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Determination of Platelet Count and Indices in Ischemic Stroke Patients

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Abstract

Background: *Determination of platelets count in ischemic stroke disease is an important because they contribute to thrombus formation and embolism. The platelet indices are markers of platelet activation. The study aimed to determine the relationship between platelet count and platelet indices (mean platelet volume, platelet distribution width, and platelet crit) with ischemic stroke.*

Materials and methods: *100 ischemic stroke patients and 100 healthy control subjects who attended Kosti Teaching Hospital were included. Diagnosis of ischemic stroke patients was performed clinically according to the World Health Organization and confirmed by brain CT. Platelet count and platelet indices were measured by using the hematological analyzer (Mindray BC 3000 plus).*

Results: *There was non-significant variation in the distribution of gender between groups (P=0.090). Males represented 44 % and females 56% of study cases, whereas males represented 56 % and females 44% of study control individuals. The platelets count was decreased in ischemic stroke patients but the mean of platelet volume (P<0.05), platelet distribution width (P<0.05), and platelet crit (P<0.05) were significantly increased.*

Conclusions: *Platelets count and indices are important predictor, diagnostic, and prognostic factors in patients with acute ischemic stroke.*

Key Words: Ischemic stroke, Platelet count, MPV, PDW, PCT

1. INTRODUCTION

Platelet is a nucleated cell fragment produce from the megakaryocyte of the bone marrow. It is play a vital role in homeostasis [1]. A normal platelet count ranges from 150,000 to 450,000 platelets per microliter. The lifespan of the platelets is between 5 to

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7 days following formation and separation from the megakaryocyte [2]. Platelet count must be performed in an accurate and reliable way. Currently, the available hematology analyzers use different technologies to count the Platelets like impedance and optical methods [3]. Platelet volume is a marker of platelet function and activation that is readily measured as mean platelet volume (MPV) and positively associated with platelet reactivity [3,4]. Larger platelets contain more dense granules and are metabolically more active than small platelets and having higher thrombotic potential [5]. Platelet distribution width (PDW) is a marker of platelet anisocytosis, which describes the size of platelets distribution and increases upon platelet activation [6]. Platelet crit (PCT) measures the total platelet mass as a percentage of volume occupied in the blood. The normal range for PCT is 0.22–0.24% [7,8]. It seems to play an effective screening role in detecting platelet quantitative abnormalities [9,10]. A stroke is significant cause of morbidity and mortality worldwide [11]. There were two types of stroke, namely, ischemic stroke due to lack of blood flow and hemorrhagic due to bleeding. Signs and symptoms of a stroke include weakness, paralysis on one side of the body, slurred speech, dizziness, or loss of sensation [12,13] . Signs and symptoms often appear after the stroke has occurred [3]. Ischemic stroke can also be a mini-stroke [14]. A ischemic stroke may also be associated with a severe headache [15]. The main risk factor for stroke is high blood pressure [16]. Other risk factors include high blood cholesterol, smoking, obesity, diabetes mellitus and cardiac diseases [16,17]. An ischemic stroke is typically caused by blockage of a blood vessel [18]. Diagnosis of ischemic stroke is typically based on a physical exam and supported by medical imaging such as a computerized tomography (CT) scan and electro-cardio-gram (ECG) [19,20]. The study aimed to determine the relationship between platelet count and indices (MPV, PDW, and PCT) and ischemic stroke.

2. MATERIALS AND METHODS

This was a case-control study included 100 ischemic stroke patients who admitted to Kosti Teaching Hospital, Kosti (Sudan) along with 100 healthy controls. The diagnosis of ischemic stroke was performed clinically according to The World Health Organization and confirmed by brain CT and ECG.

The study follows the declaration of Helsinki concerning human research and informed consent was obtained from each subject.

In the current study, the eligible subjects were ischemic stroke patients and non-ischemic stroke healthy subjects. The excluded subjects were patients with a history of head trauma, previous intracranial surgical procedures, hemorrhagic stroke, and history of previous stroke as well as patients with a history of previous vascular events, malignancies, autoimmune diseases, and patients on anti-platelet therapy.

2.1. Sample collection and laboratory investigations:

From each admitted acute ischemic stroke patient and healthy control subject, venous blood was immediately collected in an EDTA vacationer, mixes well, and analyzed in a hematological analyzer (Mindray BC 3000 PLUS) to measure platelet count and platelet indices (MPV, PDW, PCT) by using the Coulter method.

2.2. Statistical analysis

Data were analyzed using SPSS version 21 software. Figures displayed by Graph-pad prism software (version 0.8). The level of significance was considered as P< 0.05.

3. RESULTS

In our study, a total of 100 ischemic stroke patients and 100 normal healthy control individuals were involved. There were in-significant differences (X^2=2.880, P=0.090) in distribution of gender between study groups (Gender-matched case-control study). In this study, males represented 44 % and females 56% of study cases, whereas, males represented 56 % and females 44% of study control individuals. In study cases, the majority of subjects were in the age range from 71 -80 years (46%). In contrast, the majority of control subjects were in 41-50 (32%) and 61-70 (32%) age groups. Between study groups, the distribution of study cases and controls were significant differences (X^2=49.838, P<0.000) among age groups (Table 1).

The mean platelets count was 185.8± 34.4 in ischemic stroke patients and 261.8 ± 77.6 in healthy control subjects, P<0.05 (Figure 1). In the current work, the analyzed platelets indices were higher in study cases (PDW=15.1±1.4, MPV=9.7±1.3, PCT=0.3±0.0) compared to control (PDW=11.4±1.5, MPV=7.9±0.7, PCT=0.2±0.2), P<0.05 (Figure 2).

Table 1: Socio-demographic features of study subjects

Variable		Group: N (%)		X^2	P value
		Case: N=100	Control: N=100		
Gender	Male	44 (44)	56 (56)		
	Female	56 (56)	44 (44)	2.880	0.090
Age years	41-50	10 (10)	32 (32)		
	51-60	8 (8)	25 (25)		
	61-70	29 (29)	32 (32)	49.838	<0.000
	71-80	46 (46)	10 (10)		
	81-90	7 (7)	1 (1)		

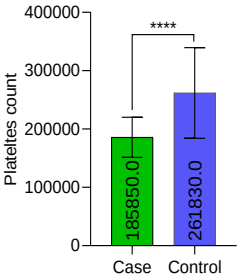

Figure 1: comparison of platelet count between patients and control

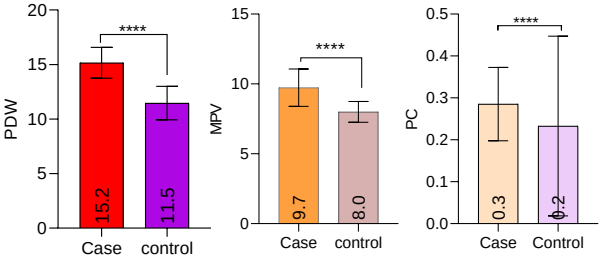

Figure 2: Comparison of platelets indices between ischemic stroke patients and control.

4. DISCUSSION

In our study, the majority of patients were in the age range from 71 -80 years (46%), which is similar to data reported by O'Malley *et al* [21]. In our study, there were insignificant differences (X^2=2.880, P=0.090) in distribution of gender between study groups (males represented 44 % and females 56% of study cases; whereas, males represented 56 % and females 44% of study control individuals). Thus, it is matched case-control study, which will give more accurate results. In this study, the platelets count was significantly lower in ischemic stroke patients (185.8 ± 34.4) compared with healthy control subjects (P<0.05), whereas, MPV mean was higher in ischemic stroke patients than control. Formerly, Leader et al., study found that the mean of platelet count was declined in ischemic stroke patients and MPV mean were higher in ischemic stroke patients [2] .In our study, the mean of PDW and PCT were higher in study cases than normal health control. This is similar to data reported by Vagdatli et al., study that found the PDW and PCT both increased in ischemic stroke patients [22].

5. CONCLUSION

The study highlighted the alterations of platelets count and indices in ischemic stroke. Platelet count and indices are important prognostic factors in patients with acute ischemic stroke as well as they are essential in the diagnosis of ischemic stroke because it's available and not expensive.

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