

Platelets Distribution Width as A Clue of vascular Complications in Diabetic Patients

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ABSTRACT

Background: The susceptibility to developing vascular complications in diabetic patients could be correlated with alteration of platelet morphology. Although the prevalence of diabetes mellitus in Sudan is considered as medium when compared with other countries in the Eastern Mediterranean Region, the complications of patients with diabetes are high.

Objective: This study aimed to evaluate platelet distribution width as an indicator of vascular complication in diabetic patients.

Methods: One hundred and fifty type 2 diabetic mellitus patients and one hundred and fifty healthy individuals as controls were enrolled in this study. Five ml of blood were collected into EDTA containers and analyzed by a fully automated hematological analyzer to measure platelet distribution width.

Results: The patients were classified into four groups according to duration of disease in years, ≤5 years (40.6%; 61/150); 6-11 years (28.7%;43/150); 12-17 years (18.7%;28/150) and over 17 years (12.0%;18/150). The results revealed that the mean ±SD of platelet count, main platelet volume, and platelet distribution width were significantly different between cases and control group, (296 ±75/μl, 9.5 ±0.9 fL, 12.0±2.0fL, 0.3%±0.1), and that in controls was 307±85/μl, 9.1±0.7fL, 11.3±1.5fL, 0.3%±0.1 respectively. The platelet distribution width was significantly increased with the duration of diabetes (p value = 0.041).

Conclusion: Platelet distribution width can be used as a clue to vascular complications in diabetic patients.

Keywords: Diabetic mellitus, platelets count, Platelet distribution width, Sudan

INTRODUCTION

The chronic hyperglycemia which is known as diabetes mellitus (DM) is characterized by metabolic disturbances as a result of insulin deficiency, in acting or both (1). In Sudan, the national prevalence of diabetes is 7.7% and is predicted to become 10.8% in 2035 (2, 3). Although the prevalence of DM in Sudan is considered as medium when comparing with other countries in the Eastern Mediterranean Region, the complications in patients with diabetes are high (4, 5).

Studies have shown that insulin deficiency causes glycosylation of platelet proteins, which leads to an increase in platelet activity, which is considered a source of risk for complications of vascular thrombosis in diabetic patients (3).

The changes in platelet indices (Mean platelet volume (MPV), platelet distribution width (PDW) and platelet crit) were reported in patients with diabetes (6-8). Macro- and micro-vascular complications are very common among Sudanese patients with diabetes mellitus; the platelets indices can give a clue earlier in diagnosing these complications.

A complete blood count is performed in routine investigations in the majority of clinical practices in Sudan, but the utilization of platelet count and platelet indices is limited, although several studies of platelet count, indices, and activities were reported and emerged as potential contributors to heart diseases. MPV and PDW may indicate hypercoagulability and can be easily determined on routine automated complete blood count.

MATERIAL AND METHODS

Study design and area: A case-control study aims to evaluate the platelet distribution width as a clue to vascular complication in diabetic patients.

The study was done in *Aboagla* Health Diabetes Center, in Wad Medani City, which is the capital of Gezira State, located in Central Sudan, near the Blue Nile River, 187 kilometers south of Khartoum. *Aboagla* Health Center is a special health center for diabetic patients containing three clinics, a pharmacy, and a medical laboratory where all investigation is done, receiving daily about 100 patients with diabetes for follow up.

Study population and sample size: One hundred and fifty patients with type 2 diabetes and 150 apparently healthy controls were enrolled in this study; diabetic patients under anticoagulants or hypertensive were excluded from this study.

Methods: One hundred and fifty type 2 diabetic mellitus patients and one hundred and fifty healthy individuals as control were enrolled in this study. Five ml of blood were collected into EDTA containers (CRESCENT Diagnostics, Jeddah, KSA) and analyzed by a full automated hematological analyzer (EX300 German) to measure platelet distribution width. This is an analyzer that performs full blood count and prints out results. The analysis of the full blood count was done after passing calibration control material according to manufacturer instructions.

Data analysis: The data in this study was analyzed by using Statistical Package for Social Sciences. p. value < 0.05 was taken as statistically significant.

Ethical clearance: This was obtained from the ethics committee of the Faculty of Medical Laboratory Sciences, University of Gezira, and permission was taken from the head director of the *Aboagla* Health Center. The aims of the study, optional participation, risk, and confidentiality of information were explained to each study subject. The complete blood count results were referred to a clinician for further management.

RESULTS

This study was conducted from 2017 to 2018, a total of 150 Type 2 diabetic patients and 150 healthy control subjects were enrolled in the study, of which 33% were male and 67% were female. Most of the patients were aged from 46 – 60 years with a mean age of 53.39 years. The patients were classified into four groups according to the duration of diabetes (**Table 1**).

The mean \pm SD of platelets count, MPV, PDW, and PCT, of cases was $296 \pm 75/\mu\text{L}$, $9.5 \pm 0.9 \text{ fL}$, $12.0 \pm 2.0 \text{ fL}$, $0.3\% \pm 0.1$, and that in controls was $307 \pm 85/\mu\text{L}$, $9.1 \pm 0.7 \text{ fL}$, $11.3 \pm 1.5 \text{ fL}$, $0.3\% \pm 0.1$ respectively (**Table 2**). These values of platelet count, MPV, and PDW were significantly higher in individuals with T2DM when compared to the control group.

The values of PDW were significantly higher and proportional to the duration of the disease (p. value 0.041), But there were no significant differences in platelet count, MPV, and PCT (**Table 3**).

The mean \pm SD of platelet count, MPV, PDW, and PCT were not significantly correlated to types of treatment (Oral, Insulin, and Diet) to control the hyperglycemia, P. value 0.750, 0.543, 0.836, and 0.704 respectively (**Table 4**).

DISCUSSION

The susceptibility to developing vascular complications in diabetic patients could be correlated with the alteration of platelet morphology. In Sudan most patients with diabetes are diagnosed incidentally in clinical facilities following detection of micro-vascular or macro-vascular complications (9, 10).

We observed significant differences in platelet count among patients compared with the control group (p value = 0.037). This result was in agreement with other reports coming from several studies (9-11). The observed differences between platelet count in patients and controls may result from chronic inflammation in diabetic patients, that may affect the production of platelets, shorten the platelet half-life, and remove platelets from the blood circulation (12).

In our study the MPV among the patients was significantly increased (p value = 0.000), this result agreeing with published data reported by Chen *et al* (13). In Zuberi's study, the MPV value of patients was significantly increased over the control group (8.69 ± 1.288 and 8.27 ± 1.244 versus p = 0.018 respectively). The reason for the MPV increase in the patients with diabetes could be the alteration of platelet morphology as a result of platelet activation due to hyperglycemia and glycation of platelet proteins (12, 14, 15). In our study, there were significant differences observed in PDW among the study subjects and control group (p value = 0.000). This result

agrees with other studies which reported that the value of PDW was higher among patients with diabetes than in normal individuals (14, 16). Our study result revealed no significant differences in PCT between patients and controls (p = 0.720). This disagrees with a study done by Ergelen M *et al.* (17). Platelet distribution was significantly correlated with the duration of disease (p = 0.041), which means that the possibility of complications might be increased with the duration of disease. Thus, PDW can be used as a potential clue of platelet activation in diabetic patients. In our study, there were no significant differences in platelet count, MPV, PDW, and PCT between patients according to the types of management (diet, oral or soluble insulin).

CONCLUSION

The study concludes that the PDW can be used as an indicator of vascular complications in diabetic patients.

Competing interests: Nil

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