Original Research Article

COMPARISON OF LEVELS OF CLOTTING FACTORS BETWEEN TYPE 1, TYPE 2 DIABETES MELLITUS PATIENTS WITH AND WITHOUT COMPLICATIONS: A HOSPITAL BASED STUDY

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A B S T R A C T

Background: Diabetes mellitus is a metabolic disorder. Uncontrolled or long term diabetes mellitus causes glycation of proteins. It can affect the coagulation factors which may lead to develop abnormality in coagulation mechanisms. The present study aimed to evaluate the levels of coagulation factors in Type-1, Type-2 Diabetes mellitus and in related complicated cases.

Materials and Methods: The study was conducted in the Institute of Biochemistry, Madras medical College, Chennai, Tamil Nadu for a period of one year. A total of 200 patients were included in the study based on inclusion and exclusion criteria. Study protocol was explained to all the patients and informed consent was obtained. The study population was divided into Group-I (Type 1 DM), Group-II (Type 2 DM), Group-III (T2DM with nephropathy) and Group-IV (T2DM with retinopathy). All the patients demographic and biochemical data were collected and analyzed. Statistical Package for Social Sciences (20.0 version) used for analysis.

Results: The present study showed significant difference in age between the groups. Post prandial blood glucose and HbA1c showed significant difference in Group-I when compared

with other groups. Fasting blood glucose level did not show any significant difference between the groups. Triglycerides, Total cholesterol and LDL cholesterol levels showed significant difference when compared between the groups. HDL cholesterol showed no significant difference between the groups. Comparison of fibrinogen levels between the groups showed significant difference.

Conclusion: The study was concluded that there is a significant change in coagulation profile in T1DM, T2DM and diabetic complications. Patients with diabetic complications require more care because of the profound changes in their coagulation profile.

Keywords: Glucose, Diabetes mellitus, Fibrinogen, Insulin, Nephropathy, Retinopathy.

INTRODUCTION

Diabetes mellitus is a major endocrine disorder. It was characterized by increase in plasma glucose levels. If plasma glucose levels increase, it stimulates the pancreas and releases the insulin. Released insulin stimulates the uptake of glucose by body cells which reduce the plasma glucose levels.[1-3] Based on insulin secretion diabetes mellitus classified as Type1DM and Type2DM. Type1DM is

due to pancreas not able to secrete the insulin. Type 2 diabetes mellitus is due to decrease in the sensitivity of insulin to the cells.[4] Type 1 DM is treated by insulin administration and type 2 DM is treated with oral hypoglycemic agents. If patient is not able to maintain the glucose levels in the normal range, that will result in glycation of tissue proteins and other serious complications. Long term DM or uncontrolled DM leads to development of neuropathy, nephropathy, retinopathy and other complications.[5,6] According to various studies it was observed that increase in glucose levels can affect the blood coagulation process and blood proteins.[7] Changes in the blood coagulation process can lead to micro and macro vascular complications. These vascular problems can lead to stroke, angina, myocardial infarction and may cause death also. Various studies proposed that long term hyperglycaemia significantly affect the coagulation factors, platelet count and thrombin that can lead to development of abnormal clots.[9] With this background the present study aimed to compare the coagulation profile in type 1 with type 2 diabetes mellitus patients with and without complications.

MATERIALS AND METHODS

Study Design: Observational cross sectional study.
Study settings: This study was done in the Institute of Biochemistry, Madras Medical College, Chennai, Tamil Nadu.
Study Period: The study was conducted for one year (2008-2009) and it was ethically cleared from Institutional Human Ethical Committee.
 Inclusion Criteria
•Age above 18 years
•Both gender
•Type-1 and 2 diabetes mellitus
•Type-2 diabetes mellitus with nephropathy and retinopathy
Exclusion Criteria
•Pregnant women
•Recent surgery
•Patients on steroids
•Pancreatic cancer
Groups
Group-I: Type 1 diabetes mellitus
Group-II: Type 2 diabetes mellitus
Group-III: Type 2 diabetes mellitus with nephropathy Group-IV: Type 2 diabetes mellitus with retinopathy

Procedure
A total of 200 patients were selected and divided into four groups based on inclusion and exclusion criteria. All the patients were explained the study procedure in the local language. Informed consent was obtained from patients. According to study protocol all the patients demographic (Age) and biochemical parameters (fasting glucose, postprandial glucose, HbA1c, triglycerides, total cholesterol, HDL cholesterol, LDL cholesterol, fibrinogen, prothrombin time (PT), INR, aPPT and platelet count (PC) were estimated by standard methods.

Statistical analysis
The data was expressed in mean and standard deviation. Statistical Package for Social Sciences (SPSS 20.0) version used for analysis. One way ANOVA post hoc followed by Dunnet t test applied to find the statistical significances between the groups. p value less than
0.05 considered statically significant at 95% confidence interval.

RESULTS

Mean age of Group-I was 27.12 years, compared with other groups showed significant difference. Group-II, III and IV showed mean age between 54-56 years. (Table-1). Comparison of mean fasting blood glucose levels in Group I showed significant difference when compared with Group-II and IV with p value less than 0.05. Fasting blood glucose levels were not significant compared group-II with group-IV. PPBS showed significant differences when compared the Group-I, II with III and IV with p value 0.02. PPBS levels were not significant when compared Group-I with Group-II. Mean HbA1c showed significant difference when Group-III, IV compared with Group-I and II (Table-2). Triglycerides, total cholesterol and LDL showed significant difference when compared group-I with other
 groups. Group-II showed significant difference in lipid profile compared to group-III and IV. Comparison of HDL levels between the groups showed no significant difference (Table-3). Fibrinogen levels showed significant increase in group-II, III and IV compared to group-I. Group-II showed significant difference in fibrinogen levels compared to group-III and IV. PT, INR, and Platelet count (PC) did not show any significant difference between the groups (Table-4).

Table 1: Comparison of mean age between the groups

Groups	Age (MEAN±SD)
Group-I	27.12±7.23
Group-II	54.53±8.73*
Group-III	54.88±9.42*
Group-IV	55.08±6.62*

(*p<0.05 significant compared group-I with other groups)

Table-2: Comparison of mean glucose profile between the groups

Groups	Fasting blood glucose (MEAN±SD)	Post prandial blood glucose (MEAN±SD)	HbA1c (%) (MEAN±SD)
Group-I	139.27±30.89	196.88±52.83	7.88±1.74
Group-II	141.50±24.99	195.67±47.99	8.05±1.49
Group-III	139.62±24.71	216.22±63.19*.#	10.50±1.69*.#
Group-IV	142.22±33.09*.$	255.23±10.12*.#	9.72±1.57*.#

(*p<0.05 significant compared group-I with other groups, #p<0.05 significant compared group-II with other groups)

Table-3: Comparison of mean lipid profile between the groups

Groups	Triglycerides (MEAN±SD)	Total cholesterol (MEAN±SD)	HDL (MEAN±SD)	LDL (MEAN±SD)
Group-I	188.15±57.36	188.25±36.51	37.43±5.38	113.20±34.87
Group-II	224.81±68.37*	201.27±35.26*	39.03±6.66	117.27±34.28
Group-III	194.08±50.98*.#	240.35±47.80*.#	37.34±6.41	164.20±45.40*.#
Group-IV	176.14±59.36*.#.$	230.51±49.89*.#	41.39±4.72	153.90±45.33*.#

(*p<0.05 significant compared group-I with other groups, #p<0.05 significant compared group-II with other groups, $p<0.05 significant compared group-III with other groups)

Table-4: Comparison of mean coagulation profile between the groups

Group s	Fibrinogen (MEAN±SD)	PT (MEAN±SD)	INR (MEAN±SD)	aPTT(MEAN±S D)	PC(MEAN±S D)
Group-I	493.98±38.72	10.12±0.45	1.00±0.08	22.18±2.27	2.33±0.45
Group-II	30.98±64.28*	12.23±1.03*	1.1±0.09	24.12±2.27	2.41±0.71
Group-III	650.84±70.05*#	11.17±1.52	1.0±0.12	21.34±2.34	2.42±0.71
Group-IV	596.52±78.56*#,$	11.01±0.78	1.0±0.06	22.56±1.94	2.58±0.68

(*p<0.05 significant compared group-I with other groups, #p<0.05 significant compared group-II with other groups, $p<0.05 significant compared group-III with other groups)

DISCUSSIONS

This study was conducted to compare the change in coagulation profile in patients with T1DM, T2DM, T2DM nephropathy and T2DM retinopathy. Significant changes were observed in the levels of coagulation profile of patients with diabetes mellitus.[10] Obeagu et.al study concluded that T2DM showed increased fibrinogen levels and prolonged aPTT time. In this study also similar results were observed in fibrinogen levels but not in aPTT. Mark et.al reported that increased fibrinogen level is one of the causes for hypercoagulability among patients with T2DM. Takemoto et.al and Bartoli et.al studies reported similar results as present study.[11,12] The present study results were correlated with Alao et.al study.[13] In their study it was observed that there is a significant increase in the levels of coagulation factors compared to normal group. According to review of literature, there are changes in coagulation profile due to glycation of coagulation proteins. Glycated proteins can affect the clotting factors function leading to formation of abnormal clots. Long term or uncontrolled DM is associated with increased risk of various cardiovascular disorders like atherosclerosis, angina and MI because DM is a procoagulation state. A few studies observed changes in coagulation profile in T1DM compared to control group. Collier et.al study also observed increased fibrinogen levels in DM patients.[15] In the present study also similar results were observed. Acang et.al study reported that decreased PTs and aPPT in DM, compared to normal group.[14] Cigdem B et.al observed a significant relationship between T1DM and changes in coagulation profile. The study results suggested that early detection and maintenance of normal glucose levels may reduce the risk of morbidity and mortality due to abnormal coagulation profile in patients with T1DM.[16]

CONCLUSION

The present study concluded that there are significant changes in coagulation factors as diabetes mellitus is progressing to complications. There is a significant care required while prescribing antidiabetic drugs, considering the changes in coagulation status of diabetic patients .

Funding: Self

Conflict of interest: Nil.

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