

CORRELATION OF SERUM LEVELS OF LIPID PARAMETERS IN DIABETIC PATIENTS WITH MICROVASCULAR COMPLICATIONS

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Abstract

Introduction: Diabetic mellitus is one of the metabolic-disorders associated with or without micro vascular complications. It is characterised by hyperglycemia due to relative or absolute insulin insufficiency. Uncontrolled diabetes results in the development of microvascular complications like diabetic neuropathy, nephropathy, retinopathy etc. Uncontrolled chronic hyperglycemia also alters the metabolism of lipids, proteins and carbohydrates.

Aim of the study: To find out the relation between the plasma concentration of lipid profile in diabetic patients with or without micro-vascular complications.

Materials and methods: In this comparative study, diabetic patients with micro-vascular complications were included as group I, whereas diabetic patients without micro-vascular complications were included as group II. Serum levels of total cholesterol, triglycerides, low-density lipoprotein, very-low-density lipoprotein and high-density lipoproteins were assessed in both the groups along with the glycaemic status (fasting blood sugar, post prandial blood sugar and glycated haemoglobin). These parameters were compared between both the groups using t-test.

Results: The diabetic patients with microvascular complications have high serum lipid profile levels, except HDL cholesterol (showing low level), when compared with the patients without microvascular complications.

Conclusion: This study confirms that serum lipid profile (except HDL) levels have a positive correlation. Serum HDL cholesterol level has a negative correlation in diabetic patients with microvascular complications when compared to the diabetic patients without microvascular complications.

Keywords: Fasting Lipid Profile, Microvascular complications, Type 2 diabetes. Dyslipidaemia.

INTRODUCTION

Diabetes mellitus is a common heterogeneous metabolic disorder characterized by relative or absolute deficiency of insulin secretion or resistance or both. This metabolic-disorder may be associated with or without micro vascular complications. Diabetes is associated with chronic hyperglycemia, which results in disturbed metabolism of carbohydrates, lipids and proteins. ⁽¹⁾

Diabetes mellitus has different categories - type 1, type 2, maturity-onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and secondary diabetes (endocrinopathies, steroid use, etc). The main subtypes of diabetes are Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM). Type 1 diabetes are seen commonly in children and adolescents, whereas type 2 diabetes affects middle-aged and older adults, who have long standing hyperglycemia due to disorders in the lifestyle and diet. To establish the diagnosis of diabetes, fasting plasma glucose should be more than 125 mg/dL on more than one occasion, OR oral glucose tolerance test with a 2-hour value of more than 200 mg/dL, OR a random plasma glucose of more than 200 mg/dL. However fasting glucose values are more preferred, due to the reproducibility and its correlation with increased risk of microvascular complications. ⁽²⁾

Duration of hyperglycemia results in the dysfunction of various organ like nerves, eyes, kidneys, heart etc. Disorders like obesity, dyslipidemia, insulin resistance, glucose intolerance and hypertension lead to metabolic syndrome, which is responsible for the morbidity of diabetes mellitus. The long-term effects of hyperglycemia results in microvascular complications (diabetic neuropathy, nephropathy, and retinopathy) as well as macrovascular complications (coronary artery disease, stroke, peripheral arterial disease etc). ⁽³⁾

Diabetes mellitus increases the risk of development of many complications, most of which are irreversible due to microvascular or macrovascular changes. Duration of uncontrolled diabetes is an important factor in the pathogenesis of the complications like microangiopathy and macroangiopathy. There are some other risk factors which also influences the pathogenesis, eg. - hypercholesterolaemia, hypertension, cigarette smoking etc. ⁽⁴⁾

Dyslipidaemias are commonly seen in individuals with type 2 diabetes mellitus, even in patients with good glycaemic control. These type 2 diabetes mellitus patients have abnormally elevated levels of total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL), very-low-density lipoprotein cholesterol (VLDL) and decreased levels of high-density lipoproteins (HDL). These dyslipidaemias are considered as atherogenic factors in patients with type 2 diabetes mellitus. ^(5, 6, 7, 8, 9)

Hyperlipidemia is a metabolic abnormality in type 2 diabetes mellitus, which leads to complications like neuropathy, retinopathy nephropathy and cardiovascular diseases. The circulating lipoprotein and apolipoproteins are also connected with pathophysiology of diabetic complications like retinopathy, cardiovascular diseases etc. ^(6,10)

So, this research study is embarked to find out the association between the levels of lipid components in diabetic patients from North Kerala with or without micro-vascular complications, who are attending the outpatient clinics of Govt. Medical College Kozhikode.

MATERIALS AND METHODS

Study setting: Outpatient departments of Medicine, Physical Medicine & Rehabilitation and Biochemistry - Govt. Medical College, Kozhikode, Kerala - a tertiary care hospital.

Study design: cross-sectional study.

Inclusion criteria

- 1) Diabetic patients aged between 20 - 60 years with micro-vascular complications and similar age and gender matched group without microvascular complications.
- 2) Patients who are willing to give valid informed consent.

Exclusion criteria

- 1) Seriously ill patients
- 2) Pregnancy
- 3) Lactating mother

Method:

Diabetes patients in the age group between 20 - 60 years (both genders) with and without microvascular complications coming to the outpatient departments of Medicine and Physical Medicine and Rehabilitation, Govt. Medical College, Kozhikode are included in this study.

Sample size: 180 patients

Study period: 2 years

Study variables:

- 1) Fasting blood sugar
- 2) Post prandial blood sugar
- 3) HbA1C
- 4) Total cholesterol (TC)
- 5) Triglycerides (TG)
- 6) Low-density lipoprotein cholesterol (LDL)
- 7) High-density lipoproteins (HDL).

Details of the patients were collected in the proforma which includes name, age, gender, address, occupation, history of type 2 diabetes (including its duration, treatment, and any co-morbidities). Anthropometric measurements were also taken.

Laboratory investigations

Venous blood samples (5-8 ml) were collected from all diabetic patients in a vacutainer after a fasting for at least 10 hours. Samples were collected between 6 and 8 am and then post prandial blood samples were also taken. The Study variables FBS, PPBS, HbA1c, TC, TG, LDL and HDL were estimated in both groups I and II. Glucose oxidase peroxidase method was used for estimating FBS and PPBS. HbA1c was estimated by high-performance liquid chromatography (HPLC) based on automated analyzer. Total cholesterol, triglycerides, HDL cholesterol, LDL cholesterol were determined using commercially available standard assay kits.

Statistical analysis

Statistical analysis was done with SPSS 18.0

RESULTS

Total patients in this study was 160. Of these, 80 diabetic patients were with microvascular complications of diabetes mellitus and other 80 patients were without microvascular complications. The group I patients were with microvascular complications and group II were without microvascular complications. In the group I, there were 34 males and 46 females. In the group II there were 36 males and 44 females. In our study the mean age of participants in group I was 54 ± 6 years. The mean age group of participants in group II was 51 ± 5 years. The mean fasting blood sugar level in the group I, was found to be 181.32 ± 35.56 and the mean post prandial blood sugar level was 293 ± 25.24 . The mean level of fasting blood sugar level in the group II was 164.68 ± 20.32 and the mean of post prandial blood sugar level was 233 ± 19.26 . Diabetic patients with duration less than 5 years in our study was 60 and those with duration more than 5 years was 100. In group I mean HbA1c level was 8.63 ± 0.74 . In the group II the level was 7.98 ± 0.83 .

In our study the mean serum TC level (mg/dL) in the group I patients with microvascular complications was 196.63 ± 39.23 . In group II patients without microvascular complications the mean value of TC was 151.56 ± 47.89 . In the group I patients with microvascular complications the mean TG level (mg/dL) was 186.12 ± 23.14 , while in the group II patients who were having no microvascular complications, the level was 151.13 ± 47.04 . The mean HDL level (mg/dL) in group I patients was 38.14 ± 11.70 . where as in the group II patients the mean level was 45.56 ± 10.89 . The mean LDL level (mg/dL) in the group I diabetic patients with microvascular complications was 127.63 ± 33.23 . In group II diabetic patients without microvascular complications the mean value

of LDL was 71.56 ± 31.89 .

DISCUSSION

Our study aims to compare the significance of serum lipid profile in diabetic patients with and without microvascular complications. 50% of the patients had diabetes with microvascular complications and the rest were without microvascular complications.

The diabetic patients in the group I in our study were with mean FBS- 181.32 ± 35.56 , and in the group II, mean FBS levels were 164.68 ± 20.32 . A study conducted in 2019 by Li-Kun Wang, et al in type 2 diabetes patients with microvascular complications, mean FBS level was 158.58 mg/dL; whereas in patients without microvascular complications levels was 144.35 mg/dL. ⁽¹¹⁾ The mean FBS level in this study when compared to our study is low.

In our study, 62.5% type 2 diabetic patients had duration of diabetes more than 5 years. Walaa Mohammed Saeed et al in 2023 conducted a similar study where the mean duration of diabetes mellitus was 12.5 ± 5.2 . ⁽¹²⁾ The duration in the above study is slightly more when compared to our study.

In group I the mean HbA1c levels of our study was 8.63 ± 0.74 whereas in the group II the levels were 7.98 ± 0.83 . A study conducted in 2022 by Kazutaka Nozawa et al the mean HbA1c levels was found to be 7.2 ± 1.0 in diabetic patients with microvascular complication while in the diabetic patients without microvascular complication the levels were 6.9 ± 1.1 . ⁽¹³⁾ So, the mean HbA1c levels in this study when compared to our study is found to be low.

In our study the mean value of serum TC levels (mg/dL) in the group I patients were 196.63 ± 39.23 . and in the group II patients the level were 151.56 ± 24.32 . A similar study conducted by Sonalika Behera, et al the mean TC levels was found to be 177.02 ± 25.11 in group I patients, whereas in group II patients the levels were 142.8 ± 48.99 . This study shows a positive correlation of TC, when group I patients are compared to group II. ⁽¹⁴⁾ So, the results of TC levels in our study are comparable with the above-mentioned study.

In the group I diabetic patients, TG levels (mg/dL) were 186.12 ± 23.14 , where as in the group II patients the TG level was 151.13 ± 47.04 , showing a positive correlation. Frank M. Sacks, et al, conducted a similar study, where the mean level of triglycerides was found to have a positive correlation. ⁽¹⁵⁾ So, the results are comparable to our study.

In group I diabetic patients mean HDL levels (mg/dL) was 38.14 ± 11.70 . while in

group II patients the mean level was 45.56 ± 10.89 , showing a negative correlation. A study by Michael B. Adinortey, et al, also shows a similar result with negative correlation of level of HDL in diabetic patients with microvascular complications. So, the results are matching with our study. ⁽¹⁶⁾

In the group I diabetic patients with microvascular complications mean LDL level (mg/dL) was 127.63 ± 33.23 . Diabetic patients in the group II without microvascular complications the mean value of LDL was 71.56 ± 31.89 . A study conducted by Gurpreet kaur gill, et al the mean level of LDL level shows a positive correlation as in our study. ⁽¹⁷⁾

Limitations

1. Single institution-based study
2. Patient size is small

CONCLUSION

This study confirms that serum levels of total cholesterol, triglycerides, low density lipoprotein have a positive correlation, while high density lipoprotein has a negative correlation in diabetic patients with microvascular complications when compared to diabetic patients without microvascular complications.

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Ethical Considerations

In this study group the only invasive procedure done is aspiration of 5 ml blood. No drugs were used in the study.

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Conflict of Interest

Nil

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