



Assessment of dyslipidemia and its association with Type 2 Diabetes Mellitus in Bangladeshi subjects

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Abstract

Background : Globally incidence of Type 2 Diabetes Mellitus (T2DM) shows an upward trend which a challenge for physicians and public health specialists. Patients with T2DM have 2- 4-fold increased risk of coronary artery disease (CAD), the leading cause of death among people with T2DM. Dyslipidemia considered an important factor for cardiovascular complication of T2DM.

Objective : Assessment of dyslipidemia and its association with T2DM in Bangladeshi subjects.

Methods : A case control study was conducted in CARE Medical College Hospital, Dhaka, during the period of July 2018 to June 2019. A total 153 subjects were included in study of which 90 belonged to Group-I were T2DM and 63 subjects were healthy Controls in Group-II. The Fasting glucose, postprandial glucose. Serum Lipid Profile were assayed in patients and controls, using standardized assay methods. Data were analyzed by using SPSS version 21.

Results : Fasting plasma glucose levels [mmol/l, (Mean \pm SD)] of the study group were Control (4.96 \pm 0.76) and T2DM (8.27 \pm 2.19) difference was statistically significant ($p < 0.001$), 2 hours post prandial plasma glucose level [mmol/l, (Mean \pm SD)] of the study groups were Control (5.81 \pm 0.87) and T2DM (11.79 \pm 2.69). A significant difference found between Control vs T2DM ($p < 0.001$). Fasting Triglyceride [mg/dl, (Mean \pm SD)] was higher in T2DM (189 \pm 82.06), compared to Control (142 \pm 80.14) and statistically significant $p = 0.001$. Total Cholesterol [mg/dl, (Mean \pm SD)], Control (172 \pm 45) and T2DM (189 \pm 50.76) $p = 0.029$ was significantly higher in T2DM than healthy subjects. HDL cholesterol [mg/dl, (Mean \pm SD); Control (30.6 \pm 8.10) and T2DM (26 \pm 9.94), $p < 0.001$] significantly increased in healthy Controls compared to T2DM subjects. LDL cholesterol [kg/m² (Mean \pm SD); Control (114 \pm 43.54) and T2DM (118 \pm 49.66), $p = 0.572$] which was not significantly different among the study subjects.

Conclusion : The present study concludes that important parameter of dyslipidemia, Fasting Triglyceride, total Cholesterol, were higher in T2DM patients and statistically significant. LDL cholesterol higher and not significant on the other hand HDL cholesterol was lower but significant difference between T2DM and healthy control found. Therefore, T2DM is associated with higher incidence of dyslipidemia

Key words : serum lipid profile, Type 2 DM, dyslipidemia.

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Introduction

Diabetes Mellitus (DM) is a chronic disease of metabolic disorder characterized by chronic hyperglycemia and disturbances of carbohydrate, fat, and protein metabolism with absolute or relative deficiency of insulin secretion and /or insulin action.¹ There is an increasing trend of Type 2 Diabetes Mellitus worldwide constitutes a major global health problem. By the 2030 an expected number will be more than 366 million most of these new

cases are from developing countries.² A Patients with T2DM have 2- 4-fold increased risk of coronary artery disease (CAD), the leading cause of death among people with T2DM.³ Dyslipidemia is major modifiable risk factors for T2DM and related CAD.⁴

Lipid abnormalities in patients with diabetes, often termed "diabetic dyslipidemia", are typically characterized by high total cholesterol (T-Chol), high triglycerides (Tg), low high density lipoprotein cholesterol (HDL-C). A recently

published meta-analysis reported that abnormal levels of the above-mentioned lipid parameters reflect, to some extent, the risk of CAD in T2DM.⁵ The Body Mass Index (BMI), the Waist Hip Ratio (WHR) and the Waist Circumference (WC) are three main anthropometrics parameters to evaluate body fat and fat repartition in adults. These parameters have ethnic susceptibility. Some authors showed that BMI and WHR were predictors of type 2 diabetes outcome.⁶

According to the INTERHEART study in all South Asian countries T2DM and related cardiovascular complications that develop 5–10 years earlier in Bangladesh than in western countries. Consequently, fatality rates are high among young adults and death due to CAD 36.5%, stroke 18.3%, and T2DM 6.7%. Earlier data from the Bangladeshi population living in their home country have shown that dyslipidemia is associated with T2DM.⁷

A study of Bangladeshi immigrants conducted in the UK also observed a high level of T-Cholesterol, even higher than in those living in Bangladesh whereas another study of Bangladeshis in the UK observed that high levels of Tg were associated with CAD.⁸

The aim of study was to find out the association of dyslipidemia with T2DM in Bangladeshi subjects.

Methods

The study was conducted in CARE Medical College Hospital, Dhaka, during the period of July 2018 to June 2019. It was an observational study with case control design involving a total 153 subjects, who were divided into two groups.

Group-I – included 63 non obese type 2 diabetic subjects and

Group-II – included 90 nondiabetic healthy controls.

After selection written consent was taken from each subject. Ethical clearance was taken from ethical committee of the institution. Detail clinical history, anthropometric measurements [Age, Body mass index (BMI), Waist hip ratio (WHR)] and investigations were performed. Fasting glucose, postprandial glucose (2 hrs after breakfast) measured by glucose Oxidase method and lipid profile by enzymatic colorimetric method.

With all aseptic precaution, fasting venous blood (6ml) was taken from each of the subject. Blood glucose, serum triglyceride and serum cholesterol were measured immediately. The serum of selected subjects aliquoted and kept frozen at -70°C until analysis. HDL was measured later. Then the patient was given standard breakfast (560 Calorie). Blood sample (3ml) was taken 2 hours after breakfast for measurement of post prandial blood glucose.

The data were expressed as mean \pm SD (standard deviation). The statistical significance of differences between the values was assessed by 't' test or Mann-Whitney U test (as appropriate). Association between the variables were analyzed by univariate (Pearson's correlation analysis). A two-tailed p value of <0.05 was considered statistically significant. Statistical analysis was performed using SPSS version 21.

Results

A total of 153 subjects were included in study of which 63 belonged to T2DM (group I) and 63 were healthy Controls (group II).

Regarding Age [(years, mean \pm SD)] between the Control and T2DM subjects were 46 \pm 8.31 and 47 \pm 7.58 respectively. There was no significant difference in age between these two groups. BMI was not significantly different among the study subjects [kg/m², (Mean \pm SD), Control, 24 \pm 3.96 and T2DM, 25 \pm 2.72, $p=0.754$]. WHR [cm, (Mean \pm SD) in Control, 0.88 \pm 0.16 and in T2DM, 0.94 \pm 0.12, $p=0.001$], showed significant difference between T2DM and healthy subjects. (Table I)

Table I: Anthropometric and Clinical characteristics of the study subjects

Variable	Control (n=90)	T2DM (n=63)	p value
Age (Yrs)	46 \pm 8.31	47 \pm 7.58	0.326
BMI (kg/m ²)	24 \pm 3.96	25 \pm 2.72	0.754
WHR	0.88 \pm 0.06	0.94 \pm 0.12	<0.001

Fasting Triglyceride was significantly higher in T2DM compared to Control subjects [mg/dl, (Mean \pm SD), Control 142 \pm 80.14; T2DM 189 \pm 82.06, $p=0.001$]. Total Cholesterol [mg/dl, (Mean \pm SD), Control (172 \pm 45), T2DM (189 \pm 50.76) $p=0.029$] was significantly higher in T2DM than healthy subjects. HDL cholesterol [mg/dl, (Mean \pm SD); Control (30.6 \pm 8.10), T2DM (26 \pm 9.94), $p<0.001$] significantly increased in healthy Controls compared to T2 DM subjects. LDL cholesterol [mg/dl (Mean \pm SD); Control (114 \pm 43.54) T2DM (118 \pm 49.66), $p=0.572$] was not significantly different among the study subjects. (Table II)

Table II : Lipidemic status of the study subjects

Variables	Control (n=90)	T2DM (n=63)	p value
TG (mg/dl)	142 \pm 80.14	189 \pm 82.06	<0.001
T.Chol (mg/dl)	172 \pm 45	189 \pm 50.76	0.029
HDL-C (mg/dl)	30.6 \pm 8.10	26 \pm 9.94	<0.001
LDL-C (mg/dl)	114 \pm 43.54	118 \pm 49.66	0.572

Fasting plasma glucose levels [mmol/l, (Mean \pm SD)] of the study group were Control 4.96 \pm 0.76 and T2DM 8.27 \pm 2.19. There was a significant difference in the fasting plasma glucose between Control vs T2DM ($p<0.001$). 2 hours post prandial plasma glucose level [mmol/l, (Mean \pm SD)] of the study groups were: Control 5.81 \pm 0.87 and T2DM 11.79 \pm 2.69. There

was a significant difference in the postprandial plasma glucose between Control vs T2DM ($p < 0.001$). (Table III)

Table III : Glycemic status and insulinemic status among the study subjects

Variable	Control (n=90)	T2DM (n=63)	p value
F_Glu (mmol/l)	4.96 ± 0.76	8.27±2.19	<0.001
PP_Glu (mmol/l)	5.81 ± 0.87	11.79 ± 2.69	<0.001

Discussion

The present study conducted to evaluate the Serum Lipid Profile and its association with Glycemic state of Type 2 Diabetes patient in Bangladesh. Total 153 subjects were studied who were divided into two groups: Group-I (63 non obese T2DM subjects) and Group-II (90 nondiabetic healthy controls).

In this study BMI found not significantly different between the study subjects, ($p=0.754$). This finding of present study was not consistent with a similar study done by Josi B et.al that BMI of diabetic participants was significantly higher ($p=0.005$) than non-diabetic participants.⁹ In case of WHR in the present study showed a significant difference ($p= 0.001$) between T2DM and healthy subjects, Bhowmik B et. al found that WHR was strongly associated with T2DM.¹⁰

In our study, we found that BMI was not associated with T2DM but WHR showed association whereas Lotfi MH et al found in their study BMI and WHR were not significantly associated with diabetes.¹ According to a report by Mckeigue et.al, in Asian Indians every 0.04 unit increase in WHR was associated with a four-fold rise in diabetes. Increases WHR caused by increased abdominal and visceral fat leads to increased insulin resistance and consequently diabetes.¹¹

Among persons with diabetes, part of the increased likelihood of cardiovascular disease appears to be a consequence of the increased frequency of risk factors like dyslipidemia. Yet diabetes itself is an independent risk factor for cardiovascular disease. Abnormalities in the lipid profile in plasma reported to occur in almost 30% of persons with diabetes. Its prevalence is variable depending on the type and severity of diabetes, glycemic control, nutritional status, age and other factors. The most characteristic lipid abnormality in diabetics is hypertriglyceridemia and low HDL cholesterol with or without associated increased in serum total and LDL cholesterol.⁸

In this present study Fasting Triglyceride was significantly higher in T2DM compared to Control subjects ($p=0.001$), (Control 142±80.14; T2DM 189±82.06.) Total Cholesterol was significantly higher ($p=0.029$) in T2DM than healthy subjects, (Control 172±45; T2DM 189±50.76). Consistency found in a

Bangladeshi study done by Nuruddin et.al, they found mean serum triglycerides and serum Cholesterol were higher in diabetic than control subjects and the differences were significant.¹² Their study showed LDL cholesterol of the study groups was 110.92mg/dl and 130.83 mg/dl respectively and the difference was significant. Which was contradictory to our study, our result showed LDL cholesterol was not significantly different among the study subjects.¹²

Our findings mainly in agreement with two landmark studies namely the Framingham Heart Study¹³ and the UK Prospective Diabetes Study (UKPDS).¹⁴ In both studies T2DM subjects compared to those without T2DM, had higher plasma Tg levels and lower HDL-C levels. In our study, high Tg was also strongly associated with T2DM even when HDL-C was normal.

The LDL-C level in subjects with glucose intolerance did not differ from their non-diabetic counterparts in neither of the studies. In our study there was a significant difference in the fasting and postprandial plasma glucose between Control vs T2DM ($p < 0.001$) Elevated blood glucose level combined with dyslipidemia increases atherosclerosis-related inflammation and makes it more extensive and dyslipidemia is an independent risk factor for cardiovascular disease.¹⁵

A limitation of the present study was that potential factors such as dietary habits, physical activity level, smoking habit, medication (s) and concomitant diseases influencing lipid levels were not evaluated.

Conclusion

Considering our study result dyslipidemia found in T2DM patients. Important parameter of dyslipidemia, Fasting Triglyceride, Total Cholesterol were higher and statistically significant, on the other hand LDL cholesterol was higher but not statistically significant and HDL cholesterol was lower but statistically significant according to our study result. Therefore, in lipid profile fasting Triglyceride, total Cholesterol, LDL cholesterol should be monitored regularly for preventing cardiovascular complications in T2DM patients.

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