



## A study on type2 diabetes mellitus patients in relation to lipid profile attending tertiary care hospital in Kanpur

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### Abstract

**Background:** Diabetes Mellitus refers to a group of metabolic disorder, characterised by high blood sugar and disturbance of carbohydrate, fat and protein metabolism due to absolute or relative deficiency of insulin secretion or insulin action or together. Both lipid profile and diabetes is predictors for metabolic disturbances including dyslipidaemia, hypertension, cardiovascular diseases. Lipids play a vital role in the pathogenesis of diabetes mellitus and dyslipidemia as a metabolic abnormality is frequently associated with it.

**Methods:** Study was conducted on 120 patients (62 males and 58 females) of age group 30 to 70 years of diagnosed type 2 Diabetes Mellitus. Lipid abnormality and relationship between different parameters like routine, blood sugar, HbA1C level and lipid profile in type 2 Diabetic Mellitus patients was done.

**Study Period:** January 2018 to October 2019.

**Result:** Study concluded that out of total study subject having t2dm about 80%) had abnormal lipid profile and 20% patients had normal lipid profile.

**Keywords:** type 2, diabetes mellitus, triglycerides, low density lipoprotein, high density lipoprotein.

### Introduction

Diabetes mellitus is a common metabolic disorder characterized by absolute or relative deficiencies in insulin secretion and/or insulin action associated with chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism associated with absolute or relative deficiency of insulin secretion or insulin action or together<sup>2</sup>. In diabetes patients, complications are

mainly due to chronic hyperglycemia that exerts its injurious to health effects through several mechanisms: dyslipidemia, platelet activation, and altered endothelial metabolism. Both lipid profile and diabetes is predictors for metabolic disturbances including dyslipidaemia, hypertension, cardiovascular diseases. Lipids play a vital role in the pathogenesis of diabetes mellitus and dyslipidemia as a metabolic abnormality is

frequently associated with diabetes mellitus. Diabetic dyslipidemia is more atherogenic than in dyslipidemia in general. Patients with HbA1c value  $> 7.0\%$  had significantly higher value of Triglycerides cholesterol, Triacylglycerol, LDL-C, LDL-C/HDL-C ratio, non-HDL-C and TC/HDL-C ratio as compared to the patients with HbA1c  $\leq 7.0\%$ .<sup>6</sup>. Increased hepatic secretion of large triglyceride-rich VLDL and impaired clearance of VLDL appears to be of central importance in the pathophysiology of this dyslipidemia. Male are at higher risk group than females due to dyslipidemia<sup>8</sup>. Triglycerides and TG/HDL-C were independent Diabetes Mellitus risk factors; and of the two, TG/HDL-C was a stronger risk factor. The Diabetes Mellitus discriminatory power of triglyceride and TG/HDL-C was poor; therefore, it is recommended that they be used in combination with other risk factors. Diabetes mellitus incidence increased with ascending risk score<sup>9</sup>. Subjects with an LDL-C  $< 100$  mg/dl, presence of metabolic dyslipidemia in adults with diabetes is associated with an increased risk of coronary heart disease<sup>11</sup>. Diabetic dyslipidemia is one of important complication of type 2 diabetes mellitus (T2DM). Blood lipid parameters (e.g., Triglyceride; total cholesterol; high-density lipoprotein cholesterol; low-density lipoprotein cholesterol) are atherogenic. Atherogenic Index of Plasma defined (AIP), are important indexes in predicting risk of obesity, lipid abnormality and T2DM 21.

### Aim

To investigate the lipid profile in patients of Type 2 Diabetes Mellitus.

### Objectives

1. To estimate the lipid profile (Serum cholesterol, Serum triglyceride and Serum ldl, serum vldl, serum hdl levels) in patients of Type 2 Diabetes Mellitus.
2. To study the relationship between Diabetes Mellitus and various lipid parameters in study subjects.

### Material and methods

Study was conducted on 120 patients between 30-70 years of age. The male patients were 80 and female were 40. The patients were diagnosed of type 2 diabetes mellitus. Study subjects were taken from IPD and OPD of KPS institute of Medicine, LLR Hospital, GSVM Medical College Kanpur and consent was obtained before the start of study. The study Period was from January 2018 to October 2019. The study was observational, cross sectional, hospital based study and most suitable statistical tools were applied for data analysis.

### Inclusion Criteria

- Subjects with previously diagnosed T2DM.

### Exclusion Criteria

- Type 1 Diabetes Mellitus
- T2 DM patients with no history of DKA/Insulin therapy/OHA/ contraceptive (in female) therapy.
- Previous history of lipid disorders or Treatment with lipostatic drugs
- Pregnancy
- Acute or chronic infection
- Malignancy
- Kidney disease (GFR  $< 30$  ml/min/1.732 m<sup>2</sup>)
- Any other kidney pathology other than diabetic kidney disease.

### Investigations

- Routine investigations
- Blood sugar
  - Fasting
  - Post Prandial
- HbA1c
- **Lipid profile**
  - Serum Total Cholesterol
  - Serum Triglycerides
  - Serum LDL
  - Serum HDL

**Diagnosis of Diabetes (ADA 2011)**

**Pre Diabetes**

HbA1c value-5.7-6.4%

Fasting blood sugar 100-125 mg/dl (5.6-6.9 mmole/L)

**Diabetes-**

Fasting blood sugar more than 126 mg/dl (7.0mmol/L).

Fasting is defined as no calorie intake for at least 8 hours OR 2 -hrs Prandial Glucose more than 200 mg/dl(11.1mmol/L)during OGTT or

HbA1C > 6.5 %.

**Statistical Analysis-** Data obtained from the study group was compiled and tabulated on MS Excel sheet and Master Table was made accordingly.

**Observations**

**General Profile of Study**

In present study most number of patients were comes under 35 to 60 years of age group. Out of which 66.66 % were males (80) and 33.33 % were females (40). 85.8% (103) were hindus and 14.2% (17) were muslims.

**Table No 1** Mean Value and Standard Deviation of Various Parameters

	MEAN	S.D.
S.CHOL	187.25	34.66
S.TRIG	165.07	49.67
LDL	101.1	40.73
HDL	38.03	8.56
HB	9.51	1.69
BSF	196.26	60.92
BSPP	263.88	73.52

The mean value of Serum Cholesterol was 187.25 ± 34.66 mg/dl., serum triglyceride mean value was 165.07 ± 49.67 mg/dl., Low density lipoprotein mean value was 101.1 ± was 40.73 mg/dl., high density lipoprotein mean value was 38.03 ± was 8.56 mg/dl and haemoglobin mean value was

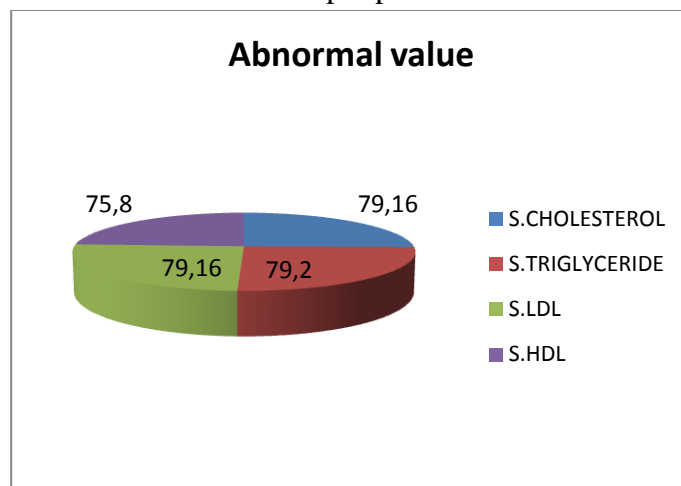
9.51 ± 1.69 g/dl. The Blood sugar fasting mean value was 196.26 ± 60.92 mg/dl. And blood sugar post prandial mean value was 263.88 ± 73.52mg/dl

**Table -2** Distribution of blood glucose and glycosylated haemoglobin values between the T2DM group (n=120)

	GROUP	MEAN	STANDARD DEVIATION
FASTING BLOOD GLUCOSE(mg/dl)	T2DM	196.28	60.92
POST-PRANDIAL BLOOD GLUCOSE(mg/dl)	T2DM	263.88	73.52
Hb1Ac(%)	T2DM	7.99	1.45

The fasting blood glucose (mg/dl) mean value was 196.28 ± 60.92 and post-prandial blood glucose (mg/dl) mean value was 263.88± 73.52. The Hb1Ac (%) mean value was 7.99 ± 1.45.

**Chart No-1** Abnormal lipid profile chart in T2dl-



Different parameter mean value were as- the Total serum Cholesterol mean value was 166.7 mg/dl, serum Triglyceride mean value was 179.15 mg/dl, Serum high density Lipoprotein mean value was 52.7 mg/dl, Serum Low density lipoprotein mean value was 79.6 mg/dl.

**Table-3** Distribution of total serum cholesterol in diabetic (T2DM) subjects (n=120)

GENDER	TOTAL SERUM CHOLESTEROL(mg/dl)					
	ELEVATED(>200)		NORMAL(<200)		TOTAL	
	N	%	N	%	N	%
MALE	64	80.00%	16	20.00%	80	100%
FEMALE	31	77.50%	9	22.50%	40	100%
TOTAL	91	79.16%	25	21.84%	120	100%

**Table no-4** Distribution of serum triglycerides in diabetic(t2dm) subjects (n=120)

GENDER	Serum TRIGLYCERIDE(mg/dl)					
	ELEVATED(>200)		NORMAL(<200)		TOTAL	
	N	%	N	%	N	%
MALE	65	81.25%	15	18.75%	80	100%
FEMALE	30	75.00%	10	25.00%	40	100%
TOTAL	73	79.20%	25	20.80%	120	100%

In total 120 subjects 73(79.20%) patients having abnormal and 25(20.80%) patients having normal serum triglycerides level

**Table no-5** Distribution of Serum Ldl Cholesterol in diabetic (T2DM) subjects in the study group (n=120)

GENDER	LDL (mg/dl)					
	ELEVATED(>150)		NORMAL(<150)		TOTAL	
	N	%	N	%	N	%
MALE	69	86.2%	11	13.75%	80	100%
FEMALE	26	65.00%	14	35.00%	40	100%
TOTAL	95	79.16%	25	20.84%	120	100%

In total 120 subjects 95(79.16%) patients having high and 25(20.84%) patients having normal serum LDL level

**Table no-6** Distribution of Serum HDL cholesterol in diabetic(T2DM) subjects in the study group (n=120)

GENDER	HDL (mg/dl)					
	Unfavorable(<40)		NORMAL(>40)		TOTAL	
	N	%	N	%	N	%
MALE	62	77.50%	18	22.50%	80	100%
FEMALE	29	72.50%	11	27.50%	40	100%
TOTAL	91	75.80%	29	24.20%	120	100%

In total 120 subjects 91(75.80%) patients having abnormal and 29(24.20%) patients having favorable serum HDL level

## Results

Total 120 Type 2 Diabetic Mellitus patients were selected for study, majority of subjects belong to 35 to 60 years age group and 66.66%(80) of study subjects were males and 33.33% (40) were females. Majority of patients by religion were Hindus (85.8%) and 14.2% were Muslims. The mean value of glycosylated Hb was 7.99%  $\pm$ 1.45, mean value of fasting blood glucose was 196.28 (mg/dl)  $\pm$  60.92 and post-prandial blood glucose (mg/dl) mean value was 263.88  $\pm$ 73.52. In lipid profile the total serum cholesterol mean value was 2.02 $\pm$  0.85, total serum triglyceride mean value was 179.15, total serum ldl mean value was 79.6, total serum hdl mean value was 52.7. In our study group 20.84% (25) of the study subjects have

normal Serum cholesterol and 79.16% (95) have high Serum cholesterol level. In our study group 20.80% (25) of the study subjects have normal Serum triglycerides and 79.20% (95) have high Serum triglycerides level. In our study group 79.16% (95) of the study subjects have high Serum ldl and 20.84% (25) have normal Serum ldl level. In our study group 24.20% (29) of the study subjects have high Serum hdl and 75.80% (91) have low Serum hdl level

## Discussion

Diabetes mellitus is the most important health problem in population worldwide and inspite of advances in treatment. A huge number of patients present with complications owing to poor glycaemic control. According to our results, about more than 70.0% of diabetic (t2dm) patients presented at least one lipid abnormality. The combination of elevated triglyceride and reduced

HDL-cholesterol was the most prevalent of the combined lipid abnormalities, result similar to Stamouli M, Pouliakis A, Mourtzikou A et al. As diabetes mellitus, a multifactorial metabolic abnormality consisting of insulin resistance with compensatory hyperinsulinaemia,. Several studies showed that insulin affects the liver apolipoprotein production and regulates the enzymatic activity of lipoprotein lipase and cholesterol ester transport protein, which causes dyslipidemia in diabetes mellitus. The term diabetic dyslipidemia comprises a triad of raised triglycerides, reduced high density lipoprotein (HDL) and excess of small, dense low density lipoprotein (LDL) particles. In fact, the “low HDL cholesterol” or “hypoalpha” syndrome is the most frequent lipoprotein abnormality in coronary patients Rafael Bitzur, MD, Hofit Cohen et al. High triglyceride levels were seen in 26 % to 64% of the participants, depending on glucose tolerance status. Low HDL-cholesterol levels were seen in all groups (>90%). Significant linear trends were observed for high triglyceride-Cholesterol, high triglyceride and low HDL-cholesterol with increasing glucose intolerance. The relation of various lipid parameters like serum cholesterol, serum triglycerides, serum ldl and serum hdl in t2 diabetes mellitus support the findings of D. S. Kalsi, Jyoti Chopra, and AnchalSood and Aclan Ozder. The lipid abnormalities are prevalent in diabetes mellitus because insulin resistance or deficiency affects key enzymes and pathways in lipid metabolism. It has been proposed that the composition of lipid particles in diabetic dyslipidemia is more atherogenic than other types of dyslipidemia by Aclan Ozder The association between reduced HDL cholesterol levels and increased risk of heart disease is, on the other hand, well established, independently of triglyceride levels and other risk factors He S, Wang S, Chen X et al. Hypertension and dyslipidemia are major risk factors for cardiovascular disease, accounting for the highest morbidity and mortality. In the present study, we aimed to research association between serum lipid

profile and blood glucose, hypothesizing that early detection and treatment of lipid abnormalities can minimize the risk for atherogenic cardiovascular disorder and cerebrovascular accident in patients with type 2 diabetes mellitus.

### Conclusion

The present study suggested that common lipid abnormalities in diabetic dyslipidemia are hypercholesterolemia, hypertriglyceridemia and elevated LDL cholesterol. Present study included 120 subjects of Type 2 Diabetic Mellitus of age group 30 to 70 years. Majority of study subjects belong to 35 to 60 years age group both in case of males and females. Study concluded that out of total study subject having t2dm about more than 70% were abnormal lipid profile. In our study subjects 79.16%(95) have high Serum cholesterol level, 79.20%(95) have high Serum triglycerides level, 79.16%(95) have high Serum ldl and 75.80%(91) have low Serum hdl level. Results suggest a high prevalence of dyslipidemia, which might be playing a major role in the development of cardiovascular diseases and cerebrovascular accidents among diabetic patients. The optimal care for diabetic patients should include routine monitoring of blood glucose and serum lipid profile. Efforts to achieve lifestyle changes, such as weight reduction, physical exercise and smoking cessation should be encouraged and initiated first and then followed by medication with lipid lowering drugs prescribed in evidence-based necessary conditions.

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