



Plasma Fibrinogen level in Type 2 Diabetic Subjects with Dyslipidemia

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Abstract

Aim: The study was to evaluate plasma fibrinogen level in type 2 diabetic mellitus (T2DM) subjects associated with dyslipidemia. **Methodology:** The cross-sectional study was conducted in Department of Biochemistry and Medicine, S.P. Medical College & Associated group of PBM Hospitals, Bikaner. The serum fasting plasma glucose (FPG), total cholesterol (TC) and triglycerides (TG) were estimated by a fully automated Beckman coulter analyzer and plasma fibrinogen was estimated by turbidimetric assay. **Results:** The mean levels of FPG, TC, TG and plasma fibrinogen were significantly higher in diabetic patients associated with dyslipidemia. It was found that there was a significant positive correlation ($p < 0.05$) of increased fibrinogen with a raised level of FPG, TC & TG in case group. **Conclusion:** Plasma fibrinogen, TC & TG measurements for vascular risk assessment in the diabetic patients for preventing cardiovascular complications. Fibrinogen use as a inflammatory biomarker for reduced the morbidity and mortality in these cases.

Keywords: Type 2 Diabetes Mellitus, Dyslipidemia FPG, Plasma Fibrinogen

Introduction

Diabetes Mellitus (DM) is a metabolic disorder characterized by the presence of chronic hyperglycemia associated with impairment in the metabolism of carbohydrates, lipids and proteins. The chronic complications of diabetes mellitus affect many organ systems and are responsible for the majority of morbidity and mortality associated with the disease¹. Plasma fibrinogen is an important component of the coagulation cascade as well as a major determinant of blood viscosity and blood flow. Increased level of fibrinogen is a recognized risk factor for macrovascular disease through its variety of mechanisms including increased blood viscosity, increased size of fibrin clots, increased tissue deposition, stimulation of atherosclerosis and vascular thickening²⁹. Insulin acutely increases fibrinogen production in an individual with type- 2

diabetes but not in individual without diabetes. The objective of the study was to evaluate of fibrinogen in type 2 DM with dyslipidemia^{2,3}.

Methods: The cross-sectional observational study was conducted on 117 normal healthy subjects and 117 newly diagnosed type 2 diabetic mellitus of either sex and of varying age (30-70 years) groups of participants attending the Medicine Department of S.P. Medical College & Hospitals, Bikaner. All the anthropometric measurements were performed. Blood sample collection was done by aseptic technique and subjected to biochemical estimations. The FPG, TC and TG were estimated by a fully automated Beckman coulter analyzer and plasma fibrinogen was estimated by turbidimetric assay. The p-values < 0.05 were considered significant and pearson correlation (r) was performed.

Results:**Table: 1 : Comparison of Biochemical parameters in both study groups**

S.NO.	Parameters (mg/dl)	Normal Healthy Controls (117) (Mean ± S.D.)	Cases (117) (Mean ± S.D.)	P-Value
1.	FPG	86.74 ±11.50	185.06 ± 50.17	P<0.001
2.	TC	177.15±12.70	243.72±42.64	
3.	TG	115.32±24.64	187.13±46.22	
4.	Plasma Fibrinogen	305.09 ±51.32	419.42 ± 62.34	

Note: $p < 0.001$ = Highly significant (HS).

Table: 2 : Correlation of plasma fibrinogen with FPG , TC & TG in case group.

Parameters (Vs)	Correlation (r)	P value
Plasma fibrinogen vs FPG	0.21	$p < 0.05$ (S)
Plasma fibrinogen vs TC	0.22	
Plasma fibrinogen vs TG	0.31	

Table:1 illustrates the mean elevated levels of FPG, TC, TG & plasma fibrinogen were found to be highly significant ($p < 0.001$) in patients with T2DM associated with dyslipidemia as compared to normal healthy control subjects. It was found that there was a significant positive correlation ($p < 0.05$) of increased plasma fibrinogen with raised levels of FPG, TC, TG in case group (Table:2).

Discussion: Serum fibrinogen is an inflammatory marker and has a role in pathogenesis of inflammation, atherosclerosis, thrombogenesis and development of vascular complications in type-2 diabetes mellitus patients. The various possible mechanisms for hyperfibrinogenemia in diabetics could be that a procoagulant state often exists in people of diabetes. We found that the mean FPG, TC, TG & fibrinogen levels were significantly higher in diabetic patients in comparison with healthy control (Table:1). High FPG may lead to hypercoagulability because glucose causes a direct effect on the endothelium. Long-term hyperglycemia damages the endothelium by increasing glycosylation of proteins and lipids to form advanced glycation end products⁴.

Fibrinogen plays important role in development of atherosclerosis starting from the stage of plaque formation till formation of occlusive thrombus over a ruptured atherosclerotic plaque, which is the most common precipitating cause of MI. The various

mechanism by which fibrinogen has been found to promote atherosclerosis and thrombosis are (a) hyperfibrinogenemia increases plasma viscosity, (b) it induces reversible RBC aggregation, (c) it binds it receptors on platelet membrane and causes platelet aggregation, (d) it forms fibrin and fibrinogen degradation products (FDPs) which in turn bind LDL and sequester more fibrinogen and (e) fibrinogen and FDPs stimulate smooth cell proliferation and migration. All these factors result in increased atherogenesis in patients of hyperfibrinogenemia i.e., diabetes and cause coronary artery disease. Besides, fibrinogen levels were found to be associated with age, smoking, hypertension, BMI, glycemic control and ischemic heart disease⁵.

In their study, Gupta P et al found significantly higher levels of cholesterol, LDL and triglycerides in the diabetic population; also, the fibrinogens were significantly higher in diabetics in comparison to normal healthy volunteers⁶. In the study of Gray TC

et al, they found that only the changes in plasma triglyceride concentration correlated with the changes in fibrinogen concentration⁷. So the change in triglyceride was identified as the only independent variable that predicted the changes in the fibrinogen concentration⁸.

Conclusion: Plasma fibrinogen level was significantly associated with glycemic control and duration of diabetes mellitus in years. Fibrinogen levels is an important risk factor for developing macrovascular complications mainly coronary artery disease and cerebrovascular accidents as well as microvascular complications. Thus, lowering plasma fibrinogen levels could be an important approach to the prevention of cardiovascular complications in diabetics.

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