

Types of Dyslipidemia in Type 2 DM Patients of Bhubaneswar region

Rajendra Dev Bhatt,^{1*} Kamal Lochan²

BACKGROUND: A characteristic pattern, termed dyslipidemia, consists of deranged of any single components of lipid profile test. This pattern is most frequently seen in diabetes and may be a preventable risk factor for subsequent cardiovascular disease. This study determined the influence of type 2 diabetes mellitus (T2DM) on lipid profile of diabetic patients reporting in a tertiary hospital in Bhubaneswar, India.

METHODS: 50 confirmed T2DM patients and 50 non-diabetic control subjects were selected for the study. Fasting and 2 hours post prandial blood samples were collected from both study and control patients. Fasting blood sample was analyzed for lipid profile test and serum glucose, and post prandial sample was analyzed for serum glucose only.

RESULTS: Sixty two (62%) of diabetic patients were males whilst thirty eight (38%) were females in this study. The mean plasma glucose levels, Total cholesterol and Triacylglycerol were significantly raised in the diabetics as compared to those in the control subjects. This is substantiated by the fact that the entire lipid fractions are disturbed in diabetics as compared to healthy controls.

CONCLUSION: Thus dyslipidemia was quite common in diabetes and Hypertriglyceridemia was the most common one.

Keywords: Type-2 Diabetes Mellitus, Dyslipidemia, Lipid Profile, Triglyceride, HDL-C, LDL-C, Total Cholesterol.

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Introduction

Diabetes mellitus (DM) is a syndrome consisting of metabolic, vascular and neuropathic components that are interrelated. It is defined as group of metabolic disorder that is characterized by hyper-glycemia resulting from defect in insulin secretion, insulin action or both. The lack of effective insulin action leads to alteration in carbohydrate, fat and protein metabolism [1]. T2DM is caused by relatively impaired insulin secretion and peripheral insulin resistance [2].

Diabetes is no more an epidemic but it has been turned into a global pandemic. Diabetes has

been recognized as a health threat worldwide. As per the global projection by international diabetes foundation the number of diabetic patients has risen sharply in recent years. While in 1985, thirty million people had diabetes worldwide; the number rose to one hundred million in 2000, two hundred eighty five million in 2010 and is estimated to be four hundred thirty five million, 7.8% of the adult world population, by 2030 [3].

According to WHO, 70% of current cases of diabetes, occur in developing countries [4]. Among these India has the world's largest population with an estimated 50.8 million people living with diabetes [3]. The international journal of diabetes for developing countries has declared India as the diabetes capital of the world [5].

A characteristic pattern, termed dyslipidemia, consists of increased triglycerides (TAG), Total cholesterol (TC), low density lipoprotein (LDL), and very low density lipoprotein (VLDL) cholesterol and decreased high density lipoprotein (HDL). This pattern is most frequently seen in diabetes and may be a preventable risk factor for subsequent cardiovascular disease.

Patients with T2DM are at greater risk of developing vascular diseases because of lipid changes. Lipid abnormalities and insulin use is critically discussed in diabetics [6]. The most typical lipoprotein pattern reported in diabetes, also known as diabetic dyslipidemia or atherogenic dyslipidemia consists of moderate elevation in TC, TAG and LDL-Cholesterol levels with or without low HDL-Cholesterol levels in blood.

The degree of variations in lipid profile of diabetic patients may not be generalized to all region and should be individualized to specific regions as ethnic, hereditary and environmental factors influence lipid profile. Due to increasing cardiovascular problems in T2DM patients [7], this study was conducted to observe the co-

¹Department of Biochemistry, Hi-Tech Medical College and Hospital, Bhubaneswar, Odisha, India.

Correspondence to: Rajendra Dev Bhatt, Department of Biochemistry, Kathmandu University Hospital-Dhulikhel Hospital, Dhulikhel. E-mail: bhattdev.rajendra@gmail.com

relation of T2DM and types of lipid abnormalities in T2DM. Thus this research aims to evaluate the types of dyslipidemia in T2DM patients of Bhubaneswar region.

Methods

The study was carried out on the patients of medical OPD at Hi-Tech Medical College and Hospital in Bhubaneswar. 50 T2DM patients were recruited after their consent had been sought.

The study targeted T2DM patients, medically diagnosed by American Diabetes Association (ADA) criteria. Randomly selected age and sex matched individuals, with no history of diabetes or any type of illness and not on statins were used as controls.

Patients with type 1 DM, other ailments, metabolic disorders and other causes of hyperlipidemia were not included in this study. Pregnant women, patients on statins for abnormal lipid treatment (both for T2DM and controls) were also excluded.

Venous blood samples were taken from both diabetic and control patients at overnight fasting and 2 hours post prandial state. Investigations carried out were, blood glucose fasting and 2 hrs post prandial blood glucose, and fasting lipid profile including TC, TAG, HDL-C, LDL-C and very low density lipoprotein cholesterol (VLDL-C).

Serum TC was determined by an enzymatic (CHOD/PAP) colorimetric method and TAG was determined by an enzymatic (GPO-PAP) method [8]. HDL-C was estimated by a precipitant method and LDL-C by was estimated by using Friedewald's formula as shown below:

$LDL-C = TC - HDL-C - (TAG/5)$, where TAG/5 is approximately equal to VLDL-C.

Serum glucose was determined by using the glucose oxidase/per oxidase enzymatic method [2].

Dyslipidemia was defined using the National Cholesterol Education Programme – Adult Treatment Panel III (NCEP – ATP III) (National Cholesterol Education Programme, 2002) criteria as shown in Table 1.

Table 1. ATP III Classification of LDL-C, TC, HDL-C and TG (mg/dL).

LDL-Cholesterol	
<100	Optimal
100-129	Near optimal/ above optimal
130-159	Borderline high
160-189	High
>190	Very high
Total Cholesterol	
<200	Desirable
200-239	Borderline high
>240	High
HDL Cholesterol	
<40	Low
>60	High
Triacylglycerol	
<150	Normal
150-199	Borderline high
200-499	High
>500	Very high

Results

In this study 50 diagnosed cases of T2DM were observed as cases and 50 non diabetic were observed as controls. There was significant difference in the fasting blood sugar, post prandial blood sugar level and lipid profile test in control and T2DM patients.

The mean serum TG in our study was 188.9 ± 69.07 mg/dL as compared to 117.56 ± 23.51 mg/dL of controls. The mean serum total cholesterol was 203.38 ± 48.0 mg/dL as compared to 161.4 ± 24.55 mg/dL of controls. While HDL-C was 38.22 ± 5.85 mg/dL as compared to 43.46 ± 6.95 mg/dL of controls, which was significantly lower to that of controls as shown in Table 2.

Discussion

We found significant difference ($P < 0.0001$) at the Triglyceride level in control and cases where mean \pm S.D is 117.56 ± 23.51 and 188.9 ± 69.07 of control and cases respectively. We also found 74% diagnosed diabetics have >150 mg/dl, 14% have >250 mg/dl and 10% have >300 mg/dl of Triglyceride out of 50 cases. And only 6% control have >150 mg/dl of Triglyceride.

We also observe significant difference ($p < 0.001$) in the Total cholesterol level, where mean \pm S.D is 161.4 ± 24.55 and 203.38 ± 48.00 of control and cases respectively.

Table 2. Fasting and post prandial serum glucose of type 2 diabetic patients and controls

Parameters	Patients	Controls	P value	T
Fasting serum glucose (mg/dL)	144.62±71.61	85.86±9.33	<0.0001	5.75
Post prandial serum glucose (mg/dL)	209.60±75.49	113.88±15.73	<0.0001	8.78
Triacylglycerol (mg/dL)	188.9±69.07	117.56±23.51	<0.0001	6.91
Total Cholesterol (mg/dL)	203.38±48.0	161.4±24.55	<0.0001	5.51
HDL (mg/dL)	38.22±5.85	43.46±6.95	<0.0001	4.07
LDL (mg/dL)	127.36±45.19	96.32±42.90	<0.0001	4.25
VLDL (mg/dL)	38.90±15.73	23.28±4.70	<0.0001	6.72

We also found 48% of Diabetic have >200mg/dl of Total Cholesterol from 50 cases of diagnosed diabetics, while only 4% control have >200mg/dl of Total cholesterol.

Smith S. and Lall A. M also found mean ±SD of Total cholesterol 299.36±13.46 in their study in Allahabad, India [5].

A significant difference in the HDL and LDL cholesterol level in control and cases. Where mean±S.D is 43.46±6.95 and 38.22±5.86 of HDL and is 96.32±42.90 and 127.36±45.19 of LDL in control and cases respectively. P value of HDL and LDL is <0.0001 which means there is significant difference between control and cases. Among 50 of diabetics 38% have <35mg/dl of HDL and 8% out of 50 controls have <35mg/dl of HDL Cholesterol.

Another study done by Rakesh et al [9] most common pattern was combined dyslipidemia with high LDL and low HDL in both males (22.7%) and females (33%).

In our study, level of TC, TAG, VLDL-C & LDL-C were significantly increased ($p<0.001$) while HDL-C level was significantly decreased ($p<0.01$) in T2DM. These findings are consistent with those of Taha D et al (2002) [10], Howard BV et al (1999) [11], O'Neal DN (1998) [12], Mazanto et al (1993) [13], Niemeijer et al [14] and they found that increased TAG & decreased HDL-C plasma concentration are common features of dyslipidemia in T2DM. Oki JC in

1995 [15] stated that essentially any dyslipidemic pattern can be present.

In a study by H. Surekha Rani et al [16] an attempt has been made to evaluate the risk factors for coronary heart disease in DM patients. It is observed that, TC, VLDL, LDLs, TGs were high and the levels of HDLs were low compared to controls.

A significant difference was noticed in the VLDL Cholesterol level in control and cases where mean ±S.D is 23.84±4.70 and 38.90±15.73 of control and cases respectively with p value <0.001.

Conclusion

T2DM patients in this study had elevated levels of TAG, TC with slightly elevated levels of LDL-C and reduced levels of HDL-C. This indicates the influence of T2DM on abnormal lipid profile of patients with its associated danger of elevated CVD risk.

Diabetic patients with complication tend to have higher levels of lipid fractions (TAG, T. Chol, LDL and VLDL) and lower level of HDL. This suggests that there appears to be some relation between the geneses of various vascular complications in the presence of lipid abnormality. So it is important to aim at critical control of diabetes mellitus to prevent or at least postpone the onset of various hyperlipidemia related complications.

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