



(RESEARCH ARTICLE)



Alteration in prothrombin time, INR, partial thromboplastin time and platelets in type 2 diabetes mellitus, cross-sectional study- Sudan

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Abstract

Diabetes mellitus is a common disease and it is a major cause of morbidity; several studies indicate that diabetes is a likely under reported cause of death. The goal of current study to evaluate the alteration of Prothrombin Time, Activated Partial Thromboplastin Time and Thrombocytes among in type 2 diabetes mellitus. Fifty-seven patients have diabetic and twenty healthy people considered as control. The blood coagulation parameters (PT, INR and aPTT) were measured by coagulation analyzer. Platelets was counted by hematological analyzer (Sysmex). Data analysis was performed using statistical package for social science (SPSS) software. Evaluation of patient's data was performed using the t-test and Pearson correlation test, results with p value < 0.05 were considered as statistically significant. Our result showed with p value < 0.05 in PT, INR, aPTT and Platelet, when were compared to control group. From our finding we concluded that, diabetes mellitus is more prone to change in PT, INR, APTT and Platelet count.

Keywords: Prothrombin Time; INR; Partial Thromboplastin Time; Platelet; Diabetes Mellitus

1. Introduction

Diabetes mellitus (DM) is characterized by hyperglycemia accompanied with the biochemical alterations in carbohydrate, protein and lipid metabolism. Diabetics have been shown to be in procoagulant state due to abnormalities in several plasma proteins in blood coagulation. Measurement of prothrombin time (PT), activated partial thromboplastin time (APTT), bleeding time and clotting factor concentration are usually done in patients with a suspected abnormal coagulation [1]. Two types of diabetes mellitus are the most prevalent: type-1 diabetes is characterized by autoimmune destruction of pancreatic beta cells resulting in an absolute deficiency in insulin; and type 2 diabetes (T2DM), which corresponds to approximately 90% of cases of diabetes worldwide, is characterized by insulin resistance and/or reduced production of insulin [2]. Diabetes-related mortality is associated with thrombotic events, especially cardiovascular. In general, patients with diabetes present symptoms of hypercoagulability and hypo fibrinolysis. However, the mechanisms that trigger hemostatic abnormalities in diabetic patients are not clear [3]. Many patients with diabetes mellitus fall into this category. Diabetics suffer from accelerated atherosclerosis too. Vascular endothelium, primary defense against thrombosis is abnormal in diabetes, which plays a role in enhanced activation of platelets and clotting factors seen in diabetes [4]. A procoagulant condition is observed in diabetic patients, which ultimately contribute to cardiovascular events. The coagulation abnormalities observed in diabetic patients seem to be caused by the hyperglycemia, which also constitutes the distinguishing feature of this disease. These data are also supported by in vitro studies which demonstrate how glucose can directly determine alterations in the coagulation system. The abnormalities observed involve all stages of coagulation, affecting both thrombus formation and its inhibition, fibrinolysis, platelet and endothelial function [5]. Many clotting factors such as I, VII, IX, XII, Kallikrein and von Willebrand factor (VWF) are increased in diabetes. This hypercoagulability could be due to an imbalance between the endothelial surface and the blood clotting factors [6]. This study was designed to assess changes in coagulation (PT, PTT, INR and Platelets during diabetes Mellitus.

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2. Material and methods

This is cross sectional, conducted in Sudan-Khartoum and Algazeira states from May 2011 to July 2011. The subjects were selected from the coming patients to outpatients of emergency units. 57 persons with diabetes (type I&II), with different age and sex. The inclusion criteria for the selection of cases were diagnosis of diabetes. The exclusion criteria Patients with disorder in which the proteins that control blood clotting become over active (disseminated intravascular coagulation), Patients with liver disease and Patients with Warfarin (Coumadin) use. Five ml of blood samples were drawn from everyone of study population, using standard venipuncture techniques. Sample was collected and then 2.5 ml in trisodium citrate centrifuged at 3000 rpm for 15 minutes to obtain platelet poor plasma (PPP) and transparent plasma the separated plasma was analyzed to do PT, APTT or stored at 2-80C if not tested immediately [7] 2.5 mL of whole blood in K2 ethylene diamine tetra acetic acid. Sysmex KX-21 (hematology analyzer) to count thrombocyte [8]. Statistical analysis was performed using SPSS (SPSS, version16), data were expressed as mean and standard deviation ($M \pm SD$), the means were compared using independent T.test and Pearson's correlation analysis was used for correlation of parameters measured, P-value < 0.05 was considered as statistically significant. This study was approved by faculty of medical laboratory sciences, Omdurman Islamic University, Khartoum, Sudan, and ethical clearance was obtained from ministry of health. All participant Patients was signed an informed consent before samples collection.

3. Results

The studied of total diabetic patients were 57 and 20 as control groups. They have been categorized into different ages whose frequencies are (20 - 74years) with different duration of disease and the majority of group between (41 – 60 months). Fig I&II. The results of PT in patient in mean was (16 seconds) and the mean of PT result in control was (14.6seconds), with P.value (0.003). the mean of INR results in patients was 1.3 and the mean of INR results in control were (1.1) with P. value (0.000). The results of PTT in patients in mean was (45 second) and the mean of PTT results in control were (34 seconds) with P.value (0.003). Table I.

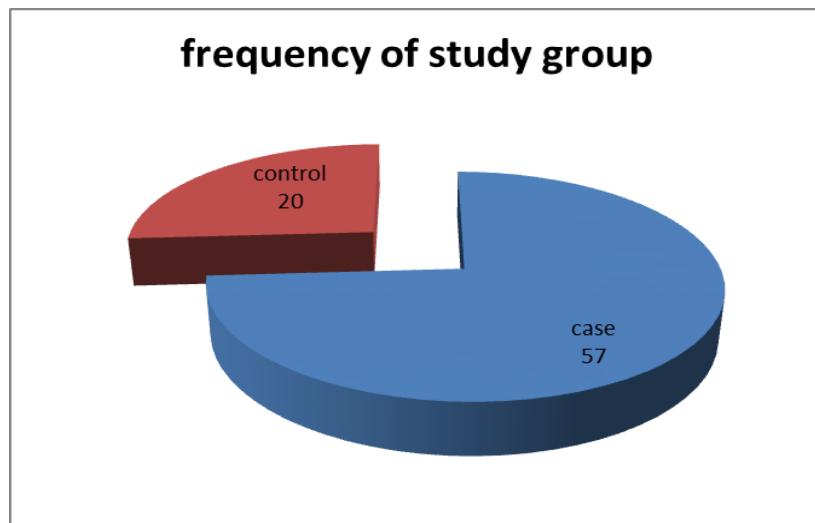
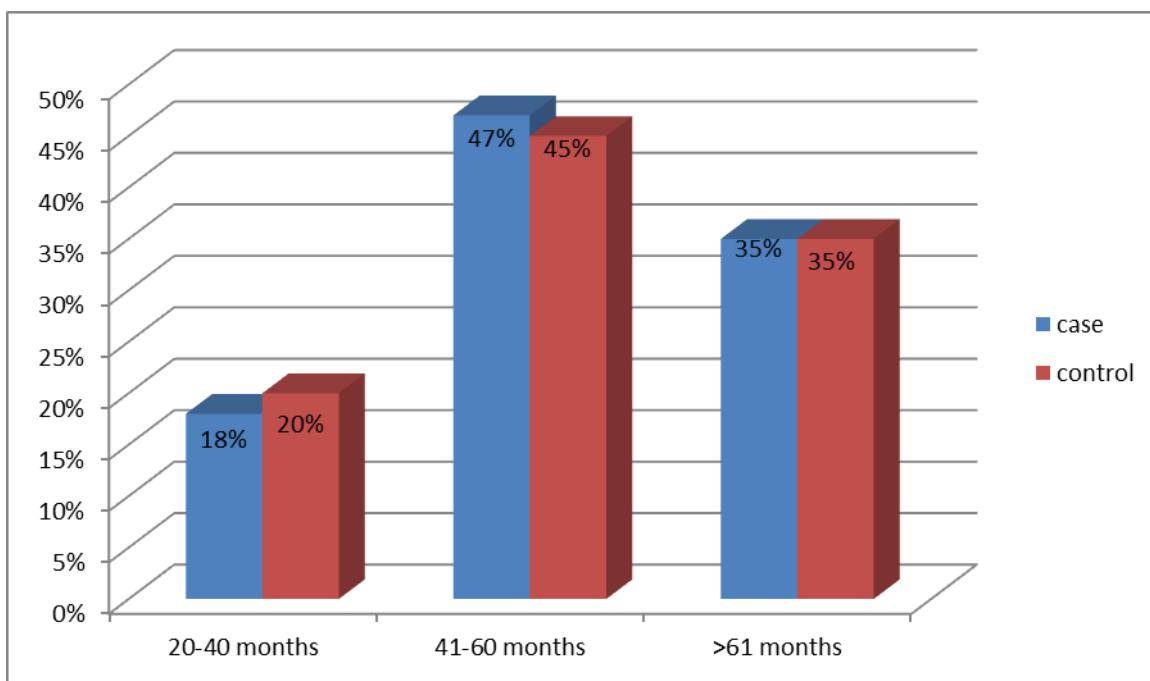


Figure 1 Show the frequency of study group

**Figure 2** Comparison between case & control in different duration**Table 1** Comparison of PT, INR, PTT and Platelets between case & control

Tests	Sample	N	Mean	Std. Deviation	P value
Prothrombin time/ sec	case	57	16.091	3.0626	0.003
	control	20	14.570	1.3191	
International normalize case ratio	case	57	1.3214	.27799	0.000
	control	20	1.1375	.12506	
Activated thromboplastin time/sec	partial case	57	44.979	25.4686	0.003
	control	20	34.320	3.6222	
Platelet count $\times 10^3/L$	case	57	194.54	79.31021	0.001
	control	20	262.95	70.72815	

4. Discussion

Diabetes is characterized by heavy risk of atherothrombotic complications affecting the cerebral, coronary and peripheral arterial trees. PT is an indicator of defects extrinsic and common pathway while APTT indicates in intrinsic and common pathway. This may account for abnormalities in hemostasis. Platelet abnormalities and dysfunction in coagulation cascade can elevated atherogenesis in diabetic patients. Insulin resistance (IR) is a uniform finding in type 2 diabetes, as are abnormalities in the macrovascular and microvascular circulations [9]. Our study shows that significantly increased values APTT and PT and INR among diabetic patient. Similar findings were observed in oltani et al. [10]. Prolonging of time period of coagulation tests and involvement of intrinsic coagulation pathway has also been confirmed by Soltani et al, [11]. But also, some studies found no significant changes in coagulation studies among diabetic patients [12,13,14]. whereas few studies found lower of coagulation tests in diabetic patients [15,9]. Again, in the present study, we found the platelets signiant lower when was compare to our case control. Similar findings were observed in study conducted by Hekimsoy et al. [16]. It is however in contrast with the findings of a studies conducted

by Thomas et al. [17], and Akinsegun et al [18]. Also, another study conducted by Chen et al found Thrombocyte, was not significantly different between diabetic patients and non-diabetic population [19]. Numerous studies have shown that coagulation abnormalities occur in the course of diabetes mellitus, resulting in a state of thrombophilia [5]. In Sudan there are many studies conducted about evaluation of coagulation impairment and mechanism of changing about liver disease, hypertension and pregnancy, and few studies among diabetic, the affect among patient with liver disease were clearly significant [20,21,22,23], but in diabetes some studies found significant and other not, till now the hemostatic impairment it does not clear till now. The major limitations of our study are the sample size and duration of the study. Also, the study it should including more advance tests like thrombin generation assay and quantitative measuring to all coagulation factors by using immune assay.

5. Conclusion

Hypercoagulable state as indicated by increased coagulability (PT, PTT) and reduced platelets during diabetes mellitus.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflicts of interest.

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