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SHORT COMMUNICATION

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Assessment of Plateletcrit as Biomarker in Ischemic Heart Disease Patients

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Abstract

***Background*:** Platelets are crucial in initiating the formation of atherosclerosis and thrombus in ischemic heart disease. Larger platelets are enzymatic and metabolically active and have a higher potential thrombotic ability. Evaluation of their volume indices as indicators of their activity could be valuable in predicting and differentiating different ischemic heart disease (IHD) spectrums. This study aimed to assess plateletcrit (PCT) levels in IHD patients and compare them with healthy subjects.

Methods and Results: A cross-sectional, hospital-based study was conducted in different specialized cardiovascular centers in Khartoum state, Sudan. 95 IHD patients were categorized into two groups. Group 1 included 57 patients with ST-elevation myocardial infarction (STEMI), and Group 2 included 38 patients with chronic stable angina (CSA). The control group (Group 3) included 100 healthy subjects without a history of IHD, who were age—and sex-matched to the patient groups.

Plateletcrit was measured as part of the full blood count by an automated blood cell analyzer, Sysmex KX-21. Groups 1 and 2 had significantly higher PCT than the normal controls (P=0.000). PCT level was slightly higher in Group 1 than in Group 2. There were no age or gender differences in PCT values in the control group.

***Conclusion*:** Plateletcrit should be investigated in patients with IHD, along with other platelet volume indices, to predict the possibility of developing acute coronary events.(**International Journal of Biomedicine. 2024;15(1):222-225.**)

Keywords: plateletcrit • ischemic heart disease • acute coronary syndrome

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Abbreviations

ACS, acute coronary syndrome; **IHD**, ischemic heart disease; **STEMI**, ST-elevation myocardial infarction; **CSA**, chronic stable angina; **MPV**, mean platelet volume; **PCT**, plateletcrit; **P-LCR**, platelet-large cell ratio.

Introduction

Ischemic heart disease (IHD) is the most important cause of mortality and morbidity worldwide.[1] After the age of 40, the risk of IHD is 32% for women and 45% for men.[2] Numerous risk factors are involved in the pathogenesis of coronary syndromes, acting either singly or synergistically (obesity, smoking, diabetes mellitus, hypercholesterolemia, etc.).[3,4]

The IHD pathogenesis has been linked to platelet disorders.[5-8] Platelets are crucial in initiating the formation of atherosclerosis and thrombus in ischemic heart disease.[9] Larger platelets are enzymatic and metabolically active and have a higher potential thrombotic ability. Evaluation of their volume indices as indicators of their activity could be valuable in predicting and differentiating different IHD spectrums.

It has been proposed that local platelet activation and platelet hyperactivity are the causes of acute coronary events. Anti-platelet drugs have a major role in the management of patients with acute coronary syndrome (ACS).[10] They block the pathologic pathway of thrombosis by inhibiting platelet function; hence, they are used in treating ACS patients. It has been well known that platelet size reflects platelet activity. Hemostatic active platelets are large[11-13] and tend to adhere and aggregate more than smaller ones due to their high thromboxane A2 level.[14,15] Such an increase in platelet size

will increase the tendency for coronary thrombus formation in ACS patients.[16]

Platelet volume indices, including mean platelet volume (MPV) and platelet large-cell ratio (P-LCR), provide useful information regarding the morphology and maturation of the platelets. Mean platelet volume is a measurement of the average volume or size of platelets.[17] The larger platelets have a higher MPV. The PCT is also proportional to the volume and number of platelets. Several published studies have documented the increase of platelet volume indices in coronary artery events.[18-21] Previous studies suggest that, besides well-known risk factors, platelet indices may represent additional risk factors for myocardial infarction.[22] The prognosis of IHD is also linked to platelet indices.[23]

This study aimed to assess PCT levels in IHD patients and compare them with healthy subjects.

Materials and Methods

A cross-sectional, hospital-based study was conducted in different specialized cardiovascular centers in Khartoum state, Sudan. A specialized cardiologist in the center diagnosed IHD based on clinical examination and other diagnostic criteria.

A total of 95 IHD patients were categorized into two groups. Group 1 included 57 patients with ST-elevation myocardial infarction (STEMI); Group 2 included 38 patients with chronic stable angina (CSA). The control group (Group 3) included 100 healthy subjects without a history of IHD, who were age- and sex-matched to the patient groups. Demographic and clinical data were gathered from the patients' medical records in the hospital.

Exclusion criteria were severe hepatic or renal impairment, myeloproliferative disorders, malignancy, hypo/hyperthyroidism, and any other condition affecting the platelet function and number.

An EDTA-K3 venous blood sample (3mL) was collected from each enrolled patient and sent immediately after collection for laboratory analysis. PCT was measured as part of the full blood count by an automated blood cell analyzer, Sysmex KX-21.

The study protocol was reviewed and approved by the Ethics Committee of the College of Applied Medical Sciences, Northern Border University (Arar, Saudi Arabia). All participants provided written informed consent.

Statistical analysis was performed using statistical software package SPSS version 25.0 (SPSS Inc, Armonk, NY: IBM Corp). Baseline characteristics were summarized as frequencies and percentages for categorical variables and as mean±standard deviation (SD) for continuous variables. Multiple comparisons were performed with one-way ANOVA. A probability value of $P<0.05$ was considered statistically significant.

Results and Discussion

PCT levels were elevated in IHD patients (Figure 1). Groups 1 and 2 had significantly higher PCT than the normal controls (Table 1). PCT level was slightly higher in Group 1 than in Group 2. There were no age or gender differences in PCT values in the control group.

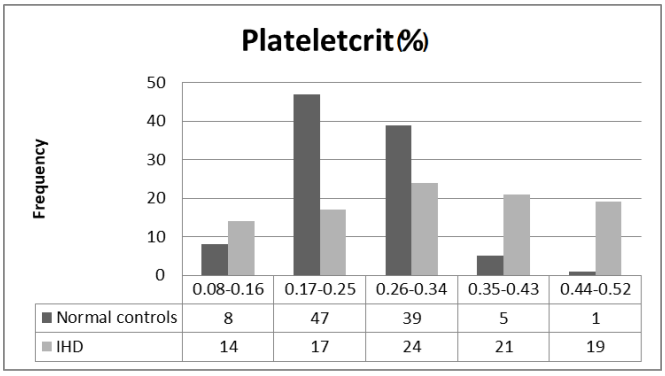

Fig. 1. *Frequency distribution of PCT in IHD patients and healthy controls.*

Table 1.
The PCT levels in the study groups.

Variable	Group 1 (STEMI)	Group 2 (CSA)	Croup 3 (Controls)	Statistics
n	57	38	100	F=14.9314, P=0.000
PCT, %	0.27±0.08	0.25±0.09	0.21±0.05	P_{1-2}=0.3478, P_{1-3}=0.000 P_{2-3}=0.0072

Platelet function can be affected by different elements, such as platelet number, age, density, granules content, expressed adhesion receptor, and volume or size. Platelet function and size correlate because larger platelets, produced by active megakaryocytes, are expected to be more reactive and condensed, and have more secretory granules than normal platelets.[14] Therefore, MPV, as a measurement of the average size of platelets,[18] correlates positively with platelet function. PCT is proportional to MPV, as larger platelets are indicated by higher MPV and PCT values. Accordingly, larger and more active platelets accelerate the development and expansion of intracoronary thrombus, resulting in acute thrombotic events.[22]

Numerous tests have been used to assess platelet activation and function.[23] All these technologies have their limitations in such assays. As one of the platelet volume indices, PCT is a simple, inexpensive, and fast test that does not require sophisticated technology. Previously published studies have investigated the platelet indices in IHD[18-21] and suggested that they can reflect an atherothrombotic tendency in the human body.

Khandekar et al.[18] suggested that all platelet volume indices are significantly higher in ACS patients than in those with CSA.

In the present study, elevated PCT levels in IHD patients aligned with data from several studies. Similar

results were reported by Khode et al.[20] and Al-Obeidi et al.[24] However, Assiri et al.[25] and Jasani et al.[26] found no significant variation in PCT between the CSA patients and healthy controls.

According to the present study findings, we suggest that PCT is useful in predicting the occurrence of acute coronary events and in helping in early intervention to manage and care for such patients.

In conclusion, plateletcrit is increased in ACS probably because of platelet activation and compensatory volume enhancement. Plateletcrit should be investigated in patients with IHD, along with other platelet volume indices, to predict the possibility of developing acute coronary events.

Competing Interests

The author declares no competing interests.

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