

Evaluation of coagulation profile in patients suffering with type-2 diabetes mellitus: A hospital based prospective study

Mariappan A^{1,*}, Deepa VS², Nagendran R³

¹Associate Professor, ²Assistant Professor, ³Professor & HOD, ^{1,3}Sree Mookambika Institute of Medical Sciences, Kanyakumari (Dist), Tamil Nadu, ²Kanyakumari Government Medical College, Kanyakumari (Dist), Tamil Nadu, India

***Corresponding author:**

Email: johamaha15@gmail.com

Abstract

Introduction: T2DM and its complications develop due to uncontrolled plasma glucose levels for long time. Long term hyperglycemia will cause glycation of various tissue proteins. It also affects the coagulation process and proteins involved in coagulation. The present study conducted to evaluate the coagulation profile in the T2DM with and without complications.

Materials and Methods: This study was done in the Institute of Biochemistry, Madras Medical College, Chennai, Tamil Nadu during the period of Nov. 2008 to Dec. 2008. A total of 175 subjects were included in the study, 25 patients in group-I was considered control group. Group-II had T2DM patients without complications (n=50). Subjects with T2DM-nephropathy (n=50) were included in group-III. The group-IV (n=50) had T2DM with retinopathy. All subjects demographic data, glucose levels, lipid profile, urea, creatinine and coagulation profile were estimated and recorded. The data was analyzed by SPSS soft ware by using ANOVA.

Results: More females were there in group-I and II and more males in group-III and IV. Group-II showed significant changes in glucose, lipid profile and coagulation profile levels compared to other groups.

Conclusion: T2DM with complications and without complications patients showed changes in coagulation profile. Better knowledge is required about the coagulation profile in T2DM patients with complications.

Keywords: Bleeding, Coagulation profile, Creatinine, Diabetes mellitus, Glucose, Insulin, Lipid profile.

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Introduction

Diabetes mellitus (DM) is a metabolic disorder characterized by increased glucose levels. Based on the insulin secretion it is classified into Type-1 and 2. Type-1 can develop in the early age mainly due to damage to the beta cells of pancreas.^{1,2} Type-2 DM (T2DM) can develop in the later age. It develops mainly due to decrease the insulin secretion or insulin resistance.³ Insulin is required for the uptake of glucose by cells. In T2DM due to decreased insulin levels or insulin resistance, the cells cannot uptake glucose so it leads to hyperglycemia.⁴ Increased glucose level causes glycation of cellular proteins and development of neuropathy, retinopathy, nephropathy and other complications. Long term hyperglycemic state can affect the coagulation process and proteins.^{5,6}

DM can cause long term complications. These can develop after many years of DM (10 years). The major complications are related to cardiovascular system followed by others.⁷ Long term hyperglycemia can damage to the microvascular system leading to nephropathy and retinopathy. DM is a major health problem that can affect the significant number of

population every year. Early detection and control of plasma glucose levels can reduce the risk for complications.^{8,9} The present study was conducted to evaluate the levels of coagulation profile in patients with T2DM with and without complications.

Materials and Methods

Study settings

This study was done in the Institute of Biochemistry, Madras Medical College, Chennai, Tamil Nadu during the period of Nov. 2008-Dec. 2008 and it was ethically cleared from Institutional Human Ethical Committee.

Inclusion criteria

1. Type-2 diabetes mellitus
2. Type-2 diabetes mellitus with retinopathy
3. Type-2 diabetes mellitus with nephropathy

Exclusion criteria

1. Patients on insulin therapy
2. Patients on steroids, gonadal hormone therapy
3. Pancreatic cancer
4. Pregnant women

5. Recent surgery, trauma

lipid profile, urea, creatinine and coagulation profile by standard methods.

Study groups

Based on the inclusion and exclusion criteria subjects were selected and divided into four groups

Group-I (n=25): Healthy subjects

Group-II (n=50): T2DM without any complications

Group-III (n=50): T2DM with nephropathy

Group-IV (n=50): T2DM with retinopathy

All the subjects were instructed for overnight fasting for the estimation of fasting blood glucose levels. Informed consent was obtained from all the subjects before included in the study.¹⁰⁻¹²

Statistical analysis

Statistical Package for Social Sciences (SPSS 16.0) version used for data analysis. One way ANOVA (Post hoc test) followed by Dunnett t test applied to find the statistical significant between the groups. P value less than 0.05 (p<0.05) considered statistically significant at 95% confidence interval. The data was expressed in number, mean and standard deviation.

Procedure

The demographic data of all the subjects were recorded. Required amount of blood was collected and used for the estimation of glucose,

Results

Table 1: Demographic data of the study groups

Demographic data	Group-I	Group-II	Group-III	Group-IV
Age (MEAN±SD) (Y)	53.20±3.26	54.53±8.73	54.88±9.42	55.08±6.62
Gender				
Male	12	19	33	31
Female	13	31	17	19
Duration of DM (MEAN±SD) (Y)	-	7.36±2.33	10.30±2.87	8.24±2.47

Table 2: Comparison of glucose, HbA_{1c}, urea and creatinine levels between the groups

Groups	FBS (mg/dL) (MEAN±SD)	PPBS (mg/dL) (MEAN±SD)	HbA _{1c} (%)	Urea (mg/dL) (MEAN±SD)	Creatinine (mg/dL) (MEAN±SD)
Group-I	87.54±8.24	124.25±6.69	4.38±0.44	24.21±4.53	0.84±0.13
Group-II	141.50±24.99*	195.67±47.99*	8.05±1.49*	28.35±7.95*	0.95±0.24*
Group-III	139.62±24.71* [#]	216.22±63.19* [#]	10.50±1.69* [#]	97.46±48.15* [#]	4.47±2.29* [#]
Group-IV	142.22±33.09* ^{#,\$}	255.23±10.12* ^{#,\$}	9.72±1.57* ^{#,\$}	31.53±9.00* ^{#,\$}	0.98±0.28* ^{#,\$}

(*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 3: Comparison of lipid profile between the groups

Groups	TG (mg/dL) (MEAN±SD)	TC (mg/dL) (MEAN±SD)	HDL (mg/dL) (MEAN±SD)	LDL (mg/dL) (MEAN±SD)
Group-I	118.05±19.41	167.98±14.96	43.04±4.14	101.33±13.20
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 coagulation profile between the groups

Groups	Fibrinogen (mg/dl) (MEAN±SD)	PT (Seconds) (MEAN±SD)	INR (MEAN±SD)	aPTT (Seconds) (MEAN±SD)	PC (Lacs/µl) (MEAN±SD)
Group-I	284.46±38.63	12.52±0.68	1.05±0.05	24.78±2.55	2.32±0.76
Group-II	530.98±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
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(*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)

In the Group-I and II females were more than males. Group-III and IV had more males than females. Group-III had maximum (10.30 years) duration of DM compared to other groups. Significant increase in FBS and PPBS was observed in Group-IV when compared to other groups. Group-III showed significant increase in HbA_{1c}, urea and creatinine levels compared to other groups. Significant increase in total cholesterol (TC) was observed in other groups, compared to group-I. Group-II had significant increase in TG levels compared to other groups. In TC, group-III showed significant difference compared to other groups. High HDL levels were seen in group-I compared to other groups and it was statistically significant. Group-III showed high levels of fibrinogen compared to other groups. Significant decrease in PT, aPTT and INR levels observed in group-II, III and IV compared to group-I. Increased PC levels in group-II, III and IV compared to group-I.

Discussion

The present study was conducted to evaluate the changes in coagulation profile in patients with T2DM with and without complications. Significant changes were observed in the levels of coagulation profile of patients with and without complications of T2DM. Obeagu et.al study concluded patients with T2DM showed increased fibrinogen levels and prolonged aPTT time.¹³ In the present 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.¹⁴ Takemoto et.al and Bartoli et.al studies reported similar results as present study.^{15,16} The present study results were correlated with Alao et.al study. In their study it was observed that increased levels in fibrinogen.¹⁷ These changes in coagulation profile may be due to glycation of proteins and alteration in the coagulation process. Glycation of proteins can affect their functions leading to coagulation abnormalities.

Conclusion

Changes in coagulation profile can lead to cardiovascular disorders. DM is one of the causes to affect the coagulation profile. Patients with long term DM is required monitoring of coagulation profile. So, it is necessary to have

sufficient knowledge about changes in coagulation profile in DM, which can help for better treatment and for reducing the mortality rate.

Conflict of Interest: Nil

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