

# Correlation between Glycated Haemoglobin Values and the Lipid Profile in Type 2 Diabetic Patients

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## ABSTRACT

**Background:** To investigate the relationship between glycated haemoglobin (HbA1c) and the lipid profile in patients of type-2 diabetes.

**Methods:** The study has been conducted on 32 patients of type 2 diabetes. These are patients diagnosed with Type 2 diabetes of age group between 30 and 70 years. Blood samples were collected after 12 hours of fasting where blood samples were drawn before and after a meal from the patients to measure levels of the sugar and lipids. Various biochemical assays were carried out including fasting plasma glucose (FPG), PPBG, HbA1c and lipid profile, along with the patient's age, and gender. The method that has been used for doing these investigations is Kit Spinreact.

**Results:** The study found that the participants have an increase in FBG, PPBG, HbA1C, TC, TG, VLDL-C and LDL-C, with a decrease in HDL-C concentrations in type 2 diabetic patients. The result showed a correlation of HbA1c with other variables. The HbA1c significantly correlated with FBG ( $r=0.531$ ,  $P=0.000$ ), PPBG ( $r=0.699$ ,  $P=0.000$ ), Total Cholesterol ( $r=0.339$ ,  $P=0.006$ ), Triglycerides ( $r=0.357$ ,  $P=0.004$ ), Low-density Lipoprotein ( $r=0.269$ ,  $P=0.031$ ) and Very low-density Lipoprotein ( $r=0.364$ ,  $P=0.003$ ) where it was not correlated with HDL ( $r=-0.182$ ,  $P=0.149$ ).

**Conclusion:** The HbA1c was significantly associated with all variables (lipid profile) except HDL which did not reach the significant level. These findings suggest that HbA1c level can be used as a good parameter for predicting the lipid profile of type 2 diabetic patients.

**Keywords:** Type 2 diabetes; Glycated haemoglobin (HbA1c); Lipid profile; Glycemic control

## REVIEW

Type 2 diabetes patients are prone to diabetic dyslipidemia, which leads to the risk of developing macrovascular (peripheral vascular disease, stroke, and coronary artery disease) and microvascular (retinopathy, neuropathy, and nephropathy) diseases. The results of this study showed an increase in FBG, PPBG, HbA1C, TC, TG, VLDL-C and LDL-C, with a decrease in HDL-C concentrations in type 2 diabetic patients. This clearly shows that diabetic patients, irrespective of the sex, were exposed to increased oxidative stress via lipid peroxidation [1]. The other researchers have also reported elevated lipid peroxidation products in blood samples of type 1 and 2 diabetic patients. Furthermore, the researcher observed a slight increase in FBG, PPBG, HbA1C, TC, and LDL-C within females compared with males. It was also found that the increase within males in TG and VLDL is less than females. The study also showed the mean value of HDL was slightly higher in males in comparison

to female's patients but the differences were not reached to statistical significance  $p \geq 0.05$ . Again, a few other studies have reported similar results [2,3]. One of the reasons for the gender difference in lipid parameters could be the influence of sex hormones on the distribution of body fat that causes altered lipoprotein levels [4]. Also, one explanation for the increase in serum cholesterol and LDL-C in diabetic females might be an absence of a protective effect of estrogen in type 2 diabetic females [5].

HbA1c levels could be used as a possible biomarker for recognizing T2DM patients at risk of CVD and could be used as a biomarker for treating patients [3,6]. The study showed a correlation between haemoglobin A1c and serum lipid profile in patients with type 2 diabetes. The present study found a significant positive correlation between HbA1c and TC, LDL. The results of the present study are consistent with another study. Meenu J, et al. [7], is reporting a significant relationship between HbA1c and TC, LDL parameters.

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Also, these results are consistent with the results of many other studies reported a significant relationship between HbA1c and (TC and LDL).

Our results display a significant positive correlation between HbA1c and TG. A similar correlation has been reported by some other studies, found a positive relationship between HbA1c and high TG levels, in agreement with the present study. In type 2 diabetes, insulin resistance is considered the cause of dyslipidemia. The due reason for the increase of TG levels in T2DM patients is an inadequate secretion or function of insulin that causes the increased hepatic secretion of very low-density lipoprotein (VLDL) along with the late removal of TG-rich lipoproteins, mainly due to an increase of substrate levels for TG synthesis. This study and the others referred to above indicate that HbA1c is a direct indicator of increased TG and indirectly helps in assessing the risk for macro- and microvascular problems [6]. Furthermore, our results show a statistically non-significant negative link between HbA1c and HDL. This is in agreement with the results of a few other studies. However, it is inconsistent with several studies that reported a negative relationship between HbA1c and HDL. Our results could be explained by the fact that in the females group, there were significantly higher levels of FBG and HbA1c compared to the males group. Moreover, the sample size of this study is small.

It has been reported that HbA1c is not only a dependable glycemic index but also a forecaster of dyslipidemia. Each 1% change in HbA1c values above the normal level shows a difference of approximately 35 mg/dl in the mean blood glucose level, and importantly 1% reduction in the HbA1c level lowering the 40% risk of microvascular complications. Nevertheless, the literature indicates the positive effects of enhanced lifestyle modifications in improving glycemic control and dyslipidemia.

## CONCLUSION

In this study, there is a significant correlation between glycated haemoglobin and variables (lipid profile) except HDL which did not reach the level of significance associated with type 2 diabetic patients. This indication helps to diagnose lipid abnormalities in patients with poor glycemic control and prevent risk cardiovascular.

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