Original article

Coagulation Disturbance among Essential Hypertensive and Diabetes Mellitus Type II Patients - Khartoum State

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Abstract:

Background: This was a descriptive study conducted in Khartoum. The aim was to compare the prothrombin time, activated partial thromboplastin time and fibrinogen level between type II diabetic patients, hypertensive patient, patients had both diseases and control. ***Materials and Methods***: Analytical experimental study was done in Khartoum state, Sudan, during the period of March 2014 to April 2014 to measure coagulation disturbance among essential hypertensive and diabetes mellitus type II patients. The study included 120 consecutive persons were enrolled; 30 had diabetes type II, 30 had diabetes mellitus type II plus hypertension, 30 had hypertension against 30 healthy individual setting as control. ***Results***: The result found that prothrombin time (PT) was significantly increased in diabetic type II and hypertensive patients compared with control (p-value<0.05) and it was normal among patients with diabetes type II with hypertension compared to control (p-value>0.05). While, it was significantly decreased in patients with diabetes type II with hypertension compared to who had only hypertension or only diabetes, activated partial thromboplastin time (APTT) was significantly increased in diabetic type II and among patients with both diseases compared with control (p-value<0.05); it was also, insignificantly different between hypertensive patients and control (p-value >0.05) but it was significantly increased in patients with both diseases compared to who had only hypertension or only diabetes. Fibrinogen level was significantly increased in diabetic type II and patients with both diseases compared to control (p-value <0.05) and statistically insignificant difference between hypertensive patients and control (p-value >0.05) and significantly increase in patients with both diseases compared to who had only hypertension or only diabetes. ***Conclusion***: Our results was concluded a significant correlation between PT and duration of diseased in patients with both diseases (p-value 0.001). In conclusion, fibrinogen was significantly increased in patients with diabetes plus hypertension compared to patients with hypertension or patients with diabetes type II.

Key words: coagulation disturbance; essential hypertensive; diabetes mellitus type II; Sudan

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Introduction:

Diabetes mellitus is a common endocrine disease of multiple etiologies. It is characterized by chronic hyperglycemia with subsequent disturbances of carbohydrates, fat and protein metabolism.[1] Diabetes mellitus is commonly associated with both microvascular and macrovascular complications. Patients with type II diabetes mellitus have a two- to four fold increase in the risk of coronary artery disease which accounts for 60% of their deaths.[2] Hypertension is a chronic elevation of blood pressure that, in the long-term, causes end organ damage and results in increased morbidity and mortality.[3] In Sudan, the prevalence of hypertension in an urban increased from 7.5% in 1985 to 18.2% in 2002.[4] Thrombosis often appears to complicate the course of patients with hypertension; thrombosis in some patients with hypertension could be developed to organ damage.[3] Hemostasis is one of the most significant maintenance systems of human

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body homeostasis that maintain the liquid state of circulating blood and prevent bleeding that result from blood vessel damage.[5] In the laboratory, measurement of PT, APTT, and fibrinogen concentration are the most commonly employed laboratory tests in patients with a suspected coagulopathy.[1]

Materials and Methods:

It was descriptive analytical cross-sectional study conducted In Khartoum state during the period from March 2014 to April 2014 to measure the fibrinogen level, PT and APTT in diabetic type II patients, hypertensive patients and patients had both diseases diabetes type II and hypertension. First 90 patients (case group) were enrolled in this study. 30 of them with diabetes type II. 30 were hypertensive and 30 patients had both diabetes mellitus type II and hypertension disease. Seconds 30 apparently healthy individuals with matched age (control group). Patients with other known causes of hyperfibrinogenaemia such as cardiovascular diseases, liver disease, kidney disease, under anticoagulant therapy, smoking, pregnancy, disorders associated with inflammation and other diseases such as DVT or treatments that may affect coagulation system were excluded; also secondary causes of hypertension and hypertensive patients with target organ damage have been excluded. For estimation of tests 3.5 ml of citrated anticoagulated venous blood samples were collected (9 part blood to 1 part anticoagulant), platelet-poor plasma (PPP) obtain by centrifugation of citrated blood at 2500 rpm for 15 minutes, plasma was separated from cells into plain container and tested. Automated coagulometer analyzer (Spinreact) was used. Serum Fibrinogen level was measured by Clauss method. PT and APTT were determining according to manufacture instructions. The study was conducted after permission from the institutional ethical committee, Verbal consent of cases and controls were obtained. The collected data were analyzed using Statistical Package for Social Sciences (SPSS) version 14. T-Test, ANOVA and correlations were used to calculate P value. The differences were considered statistically significant when P value $\leq$ 0.05.

Ethical Clearance was taken from local ethics committee.

Results:

The baseline characteristics of the subjects from the four groups are summarized in (table 1). A total of 120 patients were included in the study with 30 patients in each study group. The first group included those patients with diabetes mellitus type II. The second group included those hypertensive patients. The third group included those patients who had both diabetes mellitus type II pulse hypertension disease .The fourth group included the control who did not have both diabetes type II and hypertension disease. The result showed that, PT was significantly increased in diabetic type II patients (14.103 $\pm$ 1.1 seconds) compared with control (13.367$\pm$1.2 seconds) (P value 0.016). APTT was significantly increased in diabetic type II patients (37.937$\pm$ 6.2 seconds) compared with control (29.867$\pm$ 4.3seconds) (P value 0.000) and Fibrinogen level was significantly increased in diabetic type II (314.67 $\pm$ 92.8 mg\dl) compared with control (225.7 $\pm$ 34.1 mg\dl) (P value 0.00) (table 2). PT was significantly increased in hypertensive patients (14.5 $\pm$ 1.9 seconds) compared with control (13.367$\pm$1.2 seconds) (P value 0.011). While, APTT was insignificantly different between hypertensive patients (29.767$\pm$ 5.2 seconds) and control (29.867$\pm$ 4.3 seconds) (P value 0.936) and fibrinogen level statistically insignificant difference between hypertensive patients (240.67 $\pm$ 51.9 mg\dl) and control (225.7 $\pm$ 34.1 mg\dl) (P value 0.192) (table 3). PT was insignificantly different between patients with both diseases diabetes type II pulse hypertension (13.283$\pm$1.5 seconds) and control (13.367$\pm$1.2 seconds) (P value 0.813). APTT was significantly increased in patients with both diseases diabetes type II pulse hypertension (38.423$\pm$ 6.7 seconds) compared with control (29.867$\pm$ 4.3seconds) (P value 0.000). Fibrinogen level was significantly increased in patients with both diseases diabetes type II pulse hypertension (362.67 $\pm$ 115.4 mg\ dl) compared with control (225.7 $\pm$ 34.1 mg\dl) (P value 0.00) (table 4). PT was significantly decrease in patients with diabetes type II pulse hypertension compared to who had only hypertension or only diabetes, APTT significantly increase in patients with both diseases compared to who had only hypertension or only diabetes and fibrinogen level was significantly increase in patients with both diseases compared to who had only hypertension or only diabetes (table 5). Also found significant correlation between PT and duration of diseased in patients with diabetes type II pulse hypertension (P value 0.001) (figure 1). Insignificant correlation between APTT, fibrinogen level and diseased in patients had diabetes type II pulse hypertension was

founded. Also insignificant correlation between PT, APTT and fibrinogen level and duration of diabetes type II and hypertension (p value >0.005) was founded.

Discussion:

The result of prothrombin time (PT) showed significantly higher value in patients with diabetes type II than the control (p valve <0.05)[6] found same result while[2,7] showed significantly a lower value in diabetics than controls ($p<0.05$). Although PT was significantly higher value in hypertensive patients than the controls (p valve <0.05). There was no significant difference in patients has both diseases diabetes type II and hypertension than control group (p valve >0.05) and insignificant difference between diabetes type II patients and hypertensive patients. There was significantly higher value in patients had diabetes only than patient has both diseases (p valve <0.05) and significantly higher value in patients had hypertension only than patient has both diseases (p valve <0.05) . The results from this study showed PT to be significantly lower in patients who had both diseases than those who had only hypertension or only diabetes.

The result of activated partial thromboplastin time (APTT) showed significantly higher value in patients with diabetes type II than the control (p valve <0.05)[6] found same result while[2, 7, 8] showed significantly a lower value in diabetics than controls ($p<0.05$). There was no significant difference in

Table 1: Baseline Characteristics of the Study Population.

Study groups	**Age / years Mean ± SD**	**Gender n(%)**		**Duration of the diseases / years Mean ± SD**
		Male	Female	
diabetic type II patient(N=30)	53.3 ± 13.6	15 (50%)	15 (50%)	9.2 ± 7.3
Hypertensive patients (N=30)	58.3 ± 13.4	10 (33.3 %)	20 (66.7%)	8.5 ± 5.7
Patients with diabetic type II and Hypertension (N=30)	57.2 ± 11.0	16 (53.3%)	14 (46.7%)	11.5 ± 7.1
Control (N=30)	45.13 ±7.7	13 (43.3%)	17 (56.7%)	

Table 2: Comparison of PT, APTT and Fibrinogen level between diabetic type II patients and controls.

Parameters	**Mean ± SD**		P value
	Diabetic patients (N=30)	Control(N=30)	
PT(sec)	14.103 ± 1.1	13.367±1.2	0.016
APTT(sec)	37.937± 6.2	29.867± 4.3	0.000
Fibrinogen mg\dl	314.67 ± 92.8	225.7 ± 34.1	0.000

* The mean difference is significant at the 0.05 level.

Table 3: Comparison of PT, APTT and Fibrinogen level between hypertensive patients and controls

Parameters	**Mean ± SD**		**P value**
	hypertensive patients (N=30)	Control(N=30)	
PT(sec)	14.5 ± 1.9	13.367±1.2	0.011*
APTT(sec)	29.767± 5.2	29.867± 4.3	0.936*
Fibrinogen mg\dl	240.67 ± 51.9	225.7 ± 34.1	0.192*

* The mean difference is significant at the 0.05 level.

Table 4: Comparison of PT, APTT and Fibrinogen level between patients had diabetic type II & hypertensive and controls

Parameters	Mean ± SD		P value
	Diabetic & hypertensive (N=30)	Control (N=30)	
PT(sec)	13.283±1.5	13.367±1.2	0.813*
APTT(sec)	38.423± 6.7	29.867± 4.3	0.000*
Fibrinogen mg\dl	362.67 ± 115.4	225.7 ± 34.1	0.000*

* The mean difference is significant at the 0.05 level.

Table 5: Comparison of PT, APTT and Fibrinogen level between study population groups:

Parameters	Sample (I)	Sample (II)	Mean of (I)	Mean of (II)	P value
PT (sec)	DM	HTN	14.103± 1.1	14.5± 1.9	0.325*
	DM	DM & HTN	14.103± 1.1	13.283±1.5	0.044*
	HTN	DM & HTN	14.5± 1.9	13.283±1.5	0.003*
APTT (sec)	DM	HTN	37.937± 6.2	29.767± 5.2	0.000*
	DM	DM & HTN	37.937± 6.2	38.423± 6.7	0.757*
	HTN	DM & HTN	29.767± 5.2	38.423± 6.7	0.000*
Fibrinogen mg\dl	DM	HTN	314.67± 92.8	240.67± 51.9	0.002*
	DM	DM & HTN	314.67± 92.8	362.67± 115.4	0.043*
	HTN	DM & HTN	240.67± 51.9	362.67± 115.4	0.000*

* The mean difference is significant at the 0.05 level.
DM: diabetes, HTN: hypertension.

the hypertensive patients and control group (p valve >0.05). Although APTT showed significantly higher value in patients has both diseases diabetes and hypertensive than the control group (p valve <0.05). There was significantly higher in diabetic type II patients than hypertensive patients (p valve <0.05) . Insignificant difference between patients has both diseases and patients had diabetes type II only (p valve <0.05) and significantly higher value in patient has both diseases than patients had hypertension only (p valve <0.05) . The result from this study showed APTT to be significantly higher in patients who had both diseases diabetes and hypertensive than those who had only hypertension or only diabetes type II.

This study showed fibrinogen to be significantly higher in patients with diabetic type II than the control (p valve <0.05)[6, 8, 9, 10] found same result. The plasma fibrinogen level was statistically insignificant difference in the hypertensive patients and control group (p valve >0.05) while[3] their studies demonstrated that the plasma fibrinogen level was significantly increased in hypertensive patients. Although fibrinogen to be significantly higher in patients who had both diseases diabetes and hypertensive than the controls (p valve <0.05)[11] found same result. This study also showed fibrinogen to be significantly higher in diabetic type II patients than hypertensive patients did (p valve <0.05). Also showed fibrinogen level significantly higher in patients who had both diseases than patients had diabetes type II only (p valve <0.05)[11] found same result .There was significantly higher value in-patient has both diseases than patients had hypertension only (p valve <0.05). Also showed fibrinogen to be significantly higher in patients who had both diseases diabetes and hypertensive than those who had only hypertension or only diabetes type II. Insignificant association between duration of diabetes mellitus type II and fibrinogen level (p value > 0.05)[8] found same result. Insignificant association between duration of diabetes mellitus

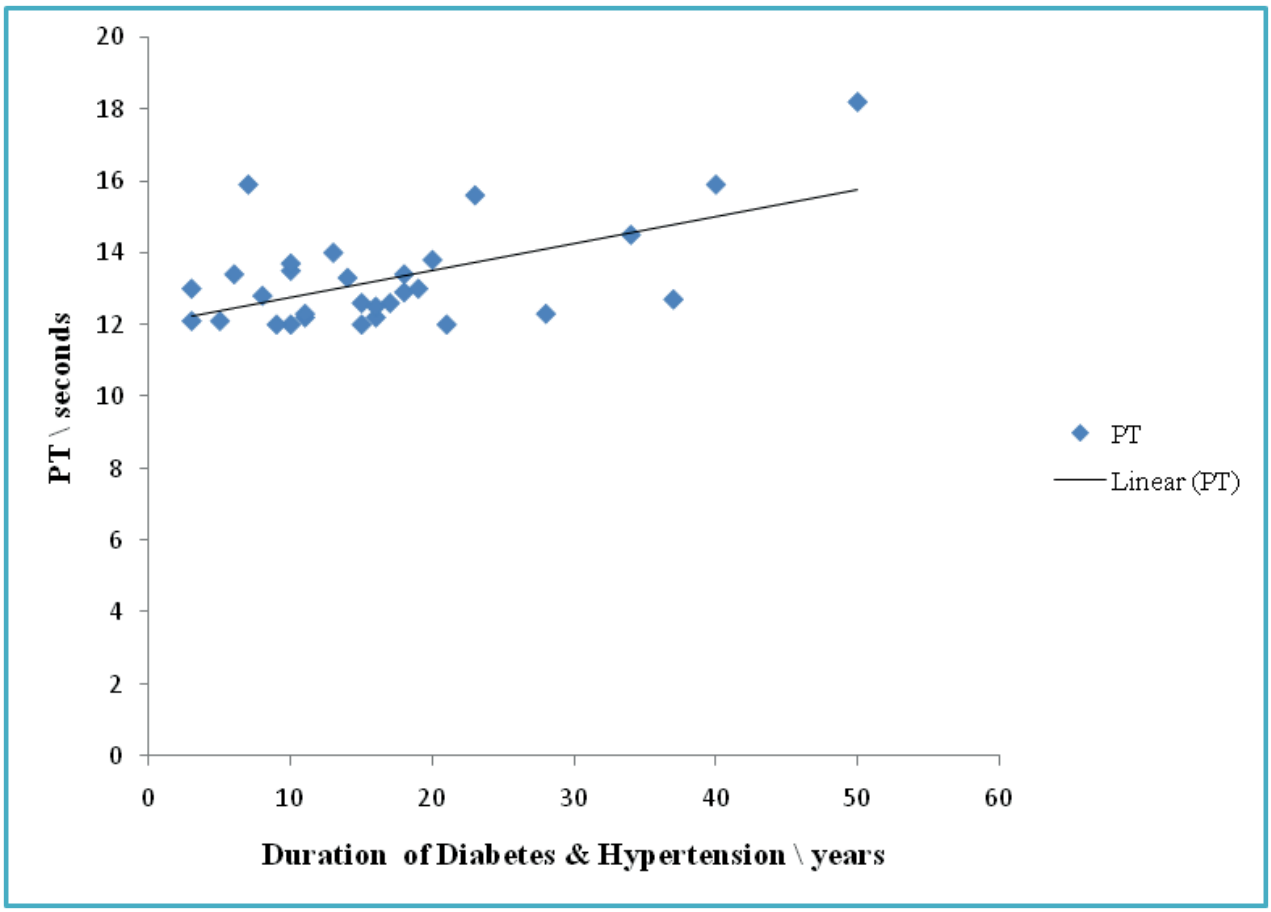

Fig 1: Correlations between duration of both diseases diabetes and hypertension and PT; showed significant correlations (p value 0.001).

type II and PT (p value > 0.05) and no significant association between duration of diabetes mellitus type II and APTT (p value > 0.05) (Sapkota *et al.*, 2013) found same result.

No significant association between duration of hypertension and fibrinogen level (p value > 0.05). Insignificant association between duration of hypertension and PT (p value > 0.05). Insignificant association between duration of hypertension and APTT (p value > 0.05).

Insignificant association between duration of both diseases hypertension &diabetes and fibrinogen level (p value > 0.05). There was significant association between duration of both diseases hypertension & diabetes and PT (p value > 0.05) and no significant association between duration of both diseases hypertension & diabetes and APTT (p value > 0.05).

Conclusion:

Fibrinogen was significantly higher in patients who had both diseases diabetes and hypertensive than those who had only hypertension or only diabetes. Patients suffering from type II diabetes mellitus, hypertension or had both diseases were found to have slightly increased in fibrinogen level when compare to control. This results indicator to hypercoagulability in these patients so measurement of fibrinogen level, PT and APTT have benefit in detecting thrombosis which appears to complicate the hypertension and type II diabetes mellitus.

Conflict of interest: None

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