



RESEARCH ARTICLE

DETERMINATION OF FIBRINOGEN LEVEL IN PATIENTS WITH TYPE 2 DIABETES MELLITUS IN ABOAGLA CENTER FOR DIABETES, MEDANI CITY, SUDAN

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ABSTRACT

Background: Diabetes Mellitus is a major leading health problem worldwide. DM type 2 is the most predominant type. High fibrinogen level in type 2 diabetes mellitus has been suggested to play a role in the occurrence of cardiovascular diseases in patients with type2 diabetes. **Objective:** The study aimed to determine the fibrinogen level in patients with type 2 diabetes mellitus. **Methods:** The study included fifty patients (cases) with type 2 diabetes mellitus and twenty are none diabetic (control group). The fibrinogen was compared in both group cases and control correlated by HbA1c and diabetes duration. Blood sample were collected into trisodium citrate container (2.5 ml) for fibrinogen estimation and EDTA container (2.5 ml)for HbA1c estimation. All sample investigated for fibrinogen using semi-automated technique. Data was analyzed using program SPSS. **Result:** The study revealed that plasma fibrinogen was significantly higher in type2 diabetic patients (cases) when compared to control group that showed statistically significance (*P* value .000) with significant correlation was found between plasma fibrinogen and HbA1c(*P* value .000) and none significant correlation was found between plasma fibrinogen and duration of diabetes (*P* value .411).

INTRODUCTION

Diabetes mellitus (DM) is a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion and/or insulin action. (World Health Organization (WHO)). Although the prevalence of both type 1 and type 2 diabetes mellitus is increasing worldwide, the prevalence of type 2 DM is expected to rise more rapidly in future because of increasing obesity and reduced activity levels. Patients with T2DM have been reported to be at increased risk of developing cardiovascular related diseases (Myocardial infarction, stroke, and atherothrombosis). Many studies elucidated that DM affects vascular integrity by its effect on endothelium, smooth muscle function, as well as propensity to thrombosis, in addition to increased level of coagulation procoagulant factors and decreased fibrinolytic activity. (Binaya Sapkota *et al.*, 2013). Fibrinogen is the major coagulation protein in the blood from which fibrin clot is formed. It is an important determinant of plasma viscosity, platelet aggregation and thrombus formation; also it is an acute-phase reactant that increases in inflammatory states. (Stec *et al.*, 2000). High fibrinogen level has been described as independent risk factor for cardiovascular diseases (Meade *et al.*, 1986.). It has been suggested to be involved in the excess rate of cardiovascular diseases in patients with type 2 DM (Kannel *et al.*, 1990).

Studies have reported that fibrinogen levels were higher in diabetics than in controls (Anjula *et al.*, 2001). Very few studies have been done regarding the correlation of fibrinogen with glycemic control in type 2DM (Mittal *et al.*, 2002). So that the aim of this study to determine fibrinogen level in type2 diabetic patients.

MATERIALS AND METHODS

Study population: The present cases and -control group study was approved and performed in accordance with the regulations of Faculty of Medical Laboratory Sciences, Gezira University Board, Medani, Sudan and consent from the patients in Medani diabetic Centre. The study included fifty patients (cases) with type 2 diabetes mellitus and twenty are none diabetic (control group) in the period between August to October 2016. Samples were collected from 50 diabetic patients type 2 and 20 patients as control group were conducting to study according inclusion criteria based on each group according to sexes, age and etc with exclusion criteria depend on smoking, inflammatory condition, pregnancy, thrombolytic therapy, congenital disfibrinogemia in DIC and pancreatitis, patients with type 1 DM, smokers and individual taking any medication likely to interfere with haemostatic system. Study variables include quantitative data such as fibrinogen level diabetic patients and group control. Data was analyzed by program statistical package for social Sciences (SPSS).

Principle fibrinogen level estimation: The fibrinogen determination in clotting time with thrombin is based on the method originally described by Clauss. In the presence of an excess of thrombin the fibrinogen is transformed into fibrin and the time to clot formation is inversely proportional to the concentration of fibrinogen present in the plasma sample. The QCA thrombin reagent placed in contact with the plasma of the patient

HbA1c estimation: Ichroma™HbA1cis based on the fluorescence immunoassay technology, specifically the sandwich immune – detection method. Whole blood is added to the mixture of hemolysis buffer and detection buffer, which results in hemolysis of red blood cells. Such that by mixing detector buffer with blood specimen in test tube, the fluorescence – labeled detector anti - HbA1c antibody in buffer binds to HbA1c antigen in blood specimen. The sample mixture is loaded and migrates on the matrix of test cartridge; the complexes of detector antibody and HbA1c are captured to anti-HbA1c sandwich pair antibody that has been immobilized on test matrix. As a result, the higher concentration of HbA1c produces a higher fluorescence signal from HbA1c-antibody complexes. The signal is interpreted and the result displayed on ichroma™ -Readerin units of % (NGSP), mmol/mol (IFCC) and mg/dl (eAG).

Method of fibrinogen level estimation

1. Thrombin (reagent A) was incubated at 37C/10-15min
2. 0.2 ml of diluted plasma was Dispensed into test tube at 37Cduring 2min.
3. 0.1 ml of reagent A(thrombin) was added at 37C and the stop watch was started.
4. The time for the clot to be formed was recorded.

Method of fibrinogen level estimation

1. 100 µl of hemolysis buffer was added into the detection buffer tube
2. Then the whole blood was added to hemolysis buffer and mixed well
3. 75µl was taken from the mixture and loaded into the cartridge
4. Then the cartridge was inserted into the i-chamber and leaved at 12 minutes
5. Finally the cartridge was inserted into the ichroma reader and result was recorded.

RESULTS

In the present study fibrinogen level was estimated by semi-automated coagulometer in 50 patients with type 2 as cases and 20 patients as control group with the same criteria (Table 1). Fibrinogen level was correlated with duration of DM and glycosylated hemoglobin (HbA1c). The patients were divided into four groups30-39, 40-49, 50-59, < 60) years for analytical purpose. The youngest age was 36 years. The oldest age was 75 years. The maximum numbers of patients were in the age group 30-39 years (24.3%), 40-49 years (18.6%), 50-59 years (27.1%) and more than 60 years (30%). Among the 50 patients studied(35.7%) was males and(64.3%) were females(figure 1). The mean plasma fibrinogen in diabetic patients (Table.2) was (541.96) mg/dl. Lowest value was (212) mg/dl and the highest value was (730.0) mg/dl. The mean plasma fibrinogen in non-diabetic controls was (304.3) mg/dl. Lowest value was (212) mg/dl and the highest value was (392) mg/dl. Diabetic

patients had a higher fibrinogen when compared to non-diabetic controls and normal range (200–400 mg/dl) and it was statistically highly significant (P = 0.00) (Table. 2 -3).

No	Gender	Duration /years	Age /years	FBG mg/dl	HbA1c %	Fibrinogen mg/dl
1	M	5	40	91	4.6	492
2	F	5	45	304	7.0	661
3	F	10	50	94	4.2	460
4	F	15	60	100	5.3	420
5	F	5	60	146	6.1	472
6	F	10	60	114	6.1	490
7	F	10	75	100	4.8	477
8	M	8	70	100	4.6	477
9	M	9	48	94	4.9	488
10	F	8	50	90	5.1	400
11	F	2	39	256	4.5	350
12	F	10	60	90	8.0	720
13	F	2	60	137	4.2	470
14	M	5	61	333	7.0	630
15	M	6	53	115	7.8	625
16	M	12	56	271	7.2	616
17	F	2	48	159	5.9	460
18	M	7	70	107	4.8	410
19	F	23	60	348	8.6	520
20	F	3	45	322	7.7	512
21	M	9	56	514	10.6	650
22	M	6	45	129	4.3	415
23	F	10	55	198	5.4	470
24	M	4	51	404	9.2	630
25	F	5	55	500	7.1	620
26	M	10	62	271	6.4	517
No	Gender	Duration/ years	Age/ years	FBG	HbA1c	Fibrinogen mg/dl
27	F	10	70	202	6.6	572
28	F	3	50	276	4.9	350
29	F	15	36	177	7.3	670
30	F	15	75	179	7.9	700
31	F	7	61	250	8.6	710
32	F	9	54	170	6.5	520
33	M	3	63	227	6.1	490
34	F	6	53	152	8.0	600
35	F	5	30	273	9.3	650
36	F	5	40	175	4.8	430
37	F	7	50	286	9.3	650
38	F	4	45	177	4.8	430
39	F	1	52	303	10.0	730
40	F	10	60	263	9.3	700
41	F	10	70	381	9.9	670
42	F	1	38	100	4.3	397
43	F	6	47	237	6.9	560
44	M	4	51	135	4.9	390
45	M	1	50	177	5.6	410
46	F	2	60	137	2.9	350
47	M	5	51	304	9.4	630
48	M	10	55	198	9.0	635
49	M	8	63	227	7.2	640
50	M	4	50	268	7.1	650

Table 2. Fibrinogen level among the study population

	Case	N	Mean	Std. Deviation	P. Value
fibrinogen mg/dl	Patient	50	541.9	113.6	.000
	Control	20	304.3	50.6	

Table 3. Correlation between fibrinogen levels in type 2 diabetic patients With HbA1c and duration of diabetes

Correlated variables	Diabetes
Duration of diabetes	P.411
HbA1c	P.000

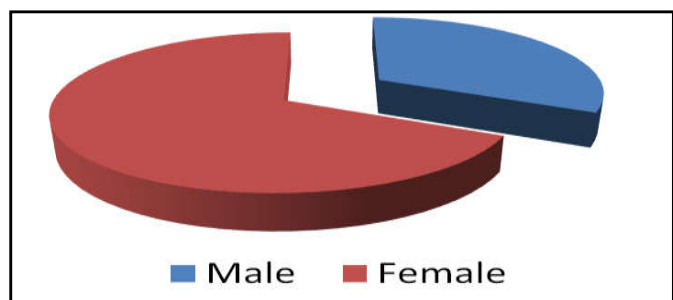


Figure 1. Gender distribution among cases of the study

DISCUSSION

The results showed that, mean plasma fibrinogen level in patients with type 2 DM attending to Aboagla Center of diabetes was increase (mean \pm SD 541 \pm 113mg/dL). The mean fibrinogen level of diabetic patients in this study was significantly higher than the fibrinogen level in the non-diabetic controls, and agrees with Mark's report (2001) of elevated fibrinogen concentration as one of the risk factors for atherosclerosis among diabetics and also agree with K. N. Pannag Desai *et al.* (2012) of evaluation of plasma fibrinogen levels in type 2 diabetes mellitus. The various possible mechanisms for hyperfibrinogenemia in diabetics could be that a procoagulant state often exists in people of diabetes. There is an increase in a number of coagulation factors such as plasminogen activator inhibitor 1, von-Willebrand factor, fibrinogen, factor VII and thrombin antithrombin complexes particularly in association with macro vascular and microvascular disease and glycemic control. Lipoprotein (a) and fibrin at the sites of vascular injury. Lp (a) has a major role in diabetes and its vascular complications by decreasing fibrinolysis and thus increasing plasma fibrinogen levels (Mohan *et al.*, 2001). Fibrinogen levels were found to be correlated with glycemic control this was agree with Bembde, (2012) of A Study of Plasma Fibrinogen Level in Type-2 DM and its relation to glycemic Control of and also agree with Nizar Abdelrahman, (2013) of Correlation between Glycemic Control and Plasma Fibrinogen Level in Patients with Type2 Diabetes Mellitus who reported that mean plasma fibrinogen level was higher in patient had poor glycemic control than those had good control, but his results showed a significant association with glycemic control. The correlation between glycemic control and fibrinogen levels could be due to that glycosylate fibrinogen is less susceptible to plasmin degradation or relative insulin deficiency in diabetic's results in differential protein synthesis i.e., 29% decrease in albumin synthesis and 50% increase in fibrinogen synthesis (Pierpaola *et al.*, 1991). In agreement with Kafle *et al.*, 2010, In this study the result showed that no correlation between plasma fibrinogen level and duration of the disease.

Conclusion

The study support that the plasma fibrinogen level was increased in type 2 diabetic patients compared to control group. However, Additional studies are needed to estimate the fibrinogen level among large group of diabetic patients type 2.

REFERENCES

- Abdeurahman M., Elshazali W. Ali, 2013. Correlation between Glycemic Control and Plasma Fibrinogen Level in Patients with Type2 Diabetes Mellitus, Alneelain University, Khartoum, Sudan, *Laboratory Medicine Journal*.
- Amos AF, McCarty DJ, Zimmet P. 2010. The rising global burden of diabetes and its complications: Estimates and projections, 14(5): 1-85.
- Anjula J, Gupta HL, Narayan S. 2001. Hyperfibrinogenemia in patients of diabetes mellitus in relation to glycemic control and urinary albumin excretion rate. *JAPI*, 49:227-230.
- Bembde A. 2012. A Study of Plasma Fibrinogen Level in Type-2 DM and its Relation to Glycemic Control. *Indian J of Hematology Blood Transfusion*, 28(2):105-8.
- Binaya Sapkota, Saroj Kumar Shrestha, and Sunil Poudel, 2013. Association of activated partial thromboplastin time and fibrinogen level in patients with type II diabetes mellitus *BMC Res Notes* volume 6.
- Braunwald E, *et al.* 2001. Alvin CP Diabetes Mellitus. In: Harrison's principles of internal medicine, 15th edn. 2109-2137.
- David G. Gardner, Dolores, 2011. "Chapter 17". Greenspan's basic & clinical endocrinology (9th ed.). New York: McGraw-Hill Medical. ISBN 0-07-162243-8.
- Hermans J, McDonagh J. 1999. "Fibrin: structure and interactions". *Semin.Thromb.Hemost.* 8 (1)11 -24.
- Kafle DR, Shrestha P. 2010. Study of fibrinogen in patients with DM. *Nepal Medical Collage Journal*, 12(1):34-7.
- Kaiser B. 2003. "DX-9065a, a direct inhibitor of factor Xa". *Cardiovascular Drug Reviews* 21 (2): 91-104.
- Kannel WB, D'Agostino RB, Wilson PW, Belanger AJ, Gagnon DR. 1990. Diabetes, fibrinogen, and risk of cardiovascular disease: the Framingham experience. *American Heart Journal*, 1990.
- Lang T. *et al.*, 2009. "The effects of fibrinogen levels on thromboelastometric variables in the presence of thrombocytopenia". *Anesthesia and Analgesia*.
- Maple-Brown LJ, Cunningham J, Nandi N, Hodge A, O'Dea K. 2010. Fibrinogen and associated risk factors in a high-risk population: urban Indigenous Australians, the DRUID Study. *Cardiovasc Diabetol.*, 9:69.
- Mark, BT., Ernest, B., Marshall, AI., Barry, S.C., Thomas, J.K., Uri, S. 2001. Atherosclerosis, thrombosis and coronary artery disease: In: Williams' haematology: 6th edition 1743-1761.
- Marucco, Arianna *et al.*, 2013. "Interaction of fibrinogen and albumin with titanium dioxide nanoparticles of different crystalline phases". *Journal of Physics. Conference Series*, 429 (Issue1). Retrieved 24 May 2014.
- Meade TW, Mellows S, Brozovic M, Miller GJ, Chakrabarti RR, North WR, *et al.* 1986. Haemostatic function and ischaemic heart disease: principal results of the Northwick Park Heart Study. *Lancet*, 2(8506):533-7.
- Mittal S, Ashutosh Dwivedi RN, Lalchandani A, Puri A, Mishra P. *et al.* 2002. Correlation of fibrinogen as an indicator of both long and short term glycemic control in diabetes. *Indian J Hematology Blood Transfusion*. 28(2): 105-108.
- Mohan A, Srinivasan V, Deepa R, Mohan V. 2001. Lipoprotein (a): role in diabetes and its vascular complications. 1100-1105.
- Muszbek L, Bagoly Z, Bereczky Z, Katona E. 2008. "The involvement of blood coagulation factor XIII in fibrinolysis and thrombosis". *Cardiovascular & Hematological Agents in Medicinal Chemistry*, 6 (3): 190-205
- Pannag Desai K. N., M. S. Roopakala, C. R. Wilma Delphine Silvia, K. M. Prasanna Kumar, 2012. Evaluation of plasma fibrinogen levels in type 2 diabetes mellitus. *International Journal of Diabetes in Developing Countries*, 2012.
- Pierpaola DF, Margaret GG, Haymond MW. 1991. Differential effects of insulin deficiency on albumin and fibrinogen synthesis in humans. *J Clin Invest.*, 88:833-840.
- Santaguida PL, Balion C, Hunt D, Morrison K, Gerstein H, Raina P, Booker L, Yazdi H. 2008. "Diagnosis, Prognosis, and Treatment of Impaired Glucose Tolerance and Impaired Fasting Glucose". Summary of Evidence Report/Technology Assessment, No. 128. Agency for Healthcare Research and Quality. Retrieved 2008-07-20.
- Stec JJ, Silbershatz H, Tofler GH, Matheny TH, Sutherland P, Lipinska I, *et al.* 2000. Association of fibrinogen with cardiovascular risk factors and cardiovascular disease in the Framingham Offspring Population. *Circulation*, 102(14): 1634-8.
- Stewart WF, Ricci JA, Chee E, Hirsch AG, Brandenburg NA. 2007. "Lost productive time and costs due to diabetes and diabetic neuropathic pain in the US workforce". *J. Occup. Environ. Med.*, 49 (6): 672-9.
- Thompson WD, Smith EB. 1999. Atherosclerosis and coagulation system. *J Pathol.*, 159:97-106
- World Health Organization (WHO). Definition, Diagnosis & Classification of diabetes mellitus & its complications. Part1: Diagnosis & classifications of diabetes mellitus. Department of Non-communicable Disease Surveillance, Geneva, 1999.