Original Research Paper

Volume - 11 | Issue - 02 | February - 2021 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Biochemistry

CORRELATION BETWEEN LIPID PROFILE AND HbA1C IN GOOD AND POOR GLYCEMIC CONTROL TYPE 2 DIABETES MELLITUS PATIENTS AT A TERTIARY CARE HOSPITAL.

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ABSTRACT Type 2 diabetes mellitus (T2DM) is a globally acknowledged health issue with its effect on human health, living standards, economy and health system. HbA_1C levels are routinely measured to monitor glycemic control. HbA_1C level <7% is considered good glycemic control and HbA_1C level> 7% is considered poor glycemic control. Previous studies have reported that HbA_1C level can be utilized as a possible biomarker for predicting dyslipidemia and consequent cardiovascular disease in diabetes mellitus patients. The aim of this study is to find the association of lipid profile with HbA_1C in good glycemic control and poor glycemic control T2DM. This is a cross sectional study conducted on 100 patients attending OPD with established diagnosis of T2DM of both sexes with no history of cardiovascular, renal or thyroid disease or history of lipid lowering drug intake. They were analysed for fasting (FBS) and postprandial (PBS) blood sugar, lipid profile and HbA_1C. Patients were classified into poor and good glycemic control groups based on their HbA_1C values. This study showed strong positive correlation between FBS and HbA_1C. Lipid levels were higher in poor glycemic control groups with total cholesterol and low density lipoprotein cholesterol showing significant positive correlation with HbA_1C .Total triglycerides and HDL do not show any significant correlation with HbA_1C.

KEYWORDS : Type 2 diabetes mellitus, dyslipidemia, glycemic control, HbA_1C

INTRODUCTION:

Type 2 diabetes mellitus (T2DM) is a globally acknowledged health issue with its effect on human health, living standards, economy and health system.[1] The International Diabetes Federation(IDF) in 2019, indicate that 463 million adults live with diabetes worldwide and by 2045 this will rise to 700 million and 374 million are at increased risk for type 2 DM.[2] T2DM causes an array of dysfunction characterized by hyperglycemia resulting from combination of insulin resistance and inadequate insulin secretion. One of the common metabolic abnormalities observed in these patients is disturbed lipid metabolism and dyslipidemias. Hence T2DM patients are prone to develop macrovascular (stroke, peripheral vascular disease and coronary artery disease [CAD]) and microvascular (nephropathy, neuropathy and retinopathy) complications.[6] HbA_1C levels are routinely measured to monitor glycemic control in T2DM.[3] HbA_1C <7% is considered good glycemic control and HbA_1C > 7% is considered poor glycemic control.[4] According to NCEP-ATP III guidelines, hypercholesterolemia is Total Cholesterol(TC) > 200 mg/dL, high low density lipoprotein cholesterol (LDL-C) is LDL-C > 100mg/dL, hyper triglyceridemia is triglycerides (TG) > 150 mg/dL and low High density lipoprotein cholesterol (HDL-C) is HDL-C< 40 mg/dL. Dyslipidemia is defined by the presence of one or more abnormal serum lipid concentrations.[5] Previous studies have reported that HbA_1C level can be utilized as a possible biomarker for predicting dyslipidemia and associated cardiovascular disease in diabetes mellitus patients.

MATERIALS AND METHOD:

This study was a cross sectional study conducted on 100 patients of diabetes mellitus who came to diabetic OP in a tertiary care hospital. The patients were classified into two groups depending on their glycated hemoglobin (HbA1c):

- **Good Glycemic Control (GGC) group of 45 cases :** having HbA1c ≤ 7.0%
- **Poor Glycemic Control (PGC) group of 55 cases:** having HbA1c>7.0%

Then fasting blood sugar level was correlated with HbA1C levels and FBS and HbA1C with serum lipid levels.

SAMPLE COLLECTION:

After overnight fast, 5 ml of venous blood was collected in a plain tube and a tube containing EDTA. Serum and plasma were separated by centrifugation at 3000 rpm for 10 mins. Fasting blood glucose and postprandial blood glucose were estimated by Glucose oxidase-peroxidise method in ERBA XL 640 auto analyser. Total cholesterol was estimated by cholesterol oxidase phenol 4-aminoantipyrine peroxidise (CHOP PAP) method, Triglycerides by glycerol phosphate oxidase phenol 4-aminoantipyrine peroxidise (GPO PAP) method and HDL-C by PEG/CHOD-PAP method in ERBA XL 640 auto analyser.

Low density lipoprotein cholesterol (LDL-C) was calculated using Friedewald's equation:

LDL-C = Total cholesterol – (HDL cholesterol + triglycerides/ 5)

HbA_1C was estimated by High performance liquid chromatography in BioRad D 10.

STATISTICAL ANALYSIS :

Statistical analysis was done by IBM SPSS statistics. Mean and SD were used to summarize the continuous variables. Independent sample t test was used to test the significance in differences between parameters for cases and control. Pearson's correlation coefficient was used to check the linear relation between parameters. P value < 0.05 was considered statistically significant.

RESULT:

Table 1 shows that the mean values of FBS, HbA_1C, TC and LDL-C was higher in poor glycemic control group compared to good glycemic control group and was statistically significant. It also shows that TGL level was not much higher in poor glycemic control group and HDL-C level did not show any statistical significance.

Table 1: Parameters categorized by patient's glycemic control (using HbA1c)

Variable	Good Glycemic Control (HbA1C ≤ 7)		Poor Glycemic Control (HbA1c>7)		P value
	Mean	SD	Mean	SD	
Age	56.22	8.96	58.62	9.95	0.21
FBS	117.62	19.01	158.24	36.56	<0.001
HbA1C	6.66	0.30	8.90	1.61	<0.001
TC	181.69	23.69	217.65	28.61	<0.001
TGL	152.53	19.43	192.35	49.39	<0.001
LDL-C	100.80	20.99	130.99	29.48	<0.001
HDL-C	50.38	6.23	48.20	6.64	0.09

Table 2: Correlation between FBS and HbA1C values

Variables compared	Pearson's correlation coefficient (r)	Strength of correlation	Significance (P value)
HbA1C vs FBS	0.706	Strong positive	Highly Significant (<0.001)

Table 1 and Table 2 show that HbA1C has significant positive correlation with FBS, and both FBS and HbA1C were higher in poor glycemic control group.

Table 3: Correlation of HbA1C levels with serum lipid levels in patients with diabetes

Variables compared	Pearson's correlation coefficient (r)	Strength of correlation	Significance (P value)
HbA1C vs TC	0.384	Moderate positive	Highly Significant (<0.001)
HbA1C vs LDL	0.302	Moderate positive	Highly Significant (<0.001)
HbA1C vs TGL	0.345	Mild positive	Significant (0.020)
HbA1C vs HDL	0.030	Negligible	Non-Significant (0.77)

Table 3 shows that HbA1C has significant positive correlation with TC and LDL-C whereas TGL and HDL-C did not show any significant correlation.

DISCUSSION:

In this study, patients in good glycemic control had FBS level 117.62 ± 19.01mg/dl and HbA_1C level of 6.66 ± 0.30% . Patients in poorly controlled group had FBS level 158.24 ±36.56 mg/dl and HbA_1C level 8.90± 1.61%. This increase in HbA_1C level in these patients was significant ($P < 0.001$). This shows that the level of HbA_1C in diabetic patients is linearly correlated with the abnormal blood glucose level. These findings were consistent with that of Paulsen et al.[7] and Mahesh Dave et al.[8] , whereas Nabarro et al.[9] found no satisfactory correlation between HbA_1C and FBS . Also this study shows that HbA_1C is positively correlated with TC and LDL-C, which is consistent with the results of Maleva Sharma et al.[10] and Nikkila et al.[11] The increase in cholesterol level appears to be due to increased cholesterol synthesis during poor or no control of hyperglycaemic state, which returns to normal or near normal after good control of their diabetic state. Obesity is an additional cause of enhanced cholesterol production. Other parameters like TG and HDL-C did not have any significant association with HbA_1C. This result was consistent with the study by Mahesh Dave et al.[8] but did not match with those of Alzahrani et al[3] and Lopes-Virella et al[12].

CONCLUSION:

Hence we conclude that HbA1C level shows strong correlation with lipid parameters like serum cholesterol, LDL-C as compared to FBS. Therefore, the use of elevated HbA1c as a marker of dyslipidemias in our population can be undertaken with caution. HbA1c may be utilized for screening diabetic patients for risk of cardiovascular events and also for timely intervention with lipid lowering drugs.

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