of anti platelet were excluded from the present study.

Data was recorded in excel and analyzed using the IBM SPSS ver. 20 software. Results were presented in Mean ±SD format. The significance of difference between two proportions was indicated by the ANOVA statistics and difference were considered to be significant if p value <0.05).

Results

Out of137 subjects, 79 (57.65%) were in group 50-69 years. Prevalence of ACS was higher in male subjects (62%).

MPV (10.34 ±1.28) and PLCR (38.79 ±10.49) were significantly higher (P<0.0001) in ST-segment elevation myocardial infarction (STEMI) patient as compared to the non-ST-segment elevation myocardial infarction (NSTEMI) (MPV, 9.52 ±1.13; PLCR, 33.15 ±8.83) and unstable angina (UA) (MPV, 9.21 ±1.09; PLCR, 30.92±7.82).

Mean values of RDW and MCHC was highest in STEMI group patients while Mean values of MCH and MCV was highest in NSTEMI subjects which was statically insignificant (P>0.05).

Discussion

Platelet has been reported to play an important role in pathogenesis of atherosclerosis and its complications like IHD. During the platelet activation, platelet indices such as MPV and PDW can be easily measured. PDW is used to measures the variability in platelet size, and its high values could suggest larger production of larger reticulated platelets. Elevated platelet indices have been proposed as a risk factor for CAD or ACS.[5, 6]

In present study there was male preponderance suffering from AMI (62.77%). Of these 51

females, 16.78% had STEMI, 11.67% had NSTEMI and 8.75% had UA. 27% Males had STEMI, 19.07% had NSTEMI while 16.05% had UA. There was no statically significant association. Similar results were depicted in the study conducted by Joaquin et al who investigated the possible sex differences in the clinical characteristics, cardiovascular risk profile, diagnostic assessment, treatment and prognosis of patients admitted with AMI in Spain between 1994-2002 including 48,369 patients (75.7% male and 24.3% female). Of these, 13,405 (26.6% female) had non-ST-elevation acute coronary syndrome (NSTEACS), while 34,334 (23.2% female) had ST-elevation acute coronary syndrome (STEACS). Similar results were shown by the Dilip et al[7] who conducted a study in tertiary care referral hospital in Kerala. Out of 51 NSTEMI patients, 4.7% were male and 33.4% were females. Similarly, 87.90% of STEMI patients were males and 12.10% were females. Among patients diagnosed with UA, 75% were males and 25% were females, however it was insignificant.

Comparison of Red cell indices in patients with AMI showed that in our study increase in mean values red cell indices was statistically insignificant in different AMI group. Tenekecioglu et al[8], analyzed blood parameters of 251 AMI patients for a year and concluded that the red cell distribution width could be considered for risk stratification of acute coronary syndrome patients admitted to emergency departments.

Comparison of Platelet indices in patients with AMI showed that mean values of MPV and PLCR was increased in STEMI study group as compared with NSTEMT and UA study group which is statically significant. Man Chanda et al[9] concluded that platelet indices especially MPV and PDW were raised in patients who have suffered STEMI and NSTEMI as compared with patients diagnosed with unstable angina. In a similar study of Walke et al[10] including acute coronary syndrome reported similar results as revealed in present study. Patil et al[11] did a comparative study on three groups, each consisting of 25 patients each with STEMI, NSTEMI and Non-Cardiac Chest Pain (NCCP) respectively and reported that the platelet indices, the mean platelet volume, platelet distribution width and platelet large cell ratio were significantly higher in STEMI and NSTEMI groups when compared to the NCCP group.

Cross sectional nature and small sample size was the limitation of the present study; a large randomized clinical trial is needed to strengthen the present study findings.

Conclusion

Based on the observations and result of this study we can conclude that the AMI is more prevalent among males as compare to females. RDW can he considered as an alternate for quick assessment of myocardial damage where 2D ECHO facilities are unavailable. Also MPV, PDW and PLCR may be used as prognostic indicator for morbidity and mortality in cases of acute myocardial infarction.

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