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Original Research Article

Comparative Study of Prothrombin Time, Activated Partial Thromboplastin Time and Platelet Counts in Type II Diabetes Mellitus and Healthy Individual

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Abstract

Background: In diabetic patients incidence of cardiovascular disease due to thrombosis is higher than healthy individual. PT, aPTT and Platelet count are haematological parameters that give an idea about the coagulation status. So, this study aimed to assess the prothrombin time, activated partial thromboplastin time and platelet counts of type II diabetes mellitus patients. *Methods:* A comparative study was conducted at SMIMER hospital, Surat. A total 50 type II diabetic patients and 50 healthy control were included in this study. 4 ml of blood was collected in citrate bulb to determined PT, aPTT and Platelet count of these 2 Groups. *Results:* The mean aPTT of diabetic and healthy control 25.14 ± 6.32 and 35 ± 3.23 s, respectively. The proportion of diabetic patients with normal PT, aPTTand platelet counts was 84.0%, 10% and 92.0%, respectively. There was significant shortening of aPTT in Type II diabetic patients. *Conclusions:* There was a significant shortening of aPTT in diabetic patients as compared with non-diabetic groups. So, shortening of aPTT in untreated Type II diabetic patients might be useful marker in patients with diabetes and monitoring of the aPTT in newly diagnosed diabetic patients is important to prevent hypercoagulation.

Keywords: Activated partial thromboplastin time; Platelet count; Prothrombin time; Type II Diabetes mellitus; SMIMER hospital Surat.

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Introduction

Diabetes mellitus (DM) is a group of metabolic disorders characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both. There are two types of Diabetes mellitus; Type I and Type II diabetes mellitus.[1] Type II diabetes mellitus is characterized by decreased insulin sensitivity which can subsequently causes decreased insulin secretion due to destruction of Beta-cell.[2] There is a high risk for the development of thrombosis and bleeding disorders in Type II

diabetic patients. Approximately 80% of patients of Type II diabetes mellitus die as a result of cardiovascular complications.[3] In diabetic patients antithrombin III, protein C and protein S level decrease and level of clotting factors and plasminogen activator inhibitor Type I increase.[4] They all contribute to hypercoagulability state in DM.[5] This hypercoagulability state in diabetes may accelerate atherosclerosis and it is the risk factor for cardiovascular disease.[6] Prothrombin time (PT), activated partial thromboplastin time (aPTT) and platelet are hematological indices that give an idea into the coagulation status of patients. PT is used to detect the activity of clotting factors (proteins) I, II, V, VII, and X of the extrinsic and common pathways. aPTT is used to monitor the anticoagulant effect of circulating heparin and activities of factors I, II, V, VIII, IX, X, XI, and XII of the intrinsic and common pathways.[7]

Aim of the study

To assess the prothrombin time, activated partial thromboplastin time and platelet counts of Type II diabetes mellitus patients at SMIMER hospital, Surat.

Materials and Methods

Total of 100 conveniently selected study subjects (50 Type II DM patients and 50 healthy controls) aged 30–60 years were included in this study. The study subjects were categorized in to two groups. Group I consisted of Type II diabetic patients who had already started their non-insulin hypoglycemic drugs. Group II included those individuals who were apparently healthy and came to the hospital for medical check up (Individuals who did not have a diabetic history or symptom, any anticoagulant therapy, hypertensive, clinically proven liver dysfunction and whose FBS level was between 70 mg/dl and 110 mg/dl) were studied.

Exclusion criteria

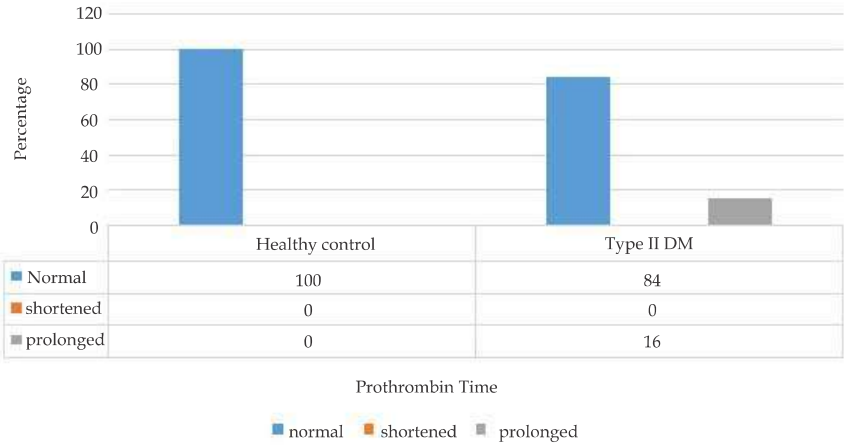
Patients on warfarin or heparin or any other anticoagulation therapy such as aspirin, and with other complications such as history of liver diseases, liver dysfunction, on hepatotoxic drugs, history of alcohol intake or cigarette smoking, hypertensive and psychic patients. Apparently healthy individuals with any of DM symptom or who had taken any anticoagulant drug or who have a history of hypertensive.

Sample collection and procedure

After taking informed written consent 4 ml of fasting blood collected. Then 1.8 ml blood sample was delivered into a test tube containing 0.2 ml tri-sodiumcitrate anticoagulant to keep 9:1 ratio of blood to anticoagulant. The blood was then centrifuged at approximately 3000 rpm for 15 min to prepare platelet poor plasma for aPTT and PT analysis. The remaining blood was delivered into EDTA test tube for platelet count using Backman coulter. Our laboratory reference ranges of coagulation testes are: PT: 11-16 sec and APTT: 35-40 sec.

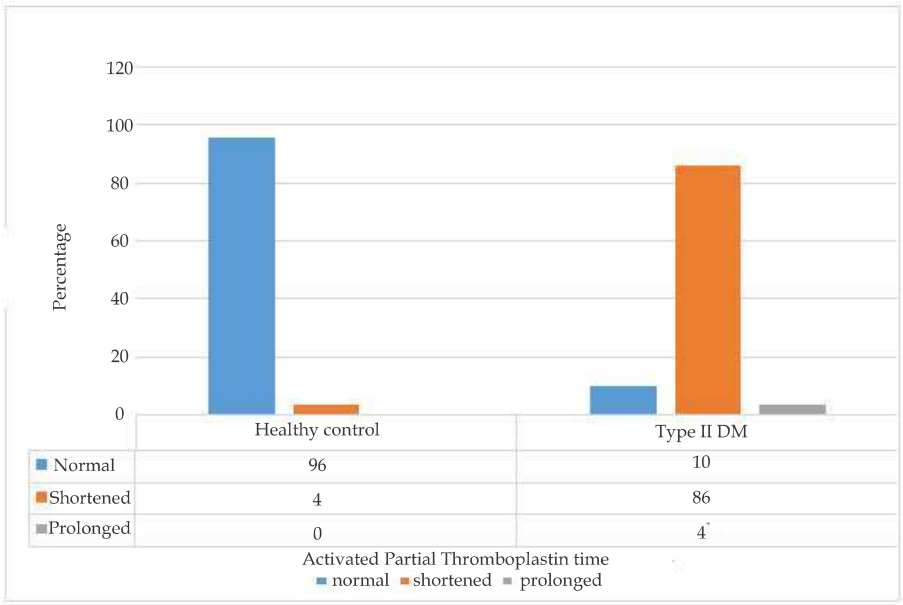
Results

The proportion of diabetic patients with normal PT, aPTT and platelet counts was 84.0%, 10% and

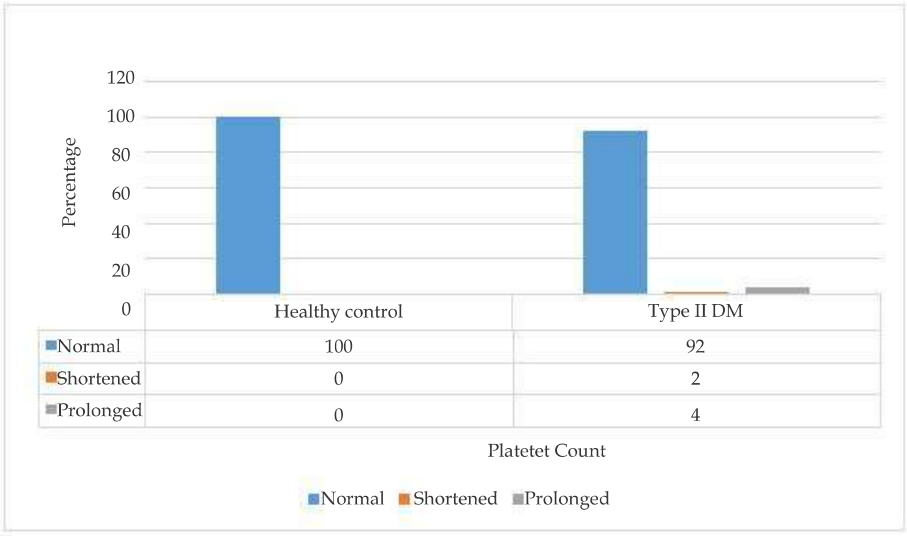


Graph 1:

92.0%, respectively. There was no decreased PT value in treated DM patients. proportion of diabetic patients with decreased PT, aPTT and platelet count was 0, 86% and 2% of respectively. The mean aPTT of diabetic and healthy control 25.14 ± 6.32 and 35 ± 3.23s, respectively. The mean PT of non-diabetic controls and DM were 14.25 ± 2.30 s and 12.36 ± 3.45 s, respectively. The platelet count of non-diabetic control and Type II DM were 2,51,000 ± 75,000 and 2,50,000 ± 50,000, respectively. There was a significant shortening of aPTT in diabetic as compared to non-diabetic controls (Graph 1).



Graph 2:



Graph 3:

Discussion

In this study, non-diabetic control and diabetic have a mean aPTT of 35.45 ± 3.23s, and 25.14 ± 6.32 s respectively. There was a significant shortening of aPTT in diabetic patients compared to non-diabetic control due to the glycation of intrinsic clotting factors caused by the presence of hyperglycemia in DM patients. Persistent hyperglycemia may result the glycation of intracellular and extracellular

protein that will change the normal functioning of these proteins which affect their clotting capacity.[8] Natural anticoagulant antithrombin III keeps the natural procoagulant inhibited. In addition protein C inactivates factors Va and VIIIa. Hyperglycemia causes non enzymatic glycation of this antithrombin III and decreases the concentration of protein C. Thus, glycation of clotting factors may result the activation of inactive intrinsic factors which finally results the shortening of aPTT.[9] However, PT of DM patients was not found significantly associated in this study when compared to non-diabetic individuals because there is less involvement of the extrinsic pathway in hypercoagulability state in diabetic conditions due to the fact that injury occurring to the vascular system in diabetic patients does not involve the release of tissue factor from outside of the vascular system. APTT but not PT would be affected by the glycation method. Hypercoagulability detected by shortened APTT values was independently associated with venous thromboembolism (VTE) and thus shortened APTT could be considered as a risk marker for VTE(10). Thus APTT is a better predictor of hypercoagulable state than PT in T2DM patients.[11] In this study, the mean PT and platelet count of diabetic patients and non-diabetic individuals had shown no significant difference. About 86% of diabetic had a decreased aPTT whereas only 4% of healthy control had a decreased aPTT. This may be due to association of glycation, a nonenzymatic binding of glucose on protein, with the persistence hyper glycemia that could change the normal function of the intrinsic factors (aPTT) and the extrinsic factors (PT).

Conclusion

There was a significant shortening of aPTT in diabetic patients as compared with non-diabetic groups. So, shortening of aPTT in untreated Type II diabetic patients might be useful marker in patients with diabetes and monitoring of the aPTT in newly diagnosed diabetic patients is important to prevent hypercoagulation.

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