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CORRELATION OF HBA1C WITH SERUM LIPID PROFILE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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ABSTRACT:

Introduction: Patients with type 2 diabetes (T2DM) are more likely to have dyslipidemia, increasing their risk of cardiovascular disease (CVD). This study aims to study the association between hemoglobin A1c (HbA1c) and serum lipid profile in T2DM patients.

Materials and Methods: This cross-sectional study was conducted for a period of 3 months. A total of 100 patients with T2DM were included in this study. The whole blood and sera were analyzed for HbA1c, total cholesterol (TC), triglycerides (TGs), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C). Patients were assigned to two groups depending on their glycated hemoglobin values: Group 1 patients with good glycemic control (HbA1c ≤7%). Group 2 patients with poor glycemic control (HbA1c >7%). The statistical analysis was done by SPSS statistical package version 20.0.

Results: 100 type-2 diabetes mellitus patients were included in the study out of which 68 (68%) were males and 32 (32%) were females. Values of TC, TG & LDL-C in Good Glycaemic Control group were significantly lower than Poor Glycaemic Control group. Value of HDL-C in Good Glycaemic Control group was significantly higher than Poor Glycaemic Control group

Conclusion: In our study, Hba1c has a substantial correlation with lipid profiles. Type 2 diabetes patients are more prone to dyslipidemia. Apart from being a valid glycemic index, HbA1c can also be used as a predictor of dyslipidemia, hence early diagnosis of dyslipidemia can be utilized as a preventive approach for the development of CVD in patients with T2DM.

keywords: Cardiovascular diseases, Diabetes mellitus, Dyslipidemia, HbA1c,

INTRODUCTION:

Type 2 diabetes mellitus is a metabolic condition characterized by hyperglycemia caused by insulin resistance and relative insulin insufficiency. [1] The International Diabetes Federation (IDF) estimated that the overall population of diabetics in India would reach 70 million by 2025.[2] Based on current trends, the International Diabetes Federation predicts that 438 million people will have diabetes by 2030.[3]

Diabetes prevalence is increasing at an alarming rate, and it has progressed from epidemic to pandemic.[4] Screening for diabetes can help lessen the burden and consequences of the condition. HbA1c, a long-term glycemic control marker, is commonly used to reflect the average blood glucose level in diabetics, suggesting the likelihood of diabetic complications. The HbA1c diabetes biomarker is useful since it indicates average blood glucose levels over the past few months. [5]

Lipid abnormalities are a major risk factor for developing cardiovascular disease in diabetes.[6] Diabetics have been linked to hypertriglyceridemia, increased blood cholesterol, and elevated levels of LDL lipoproteins.[7] The most prevalent of these disorders is hypertriglyceridemia, which is caused by a faulty triglyceride clearance.[8] The enzymes lipoprotein lipase and hormone sensitive lipase, which are required for lipoprotein clearance, were reported to be less active in Diabetes

mellitus. [9,10] Diabetic management, early screening, and timely prevention of diabetic complications significantly improve disease prognosis and reduce treatment costs.[11]
Our study aimed to estimate the relationship between HbA1c and lipid profile components in T2DM patients.

MATERIALS AND METHODS:

This cross-sectional, observational study was carried out over a three-month period at Warangal hospital and diagnostic centre in Warangal. The study comprised 100 individuals of either sex of age 40 to 75 years who had been diagnosed with type 2 diabetes for at least five years. Exclusion criteria included type 1 diabetes, lipid-lowering medications, familial hypercholesteremic syndromes, chronic renal failure, ischemic heart disease, erythrocyte abnormalities such as hemoglobinopathies, anemia, excessive bleeding, and liver illness. Patients were allocated to two groups based on their glycated hemoglobin levels: Group 1 includes patients with satisfactory glycemic control (HbA1c ≤7%). Group 2 includes patients with poor glycemic control (HbA1c >7%).
All participants provided informed consent. All patients' venous blood samples were taken after at least 10 hours of fasting. 2 mL of whole blood was used to estimate HbA1c, and 3 mL of serum was utilized to measure the lipid profile. Serum total cholesterol was determined using an enzymatic (CHOD-PAP) colorimetric technique.[12] Triglycerides were determined using an enzymatic (GPO-PAP) technique.[13] A precipitant approach was used to quantify HDL cholesterol.[14] LDL cholesterol was calculated using the Friedewald formula.[15] LDL-cholesterol equals total cholesterol minus (HDL cholesterol + triglycerides/5). HbA1c was determined using the turbidimetric inhibition immunoassay technique.[16] HbA1c readings were presented as a percentage of total haemoglobin, while all other parameters were given in mg/dl.
For the serum lipid reference level, the National Cholesterol Education Program Adult Treatment Panel III (NCEP ATP III) guideline was used. These guidelines define hypercholesterolemia as TC larger than 200 mg/dl, high LDL-C as a number greater than 100 mg/dl, hypertriglyceridemia as TG greater than 150 mg/dl, and low HDL-C as a value less than 40 mg/dl. Dyslipidemia was defined as the presence of one or more abnormal serum lipid levels.[17]
The statistical analysis was carried out using SPSS version 20. Results were expressed as percentages and mean ± SD. An unpaired student's t-test was used. Statistically significant variation was considered when the p-value was less than or equal to 0.05.

RESULTS:

100 type-2 diabetes mellitus patients were included in the study out of which 68 (68%) were males and 32 (32%) were females. The mean ± SD of all the patients were shown in Table 1

Table 1: Mean ± S.D values of Type 2 Diabetic patients.

	mean ± SD
Age	52.15 ±9.56
HbA1c	8.24 ±2.12
Total Cholesterol (mg/dl)	186.21 ±42.65
Triglyceride (mg/dl)	132.68±43.65
LDL cholesterol (mg/dl)	112.47 ±40.12
HDL cholesterol (mg/dl)	43.12 ±9.65

Those with HbA1c greater than 7.0% exhibited a significant increase in TC, LDL-C, TG and a significant decrease in HDL-C compared with those with HbA1c up to 7.0% as shown in Table 2

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Table 2 : Correlation of measured parameters with HbA1C

	HbA1c ⩽7% (n=50)	HbA1c > 7% (n=50)	P-value
Age	51.48± 9.76	53.72 ± 10.12	0.32
Total Cholesterol (mg/dl)	179.28 ± 42.92	209.72 ± 54.36	0.002*
Triglyceride (mg/dl)	130.61 ± 51.23	172.27 ± 53,28	0.01*
LDL cholesterol (mg/dl)	107.41 ± 35.53	121.30 ±37.56	0.001*
HDL cholesterol (mg/dl)	41.74 ± 10.78	36.76 ± 9.34	0.02*

*significant

DISCUSSION:

Both lipid profile and DM have been shown to be important predictors of metabolic disturbances, including dyslipidemia, hypertension, CVD, and hyperinsulinemia. [18] People with T2DM have a greater cardiovascular morbidity and mortality rate, and they are disproportionately affected by CVD compared to those without DM. Early diagnosis and treatment of dyslipidemia linked with diabetes may be a step toward lowering CVD risk. [19]

The current study found that increased HbA1c levels were associated with higher lipid profile measures such as TC, TG, and LDL, as well as lower HDL.Several studies have indicated a positive link between HbA1c and lipid profile parameters, including one in Turkey that found a significant correlation between TC, LDL, TG, and HbA1c. [20] According to one study, there is a significant negative correlation between HbA1c and LDL[21] Another study found that HbA1c had no significant connection with lipid profile other than TG.[22]

People with diabetes, including those with T2DM, frequently have abnormal lipid levels. Our findings revealed a strong connection between HbA1c and lipid profile markers. Insulin resistance and uncontrolled blood glucose levels in diabetes individuals result in increased free fatty acid (FFA) production from insulin-resistant fat cells. Increased FFAs stimulate the formation of TGs, which then boosts the release of apolipoprotein B (ApoB) and very LDL (VLDL-C) cholesterol. High blood levels of ApoB and VLDL can both contribute to an increased risk of CVD [23,24,25].

Diabetics frequently have high LDL and triacylglycerol levels and low HDL. The recent study found that diabetics have a higher lipid profile. Our findings indicated a statistically significant positive connection between HbA1c and lipid profile measures. Our findings are comparable with Wexler et al., who discovered a highly positive substantial connection between HbA1c and lipid profiles (TC and LDL) [26]. Other researchers have found a link between HbA1c levels and these lipid profiles in T2DM patients. [27]

CONCLUSION:

In this study, we found a substantial association between HbA1c and several circulating lipid markers. Lipid parameters differed significantly between two HBA1c groups (⩽7.0% and >7.0%). This suggests that, in addition to glycemic management, HbA1c could be utilized as a biomarker to predict dyslipidemia in T2DM patients. As a result, early diagnosis can be performed with very affordable blood tests, which can be used to screen high-risk diabetic patients for timely management with lipid-lowering medications.

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