

Study on the Status of Lipid Profiles as an Indicator for Complications in Type - 2 Diabetes Mellitus

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Abstract: ***Background:** Diabetes mellitus (DM) is probably one of the oldest diseases known to mankind. Diabetes mellitus (DM) is extremely common representing a significant global health problem. Type -2 DM reduces the quality of life and life expectancy, with a greater risk of heart disease, stroke, peripheral neuropathy, renal diseases, cataracts formation, amputation, and ketoacidosis. **Aim and objective:** This study aimed to assess the biochemical parameters in Type-2 Diabetes mellitus with complications and Type-2 Diabetes mellitus without complications patients and normal healthy individuals (Control Group). **Material and Methods:** A total of 100 patients, 50 - Type-2 Diabetes mellitus with complications 50 without complicated patients from the last 1 year and 50 normal healthy individuals were chosen as a control group. **Results:** The mean values of BSL (F), BSL (PP), TC, TG, and LDL were significantly increased ($P<0.0001$) in complicated type -2 Diabetes mellitus cases as compared to un-complications type-2 Diabetes mellitus. Other mean values of BSL (F), BSL (PP), TC, TG, and LDL were significantly increased ($P<0.0001$) in T - 2 DM without complications as compared to control. Whereas the mean value of HDL was significantly decreased in type -2 Diabetes mellitus with complications as well as in without - complications type-2 Diabetes mellitus patient as compared to control.*

Keywords: Complicated Type-2 Diabetes mellitus, Un-Complicated Type-2 Diabetes mellitus, hyperglycemia, and dyslipidemia.

1. Introduction

Diabetes mellitus (DM) is probably one of the oldest diseases known to mankind. Type 2 DM was first described as a component of metabolic syndrome in 1988¹. Diabetes mellitus (DM) is extremely common representing a significant global health problem. Type-2 DM is a progressive and complex metabolic disorder characterized by chronic hyperglycemia with disturbance in carbohydrate, lipid and protein metabolism².

Type -2 DM leads to reduced quality of life and life expectancy, with a greater risk of heart disease, stroke, peripheral neuropathy, renal diseases, cataracts formation, diabetic foot, and ketoacidosis. Type -2 DM is associated with plasma lipid and lipoprotein abnormalities, in terms of reduced High-Density Lipoprotein (HDL) and raised LDL, Triglycerides, cholesterol³.

Dyslipidemia is commonly seen in Type 2 DM is one of the most common secondary causes of hyperlipidemia. The relationship between hyperlipidemia and vascular complication of diabetes has long been of interest because both tend to occur with greater frequency in Type 2 Diabetes mellitus⁴. Dyslipidemia in diabetic patients and its early

detection and treatment can prevent the progression and minimize the risk of complications⁵.

They have several lipid abnormalities including elevated plasma triglycerides, elevated Low-Density Lipoprotein (LDL) and decreased High-Density Lipoprotein (HDL). Insulin deficiency or insulin resistance diverts carbohydrate away from muscle glycogen storage into hepatic de novo lipogenesis, thus leading to the increase of plasma triglyceride concentration. The most common lipid abnormality noted in diabetics is hypertriglyceridemia⁶.

2. Materials and Methods

The present study was carried out in the Department of Biochemistry and Central Investigation Laboratory in collaboration with the Department of Medicine at TSM Medical College and Hospital, Amausi, Lucknow. The study was approved by the Institutional Ethical and Research Committee to use human subjects in the research study. Informed consent was taken from patient and control subjects. 100 diabetic patients attending the Medicine ward of the Hospital for the last one year have been included in this study. 50 type-2 diabetic patients of both genders with complications and 50 without complications have been evaluated. 50 healthy volunteers' mainly medical staff

members and their families have also been included in this study who served as controls. Patients on statin and aspirin therapy, type-1 DM, suffering from infective, inflammatory, allergic disorders, necrosis, malignancy, with trauma due to surgery, burns, fractures and having the habit of alcohol and smoking and pregnant women were excluded from this study.

Collection of Blood Sample

About 3-5 ml of venous blood was collected in vacutainer using a sterile needle, from the antecubital vein. It was allowed to clot for a few minutes and was subjected to centrifugation for 10 minutes at 3000 rpm to separate the serum and kept at -20°C until analysis was carried out. By this sample estimation of serum fasting blood glucose, serum postprandial blood glucose and serum lipid profiles were done by the following methods. Serum Estimation of Serum Fasting blood glucose, Serum Post Prandial blood glucose was measured by

Method: Glucose Oxidase and Peroxidase (GOD – POD) Method ⁷.

Serum lipid profiles were measured by:

Estimation of Serum Triglycerides ⁸.

Method: Glycerol Peroxidase (GPO) Kinase, Glycerol Oxidase Method.

Estimation of Serum cholesterol ⁹.

Method: Cholesterol Oxidase and Peroxidase (CHOD-POD) method.

Estimation of Serum HDL cholesterol ¹⁰.

Method: Direct Method.

Serum LDL Cholesterol ¹¹.

Method: Direct method.

Statistical analysis:

Data were compiled and analyzed using by t-tests (student t-test) software package. It was expressed as mean ± S.D. (standard deviation).

3. Results

Table 1: Distribution of type – 2 DM with complications, type – 2 DM without – complications Patients and control

Groups	Number of people
Type -2 D.M. With Complications	50
Type -2 D.M. without - complications	50
Controls	50

The subjects were distributed according to age groups as 30 – 50 & 51 – 80 years. Our findings are as follows.

Table 2: Distribution of complicated and uncomplicated DM type – 2 cases and control according to Age and Sex

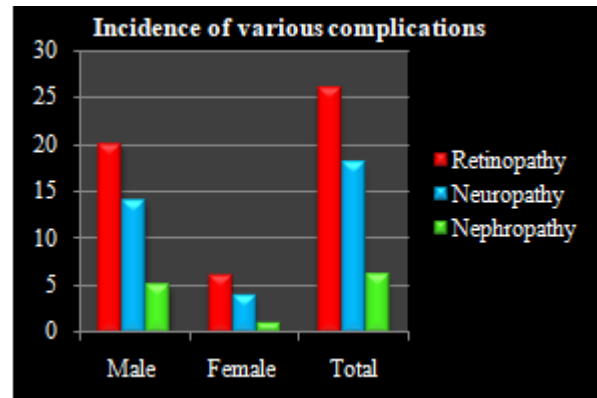
Age Group (in years)	Complicated Type – 2 DM		Un- complicated Type – 2 DM		Control	
	Male	Female	Male	Female	Male	Female
30-50	11	4	20	9	13	7
51- 80	28	7	14	7	20	10

Incidence of Various Complications

The total number of patient’s complication type - 2 diabetes mellitus. It is observed form the study that retinopathy totals 52% (40% male and 12% female), peripheral neuropathy 36% (28% male and 8% female) and nephropathy 12% (10% male and 2% female) were the most common complications.

Table 3: Incidence of various complications in type - 2 diabetes mellitus

Complications	Male	Female	Total
Retinopathy	20 (40%)	6 (12%)	26 (52%)
Neuropathy	14 (28%)	4 (8%)	18 (36%)
Nephropathy	5 (10%)	1 (2%)	6 (12%)



Graph 3: Incidence of various complications in type - 2 diabetes mellitus

Table 4: Biochemical parameters in Type-2 D.M. Un-complications and complications

Parameters	Un - Complications Type-2 D.M. (n= 50) (Mean ± SD)	Complications. Type-2 D.M (n= 50) (Mean ± SD)	Statistical Significant
BSL(F) (mg/dl)	169.44 ± 28.66	243.38 ± 50.12	P<0.0001
BSL (P.P) (mg/dl)	280.62 ± 88.70	374.66 ± 88.66	P<0.0001
T C (mg/dl)	186.32 ± 49.03	219.76 ± 54.59	P<0.001
TG (mg/dl)	164.52 ± 64.08	202.10 ± 79.66	P<0.01
HDL(mg/dl)	51.62 ± 10.12	43.0 ± 8.85	P<0.0001
LDL(mg/dl)	99.22 ± 18.66	113.56 ± 27.94	P<0.006

Table No. 5: Biochemical parameters in complications Type-2 D.M. and control.

Parameters	Complications Type-2 D.M. (n= 50) (Mean ± SD)	Control (n= 50) (Mean ± SD)	Statistical Significant
BSL(F) (mg/dl)	243.38 ± 50.12	91.66 ± 10.77	P<0.0001
BSL (P.P)(mg/dl)	374.66 ± 88.66	137.60 ± 11.55	P<0.0001
T C (mg/dl)	219.76 ± 54.59	132.96 ± 29.10	P<0.0001
T G (mg/dl)	202.10 ± 79.66	133.70 ± 46.22	P<0.0001
HDL(mg/dl)	43.0 ± 8.85	61.25 ± 21.32	P<0.0001
LDL(mg/dl)	113.56 ± 27.94	77.27 ± 30.04	P<0.0001

Table 6: Biochemical parameters in controls and Un – complications Type-2 D.M.

Parameters	Control (n= 50) (Mean ± SD)	Un – Complications Type-2 D.M. (n= 50) (Mean ± SD)	Statistical Significant
BSL(F) (mg/dl)	91.66 ± 10.77	169.44 ± 28.66	P<0.0001
BSL (P.P)(mg/dl)	137.60 ± 11.55	280.62 ± 88.70	P<0.0001
T C (mg/dl)	132.96 ± 29.10	186.32 ± 49.03	P<0.0001

T G (mg/dl)	133.70 ± 46.22	164.52 ± 64.08	P<0.011
HDL(mg/dl)	61.25 ± 21.32	51.62 ± 10.12	P<0.003
LDL(mg/dl)	77.27 ± 30.04	99.22 ± 18.66	P<0.001

P<0.01 Statistical Significant, P<0.001 Highly statistically significant, P<0.0001 extremely statistically significant.

4. Discussion

In this study, there are differences between type- 2 diabetic Mellitus with complications, without- complications and non- diabetic patients in the level of blood glucose. A significant difference was observed (p<0.0001). High levels of blood glucose of diabetic patients due to resistance to insulin, the same results were found¹². Type 2 DM has emerged as one of the most common causes of dyslipidemia vascular complications are believed to be critical for the prognosis of DM and their development, in turn, is believed to depend on several factors such as duration, degree of control, and dyslipidemia in diabetes¹³.

Age and Sex Distribution

I have reported that in the incidence of diabetes is greater in male than females. Our study comprises of 50 type – 2 DM complicated, 50 type – 2 DM Un – complicated cases and 50 controls. Among complicated type – 2 DM, 39 were male (78%), 11 were female (22%), in Un – complicated type – 2 DM, 34 were male (68%), 16 were female (32%). Out of 50 controls, 33 were male (66%) and 17 were female (34%) (14). Various studies correlated with Jain HR, et al. 2016; Utra K.M., et al 2011; Vaishnav *et al.* 1989.

Because of this, I have investigated the biochemical parameters like Table no.(4, 5, 6) BSL (F), BSL (PP), lipid profile (TC, TG, HDL, LDL). I found significantly increased (p<0.0001) BSL (F), (P.P.) level in type – 2 DM with complications, and in without - complications patients as compared to control. Prolonged hyperglycemia in these patients may cause damage to the biomolecules and the biomembranes, thus leading to various diabetes-associated complications. Other workers showed a highly significant increment in the level of BSL (F), (P.P.) level in type – 2 DM with complications, Type-2 DM without- complications as compared to controls. Our study correlated with Kamble PM. et al. (2015)³. significantly increased (p<0.001) BSL level in patients as compared to control.

In our study we observed significantly increased levels of TC, TG, LDL levels and decreased HDL levels in Type-2 DM with complications, Type-2 DM without- complications patients as compared to control. Our result correlated well with finding showed by Jain HR, (2016)¹² their studies have shown that TG, TC, LDL-C, and VLDL-C, the lipid profile are higher significantly in diabetes than and HDL-C was significantly lower in diabetics than control groups. Another study correlated with Kamble PM. et al. (2015)³ observed significantly increased (p<0.001) TC, TG, LDL levels and decreased HDL levels in patients as compared to control. Our result correlated well with finding showed Maharjan BR et al¹⁵. Mathur A. ¹⁶.

Incidence of Various Complications

The incidence of various complications observed in this study is in table No. 3 and Graph 3. It is observed from the

study that retinopathy totals 52% (40% male and 12% female), peripheral neuropathy 36% (28% male and 8% female) and nephropathy 12% (10% male and 2% female) were the most common complications. Our result correlated well with finding showed by Jain HR, et al. (2016)¹². Their studies observed from the study that retinopathy and peripheral neuropathies were the most common complication 52% and 40%, respectively.

5. Conclusion

At last, after this we can conclude that complicated and uncomplicated diabetes mellitus type - 2 cases showed disturbed lipid profile which may be responsible for various and after this observation we can suggest that early lipid profile investigation is a must in diabetes mellitus type – 2 cases. For better diagnosis and prognosis.

Abbreviation:-

T-2 D.M.:- Type-2 Diabetes Mellitus	TG:- Triglycerides.
BSL (F):- Blood Sugar Level (fasting).	TC: - Total Cholesterol.
BSL (PP):- Blood Sugar Level (Post Prandial).	LDL:- Low-Density Lipoprotein. HDL: - High-Density Lipoprotein.

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