Investigation of platelets count and indices in coronary artery diseases among Sudanese patients

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Abstract: *Platelets play a key role in initiation of atherosclerosis and formation of coronary thrombus in coronary artery diseases (CAD). Active platelets are large in size and have a higher potential thrombotic ability, evaluation of their volume indices as indicator of their activity could be useful in prediction and differentiation of coronary events. This study evaluated the platelets volume indices in a group of Sudanese patients with CAD and compared with normal populations. Among the total included 103 patients with CAD; there were 53 patients with acute coronary syndrome (ACS), 50 patients with chronic stable angina. Age and sex matched; 100 subjects with non-cardiac chest pain were also included as normal controls. K3-EDTA anticoagulated venous blood of each subject was collected, platelets count and indices were measured using Sysmex KX-21 analyzer. Platelets count was significantly higher in ACS group than normal controls; p-value 0.001, there was no significant difference between stable angina group and normal controls; p-value 0.29. Mean platelets volume (MPV), platelets distribution width (PDW), and platelets -large cell ratio (P-LCR) were significantly higher in ACS cases compared to controls (P-values: < 0.05), however, these indices were not significantly differ between stable angina and controls (P-values: > 0.05). There were no age or gender differences in MPV values in normal controls, p. values: > 0.05. Patients with ACS had significantly higher platelet volume indices compared to normal population. Evaluation of platelets count and indices might be useful in predicting those patients at higher risk for acute coronary events.*
Keywords - coronary artery, angina, indices, myocardial infarction, platelets.

I. Introduction

Coronary artery disease (CAD) is a group of disorders involved thrombotic lesion in coronary artery; these includes acute coronary syndrome (ACS) of acute myocardial infarction (AMI) and unstable angina, chronic coronary syndrome of chronic stable angina. Diagnosis of such disorders is still a challenge despite the considerable progress in the diagnostic modalities [1]. Many risk factor are involved in the pathogenesis of coronary atherosclerosis, acting either in single way or in synergistic effect, these are -not limited to -smoking, obesity, diabetes mellitus, and hypercholestraemia [2, 3].

Platelets have been concerned in the development and progression of ischemic heart diseases, including atherosclerosis and its complications, such as AMI, unstable angina, and ischemic strock [2, 4-7]. Anti-platelet drugs have a principal role in managing patients with ACS. They block the pathologic pathway of thrombosis via inhibiting the platelet function; hence they are used in treating patients with ACS patients [8]. It has been well know that platelet size reflects the platelet activity, haemostatic active platelets are large in their size [9-11]; have a tendency to adhere and aggregate more than smaller ones due to high concentration of thromboxane A2. [12, 13]. This increase in platelet volume will increase the propensity for coronary thrombus formation in ACS patients [2, 14].

Automated hematology analyzers made it possible to determine other parameters that had not previously been measured [15], it is used to determine full blood counts including platelet counts and its volume indices. Platelet volume indices including mean platelet volume (MPV), platelet distributing width (PDW), and platelet large cell ratio (P-LCR) offer valuable information about the morphology and maturity of platelets. MPV is a measurement of the average size of platelets in blood [16].The higher MPV is a larger platelets size. PDW reflects the variability in the platelets size [17] and it's therefore increased in the presence of platelets anisocytosis. Several published studies in the literature have documented the increase of platelets indices in coronary artery events [18-20]. Thus, our aim was to assess these indices in the spectrum of CAD and to compare it with normal populations.

II. Material And Methods

A cross sectional hospital-based study was conducted in 3 specialized cardiovascular centres in Khartoum state during a period of January to June 2014 after obtaining ethical approval from the Research Ethics Committee at FMLS-Khartoum University. A total of 103 patients with CAD were distributed into two groups; the first group are patients with ACS (N/53); either AMI or unstable angina, the second group are patients with chronic stable angina (N/50). Age and sex matched – 100 apparently healthy subjects- with non-cardiac chest pain were included as normal controls.

A diagnosis was made in these centres and was based on clinical symptoms and diagnosis criteria. Patients with severe hepatic or renal impairment, myeloproliferative disorders, malignancy, hypo/hyperthyroidism, and patients with any other condition affecting the platelets function and number were excluded. Demographic and clinicobiologic data were collected from patient's medical record in a questionnaire after obtaining a written consent form.

From each enrolled subject EDTA-K3 venous blood sample (3 ml) was collected, mixed gently, and was delivered within 30 minutes of collection to the laboratory for analysis. Platelets count including platelets indices was performed as part of full blood count by automated procedure using Sysmex KX-21 blood cell analyzer. The whole blood mode was selected to analyze blood sample without pre-dilution.

The results data was collected in master sheet paper, analyzed using Microsoft office Excell (2007) and SPSS program and presented in tables and figures. Simple T-test was used to compare the platelets count and indices in the entire study groups.

III. Results

The present study evaluated the platelets count and indices in 103 patients with CAD, age and sex matched 100 subjects with non-cardiac chest pain were included as normal controls. Among the total included patients with CAD; there were 53 patients with ACS (AMI/unstable angina) and 50 patients with chronic stable angina.

Patients with ACS had a significant higher platelets indices than those in normal controls (p. values were <0.05), while these indices were not statistically differ between patients with stable angina and normal controls (p. values were >0.05), "Table 1". Platelets count was significantly higher in ACS than normal controls (p. value: 0.001), however, no statistical difference was detected for platelets count between patients with stable angina and normal controls (p. value: 0.29), "Table 1". There were no age or gender differences in MPV values in normal population group (p. value: > 0.05).

TABLE 1. MEAN, P- VALUES FOR PLATELET COUNTS/ INDICES IN THE STUDIED GROUPS.

Variable	ACS (N/53)	Stable angina (N/50)	normal controls (N/100)	p. value
Plateletx103/µl	274	- 252	236	0.001 0.29
MPV/fl	10.3	- 10.0	9.2	0.01 0.12
PDW/fl	15.9	- 13.1	12.2	0.01 0.07
P-LCR%	28.0	- 26.0	24.0	0.001 0.09

MPV/fl

Plateletx10^3/µl
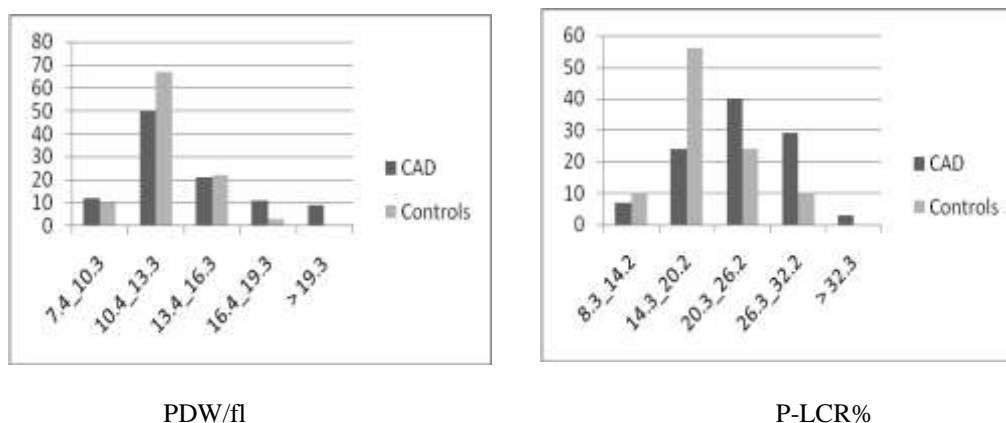
PDW/fl   P-LCR%
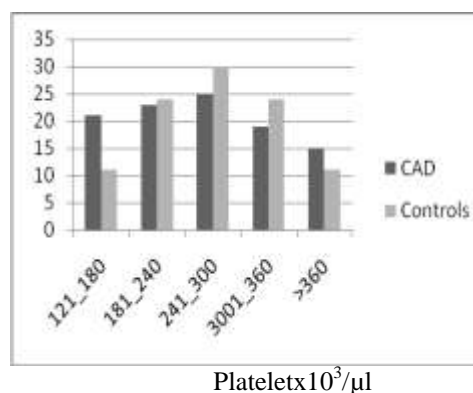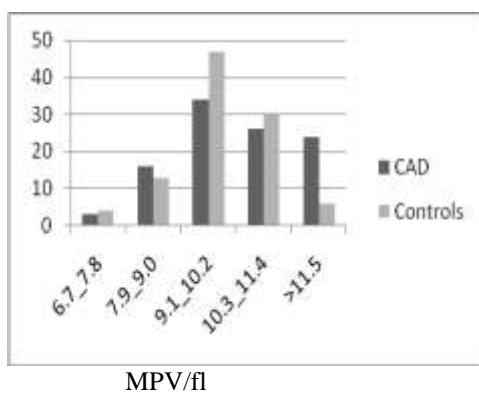
Fig.2: Frequency of Platelet Count /Indices In CAD (N/103) And Controls (N/100).

IV. Discussion

Platelet function can be affected by several factors, such as platelet count, platelet age, density, granules, and expression of adhesion receptor, as well as size. Platelet function and size correlate because larger platelets, produced by activate megakaryocyte, are expected to be more reactive than normal platelets because large platelets are more condensed and have more secretary granules and are identified to be more active than small platelets [14]. Thus MPV as a measurement of the average size of platelets [18] correlates positively with a platelets function. Consequently, larger and active platelets play a crucial role in accelerating the formation and propagation of intracoronary thrombus, leading to the occurrence of acute thrombotic events [21].

Different techniques have been used to evaluate the platelet activation and function [22], all these tests have their limitation in such assay. MPV is a simple, inexpensive, and fast test that does not require sophisticated technology. Previous published studies in the literature have evaluated the platelets indices in ischemic heart disease [18-20] and suggested that it can reflect an atherosclerothrombic tendency in the human body.

In the present study, the platelet indices; MPV, PDW, and P-LCR were assessed in a group of CAD patients and compared to normal populations. A higher significant difference was detected in patients with ACS (AMI /unstable angina) than in normal controls. Similar result was reported by Jasmin et al [23], Assiri et al [24], Salim et al [25] and Khode et al [20]. Khandekar et al [18], suggested that all platelet volume indices are significantly raised in patients with AMI and unstable angina patients as compared to those with stable coronary artery disease.

In comparison of platelets indices between chronic stable angina and normal controls; our results revealed no significant differences, this finding supported by results of Jasmin et al et al [23] and Assiri et al [24].

Our study revealed that there was also a significant difference in platelet counts in patients with ACS (P> 0.5) compared to normal controls, this is supported by the results of salim et al [25] which found that platelet count is significantly higher in patients with AMI and unstable angina, and disagree with the result of Mathur et al [26] who found that platelet counts to be significantly lower in patients with ACS (AMI and unstable angina).

According to our results we suggest that platelet volume indices are of usefulness in predicting the occurrence of acute coronary events, helping in early intervention to manage and care such patients.

V. Conclusion

Platelet indices are increased in ACS probably because of platelet activation and a compensatory volume enhancement. These changes in platelets count and volume could differentiate sup-groups patient with CAD. Platelets volume indices should be investigated in patients with CAD to predict the possibility of developing acute coronary events.

Acknowledgements

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