

Serum Lipids and Diabetic Retinopathy in Newly Diagnosed Type 2 Diabetic Subjects

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Abstract

Background: Diabetic retinopathy is the commonest and usually the first observable vascular complication of diabetes mellitus. Along with hyperglycaemia, dyslipidaemia is a contributing factor for the occurrence of diabetic retinopathy. It is postulated that dyslipidaemia results in formation of hard exudate by increasing blood viscosity and altering the fibrinolytic system. A case control study was carried out in the department of Biochemistry, Bangabandhu Sheikh Mujib Medical University, Dhaka during the period of January 2006 to December 2007 to evaluate the serum lipid profile in newly diagnosed type 2 diabetic subjects with diabetic retinopathy. **Materials and Methods:** Total 85 newly diagnosed type 2 diabetic subjects were included in this study, 40 were cases having retinopathy and 45 were age and sex matched controls without retinopathy. Serum triglyceride (TG), total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) were compared between cases and controls. Unpaired t-test and chi-square test were done between groups as tests of significance. **Results:** All the parameters of lipid profile showed dyslipidaemic trend both in cases and controls. In the cases TG was significantly higher and HDL-C was significantly lower than that of controls ($p < 0.05$) whereas no significant difference was found between cases and controls with respect to serum TC and LDL-C. **Conclusion:** It can be concluded that high TG and low HDL-C are associated with diabetic retinopathy in newly diagnosed type 2 diabetes.

Keywords: Lipid profile, Dyslipidaemia, Diabetic retinopathy

J Enam Med Col 2011; 1(2): 63-66

Introduction

Diabetes mellitus (DM) is one of the common chronic disorders worldwide with a number of irreversible complications and diabetic retinopathy is usually the first observable vascular complication in DM.^{1,2} Diabetic retinopathy is a well characterized, sight threatening, chronic, ocular disorder that eventually develops to some degree in nearly all

patients with diabetes mellitus.³ At the time of diagnosis of type 2 diabetes, about 21% patients have established retinopathy. Almost all patients with type 1 diabetes and >60% of patients with type 2 diabetes develop retinopathy within 20 years of diagnosis.⁴

Several decades of basic and clinical research have established that though hyperglycaemia is a major

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causative factor in the development of diabetic retinopathy, there are also some other factors that accelerate its development and progression. Among the contributing factors, diabetic dyslipidaemia characterized by elevated triglycerides (TG), low levels of HDL cholesterol (HDL-C), and increased presence of small, dense LDL particles, has been proposed as a probable risk factor of diabetic retinopathy.⁴⁻⁶

The mechanism by which serum lipids may cause the progression of diabetic retinopathy is not clearly understood. It has been postulated that elevation of blood viscosity and alterations in the fibrinolytic system occur in dyslipidaemia causing hard exudate formation. There may also be incorporation of triglycerides into the cell membrane leading to changes in membrane fluidity and leakage of plasma constituents into the retina. This results in haemorrhage and oedema in the retina.⁷ Epidemiological studies reveal a strong inverse relation between HDL-C levels and atherogenicity.⁸

We conducted this study in our population with the aim to compare total cholesterol (TC), triglycerides (TG), HDL cholesterol (HDL-C) and LDL cholesterol (LDL-C) concentrations between newly diagnosed type 2 DM patients with retinopathy and newly diagnosed type 2 DM patients without retinopathy to determine whether dyslipidaemia has any role in the occurrence of this sight threatening disorder of diabetes mellitus.

Materials and Methods

This case control study was carried out in the department of Biochemistry, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka during January 2006 to December 2007. A total of 85 newly diagnosed type 2 diabetic patients were included purposively on the basis of predefined inclusion and exclusion criteria with special attention to having no history of taking lipid lowering drugs. Study subjects were categorized into cases (40 in number) having retinopathy and age and sex matched controls without retinopathy (45 in number). With ethical considerations and aseptic precaution, 5 mL fasting venous blood was collected from the study subjects. Serum TC, TG and HDL-C were measured by CHOD-PAP⁹, GPO¹⁰ and precipitant¹¹ methods respectively. Serum LDL-C was calculated by

Friedewald’s formula¹² and subjects having TG > 400 mg/dL were excluded from the study. Diagnosis of diabetic retinopathy was done by ophthalmoscopy. All the data were recorded in a preformed data collection sheet and were analyzed by using SPSS 12.0 for Windows. Unpaired t-test and chi-square test were done between groups as tests of significance.

Results

Among the 85 newly diagnosed type 2 diabetes mellitus patients 40 had nonproliferative retinopathy designated as cases with mean age of 44.65 ± 8.80 years (29 to 65 years). The remaining 45 were without retinopathy regarded as controls with mean age of 44.04 ± 9.09 years (30 to 65 years). Among the cases 17 were male and 23 were female whereas 20 were male and 25 were female among the controls. No significant difference (p > 0.05) was observed regarding age and sex distribution between cases and controls (Table I).

Table I: Distribution and comparison of age and sex between cases and controls

Study subjects	Mean age (yrs)	t/p	Sex		χ ² /p
			Male	Female	
Case (n = 40)	44.65 ± 8.80 (29–65)	0.756/ > 0.05	17	23	0.033/ > 0.05
Control (n = 45)	44.04 ± 9.09 (30–65)		20	25	

Table II shows the comparison of lipid profile parameters between cases and controls. In the cases TG was significantly higher and HDL-C was significantly lower than those of controls (p < 0.05) whereas no significant difference was found between cases and controls with respect to TC and LDL-C.

Table II: Comparison of lipid profile between cases and controls

Parameters (in mg/dL)	Cases Mean ± SD (n = 40)	Controls Mean ± SD (n = 45)	t value	p value
TC	210.48 ± 31.91 (155–273)	206.60 ± 33.56 (150–268)	0.544	> 0.05
TG	205.30 ± 50.64 (134–360)	178.96 ± 41.55 (110–310)	2.633	< 0.05
HDL -C	36.42 ± 7.72 (22–53)	40.82 ± 7.57 (24–60)	-02.649	< 0.05
LDL -C	133.18 ± 28.71 (84–197)	130.16 ± 30.55 (74–187)	0.468	> 0.05

Discussion

This case control study was designed to evaluate the components of lipid profile in diabetic retinopathy in newly diagnosed type 2 diabetes mellitus subjects. We have compared serum TC, TG, HDL-C and LDL-C levels between 40 newly diagnosed type 2 diabetes mellitus cases with nonproliferative retinopathy and age and sex matched 45 controls of newly diagnosed type 2 diabetes mellitus patients without retinopathy.

We have found raised TC, TG and LDL-C and lower HDL-C concentrations in both the study groups with notable dyslipidaemic pattern in cases. Several discrepant findings were observed in different studies. In our study the concentration of TG was significantly higher in cases compared to controls and no significant difference in TC and LDL-C concentrations was observed between the groups, which is partly supported by the studies done by Kareem et al¹³ and Rema et al¹⁴ where the former group found higher TC and TG concentrations and the latter found significantly higher TC, TG and LDL-C concentrations. Our finding of no significant difference in TC and LDL-C concentrations between the groups is in accordance with that of several other studies.¹⁵⁻¹⁹ This study observed lower HDL-C concentration in both the study groups compared to reference value and comparison revealed statistically significant lower level in cases. Similar finding was observed by Kordonouri et al²⁰ and Sinav et al²¹ but the studies done by van Leiden HA et al²² and Wong et al²³ differ from our findings. These conflicting findings regarding different components of lipid profile may be due to different dietary habit, life style and ethnicity of our study subjects than that of the studies done abroad. Sample size might also play a role.

It may be concluded that hypertriglyceridaemia and low HDL-C are associated with diabetic retinopathy in newly diagnosed type 2 diabetes mellitus. Subjects with diabetes and altered lipid levels should undergo more frequent ophthalmologic examinations and appropriate lipid lowering therapy in an early phase to prevent other atherosclerosis related morbidity and mortality, and also to contribute to the prevention of retinopathy.

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