

A Study on Lipid Changes in Diabetes Mellitus Patients

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A B S T R A C T

Introduction: Uncontrolled diabetes leads to hyperglycemia or unnaturally elevated blood sugar levels, which over a period of time causes disturbances in the carbohydrate, lipid and protein metabolism and leads to serious complications to the body system. In this study, we attempted to assess the association between the patients lipid profile and diabetes so that early treatment can be started and the morbidity and mortality may be reduced.

Materials and methods: 184 patients between 30 – 75 years who were diagnosed as type 2 diabetics underwent thorough clinical examination. Blood was collected for lipid profile, fasting and post prandial blood sugar levels and hba1c levels.

Results: The mean triglyceride levels among the female patients was 205.36 ± 59.44 , LDL -C, HDL-C, and TC was 146.66 ± 38.31 , 38.29 ± 11.83 and 198.42 ± 32.18 mg/dL respectively, while the same for males was 196.49 ± 32.42 , 133.94 ± 12.32 , 40.21 ± 16.3 and 186.34 ± 28.52 respectively. 76.6% of the patients had high lipid levels as well as high hba1c levels, 12% had high hba1c levels but the lipid levels were mostly within the normal range. 10.3% patients, who were known diabetics had high lipid levels but only 1.1% of them had normal lipid levels.

Conclusion: Dyslipidemia is very common among people with diabetes. It is therefore very important to treat the high lipid levels to prevent adverse effects and complications such as atherosclerosis and CHD.

Keywords: Dyslipidemia, Diabetes Mellitus, hba1c

INTRODUCTION

Diabetes mellitus is seen in patients when the pancreas fails to produce enough insulin, which is a hormone that regulates the blood sugar or when the body is not able to use the insulin effectively. Uncontrolled diabetes leads to hyperglycemia or unnaturally elevated blood sugar levels, which over a period of time causes disturbances in the carbohydrate, lipid and protein metabolism and leads to serious complications to the body system, especially the nervous and the circulatory system.¹

Diabetes mellitus is rapidly growing globally. In 1980 the number of diabetics was 108 million and in 2014, it rose to 422 million worldwide. The prevalence of diabetics was 8.5% in 2014, from 4.7 in 1980 among the people over 18 years of age. The premature mortality due to diabetes also increased between 2000 and 2016 by 5%.² For a long time, India had the highest number of Diabetic patients in the world, but now, China has taken the top spot, putting India into the second place. Around 62 million people in India amounting to 7.2% of the adults are affected by Diabetes mellitus. The mean age of the patients affected is around 42.5 years. Every year around 1 million of the population die due to diabetes and its complications.³

Diabetes mellitus (DM) is classified broadly into Type 1 DM and type 2 DM. Type 1 DM is normally seen in children. It may reappear in adulthood, when the person is 30-40 years

of age.^{4,5} This is most probably due to autoimmunity.⁶ Type 2 DM is the one that is due to low amounts of insulin and results in peripheral insulin resistance.⁷ This leads to excessive amounts of fatty acids in the blood plasma, increased fat breakdown and decreased glucose transport to the muscles. This increases the hepatic glucose production.⁸

The lipid abnormalities that occur in diabetes are called dyslipidemia. These are characterized by high levels of cholesterol and triglyceride levels and low levels of HDL-C. DM is a secondary cause of hyperlipidemia, with poor glycemic control. This combination is a high risk factor for atherosclerosis and coronary heart disease.⁹ Other complications of DM include diabetic nephropathy, which is an end stage of the renal disease, resulting in extensive morbidity and mortality.¹⁰ A meta analysis study states that abnormal levels of cholesterol and triglycerides increase the risk of DM type 2.¹¹

Asians, especially South Asians have a higher risk of developing visceral adiposity. These patients tend to put on weight in the lower half of the body resulting in higher Body Mass Index and larger waist circumference.^{12,13} In this study, we attempted to assess the association between the patients lipid profile and diabetes so that early treatment can be started and the morbidity and mortality may be reduced.

MATERIAL AND METHODS

This was a cross sectional study carried out by the Department

of Medicine at RVM institute of Medical sciences and research Centre over a period of 2 years i.e April 2018 to March 2020 on 184 patients between 30 – 75 years who were diagnosed as type 2 diabetics. This study was cleared by the Institutional Ethical Committee and informed consent was taken from all the patients prior to including them into the study. Patients who were already on anti-lipidemic drugs were excluded from the study.

All the patients underwent a thorough clinical examination and demographic details were collected. They were all asked to come after an overnight fast. 5 ml Blood samples were collected from the left cubital vein for lipid profile, i.e triglycerides, total cholesterol, high density lipoprotein, and very low density lipoprotein level detection by enzymatic method. Low density lipoprotein was calculated by Friedwald's formula. Fasting blood sugar was estimated by GOD POD method. The patients were asked to come after 2 hours for post prandial estimation of sugar levels. Glycosylated hemoglobin was estimated by high pressure liquid chromatography method.

All the patients who had any of the above lipid parameters above the normal range were considered to have dyslipidemia. 24-hour protein was also estimated for all the patients as was urine microalbumin levels, urine albumin creatinine ratio. Serum creatinine was also done for all the patients.

Statistical analysis was done using SPSS software and Microsoft excel. Most of the analysis was done using mean and standard deviation.

RESULTS

Out of the 184 persons, 98 (53.3%) were females and 86 (46.7%) were males (Fig : 1).

The number of patients having dyslipidemia among the 184 people was 166 (90.2%)

The mean triglyceride levels among the female patients was 205.36 ± 59.44 , LDL -C, HDL-C, and TC was $146.66 \pm$

38.31 , 38.29 ± 11.83 and 198.42 ± 32.18 mg/dL respectively, while the same for males was 196.49 ± 32.42 , 133.94 ± 12.32 , 40.21 ± 16.3 and 186.34 ± 28.52 respectively (table : 1).

Most of the persons belonging to the 50-59-year age group had a higher lipid profile compared to the rest of the patients. The TGL, LDL, HDL, VLDL and TC levels were 201.36 ± 41.8 mg/dL, 142.45 ± 42.1 , 38.45 ± 19.4 , 26 ± 9.4 and 198.49 ± 39.3 mg/dL respectively. Between 40-49 years, the same was 175.55 ± 12.4 , 144.33 ± 13.5 , 37.62 ± 11.4 , 31.3 ± 16.41 and 196.62 ± 34.5 mg/dL, for 50-59 years it was 218.43 ± 32.3 , 152.4 ± 39.3 , 39.18 ± 22.69 , 35.44 ± 10.4 and 204.88 ± 27.4 respectively. The least lipid levels were seen in the 70-80 group with 159.33 ± 31.9 , 148.77 ± 31.1 , 37.1 ± 11.8 , 24.1 ± 19.1 and 196.2 ± 24.7 mg/dL respectively (Table : 2)

141 (76.6%) of the patients had high lipid levels as well as poorly controlled diabetes (hba1c levels). 22 (12%) of the patients had abnormal hba1c levels but the lipid levels were mostly within the normal range. 19 (10.3%) patients, were known diabetics had high lipid levels but but only 2 (1.1%) of them had normal lipid levels also (Table: 3).

DISCUSSION

The risk of coronary heart disease among the diabetic patients is 2-3 times higher. Diabetes in association with other risk factors such as hypertension, obesity, dyslipidemia further increases the risk of CHD. Patients with good glycemic control may have post prandial glucose levels in the normal range. On the other hand, those with poor glycemic controls post prandial hyperlipidemia occurs due to inadequate insulin and lipoprotein activity.¹⁴

In the present study, we found a prevalence of 90.2% of diabetic patients with dyslipidemia. A slightly a greater number of males (565) was found in a study by Antwi-Baffour et al.¹⁵ Another study by Bhowmik et al also found 90% increase in triglyceride levels and low HDL levels.¹⁶ A 70% of high glycerides have been reported in South Asian

Lipid	Females Mean \pm SD (mg/dL)	Males Mean \pm SD (mg/dL)
Triglycerides	205.36 \pm 59.44	196.49 \pm 32.42
Low Density Lipoprotein	146.66 \pm 38.31	133.94 \pm 12.32
High Density Lipoprotein	38.29 \pm 11.83	40.21 \pm 16.3
Total Cholesterol	198.42 \pm 32.18	186.34 \pm 28.52

Table-1: lipid levels among the patients

Age	Triglycerides	LDL	HDL	VLDL	Total Chol
30-39 years	201.36 \pm 41.8	142.45 \pm 42.1	38.45 \pm 19.4	26 \pm 9.4	198.49 \pm 39.3
40-49 years	175.55 \pm 12.4	144.33 \pm 13.5	37.62 \pm 11.4	31.3 \pm 16.41	196.62 \pm 34.5
50-59 years	218.43 \pm 32.3	152.4 \pm 39.3	39.18 \pm 22.69	35.44 \pm 10.4	204.88 \pm 27.4
60-69 years	215.93 \pm 29.4	147.74 \pm 19.6	38.21 \pm 17.5	24.61 \pm 8.99	199.63 \pm 19.4
70-80 years	159.33 \pm 31.9	148.77 \pm 31.1	37.1 \pm 11.8	24.1 \pm 19.1	196.2 \pm 24.7

Table-2: Age related lipid levels

	High lipid levels	Normal Lipid Levels
Abnormal hba1c	141 (76.6%)	22 (12%)
Normal hba1c	19 (10.3%)	2 (1.1%)

Table-3: Association of dyslipidemia and Hba1c levels

population by various studies.¹⁷⁻²⁰ Another study by Kolhar and Priyanka reported a 90%. This increase of cholesterol levels may be due to the increased activity of HMG-CoA reductase, present in the intestine.⁹

Females were slightly more at risk than males in our study, although this difference was not found to be significant. In another study by Kolhar and Priyanka, more number of males were affected than females.⁹

Dyslipidemia among the female's patients was markedly higher in females as compared to the males. In a study by Antwi-Baffour et al, higher levels of lipids especially the total cholesterol was found to be higher in females rather than in males.¹⁵ This was attributed to a higher level of E2 sex hormone and their metabolism in females.²¹ A cohort study in Iowa by Wallace et al also observed a higher lipid level among the elderly female population.²² Another study by Frishman et al where they assessed the risk factors of dementia, cerebrovascular and coronary diseases noticed that the lipid levels in females, which were one of the risk factors were higher in females than in males.²³

76.6% of patient who had high hba1c levels also had dyslipidemia, while 12% of the same had normal lipid levels. 10.3% of the diabetics who had controlled hba1c levels had dyslipidemia and only 1.1% of them had normal lipid levels. 97.7% of the poorly controlled persons had dyslipidemia in a study by Kolhar and Priyanka, while 33.3% prevalence was seen in patients with well controlled diabetes.⁹ Studies by other authors also showed similar results.²⁴⁻²⁶

CONCLUSION

We conclude that the incidence of high levels of lipids among the diabetic patients is very high, making these patients at high risk to CHD and its complications. Therefore, identifying these diseases at the earliest and controlling and monitoring it is of utmost importance to reduce the morbidity and mortality.

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