

Original Research Article

## Impact of Glycated Hemoglobin on Serum Triglycerides in Type 2 Diabetes Mellitus

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**Abstract:** Diabetic patients have increased risk of dyslipidemia compared to normal subjects. This increased risk is attributable to the poor glycemic control in diabetic patients. Increased levels of triglycerides are associated with an increased risk of cardiovascular disease. We conducted a study on 140 diabetic patients who attended outpatient and inpatient department of Shri B. M. Patil Medical College, Vijayapura, between January 2015 till June 2016. We found that 76 % of the patients had BMI above normal range. Glycated hemoglobin was above 7 in 78% of the patients. 60 % of the patients had serum triglycerides levels above normal range. Mean Glycated hemoglobin of diabetic patients in our study was  $8.5 \pm 2.1$ , mean levels of triglycerides was  $171.3 \pm 77.0$  (Pearson's Coefficient Value of 0.243 with p-value of  $<0.001$ ). Our study has demonstrated the positive association of serum levels of glycated hemoglobin and serum levels of triglycerides. Higher the glycated hemoglobin levels, more the levels of serum triglycerides.

**Keywords:** Type 2 Diabetes Mellitus, Dyslipidemia, Poor Glycemic Control, High Triglycerides, Hypertriglyceridemia, Cardiovascular Disease, Glycated Hemoglobin, HbA1c

### INTRODUCTION

Diabetic patients have increased risk of dyslipidemia compared to normal subjects and this risk owes them to have increased risk for coronary artery disease [1, 2]. This increased risk is attributable to the poor glycemic control in diabetic patients [3, 4].

The risk of complications is greatly reduced with intensive therapy for control of blood sugars [5, 6]. Long term control of blood sugars is essential for achieving low risk in diabetic patients; hence glycated hemoglobin serves as an indicator for glycemic control in such patients [7]. Increased levels of triglycerides are associated with an increased risk of cardiovascular disease. An association of high triglycerides with pancreatitis has also been demonstrated [8]. A lipid lowering therapy is beneficial to minimize the cardiovascular risk in diabetic patients [9]. Severity and complications of cardiovascular disease were notably elevated in diabetics and showed a significant association with HbA1c [10].

### MATERIAL AND METHODS

This cross sectional study is conducted in the Department of Medicine, BLDE university's Shri B. M. Patil medical college and research centre, Vijayapur from January 2015 till June 2016 amongst the patients with type 2 diabetes mellitus who attended outpatient department and inpatient department. The patients fulfilling the inclusion criteria were explained about the nature of the study. Those who consented for participation were enrolled in the study after obtaining written informed consent. A total of 140 patients with type 2 diabetes mellitus were selected for the current study.

### Inclusion Criteria

- All type 2 diabetic patients with age in between 20 to 80 years attending Diabetic Clinic, OPD and admitted in IPD of Shri B. M. Patil Medical College, Hospital and Research Centre, Vijayapur

### Exclusion Criteria

- Pregnancy
- Lactation
- Use of drugs affecting lipid profile
- Use of drugs affecting calcium and bone metabolism
- Chronic disorders of liver and kidney
- Disorders of thyroid or parathyroid gland
- Use of anticonvulsive drugs
- Vitamin D/ Calcium supplementation

### Method of collection of data

Preliminary data of the patient is noted like name, age, sex, inpatient registration number, occupation, address, date of admission. Patient is enquired for present illness. And history of type 2 diabetes mellitus is noted for duration of disease, diet, medication, exercise. History regarding other existing comorbid conditions is enquired. General Physical examination is done. Vitals are noted. BMI is calculated using height and weight of the patient. Height is measured to nearest 0.5 cm, and weight is measured to nearest 0.1kg using standard equipments. A thorough systemic examination is done. These findings were recorded in preexisting proforma designed for the present study. The patients were subjected to following blood investigations after overnight fasting,

- Complete blood count
- FBS, PPBS, HbA<sup>1</sup>C
- Fasting Lipid profile
- Renal Function tests
- Statistical analysis was done using following methods,
- Mean  $\pm$  SD
- Chi Square test
- Pearson's coefficient test

### RESULTS

A total of 140 patients were analyzed for this study, 67 male patients and 73 female patients. Most of the patients belonged to age group less than 70 years of age (87.2%). Only 5 % of the patients were solely on insulin therapy and rest of them had oral hypoglycemic drugs as a part of their treatment. Nearly half of the patients (47%) had duration of diabetes mellitus less than 5 years. 76 % of the patients had BMI above normal range. Glycemic control was inadequate in nearly 32% of the patients. Glycated hemoglobin was above 7 in 78% of the patients. 60 % of the patients had serum triglycerides levels above normal range. Serum total cholesterol was found to be high in only 33% of the patients.

Mean Glycated hemoglobin of diabetic patients in our study was  $8.5 \pm 2.1$ , mean levels of triglycerides was  $171.3 \pm 77.0$ . These values were significant with Pearson's Coefficient value of 0.243 with p value of  $<0.001$

### DISCUSSION

Variation of glycated hemoglobin is associated with increased risk of cardiovascular disease mediating through its association with increased insulin resistance [11, 12]. Hence, presence of high levels of insulin resistance in these patients with high glycated hemoglobin can be considered to have high risk of developing cardiovascular disease. Moreover high blood sugar levels are associated with inflammation, endothelial dysfunction [13], and oxidative stress [14]. Thus, greater fluctuations in HbA1c may increase the production of reactive oxygen species especially prostaglandin F2a, supporting the theory that patients with greater variations in HbA1c are at increased risk of cardiovascular diseases [15, 16].

### Limitations

This study has demonstrated the association between glycated hemoglobin and serum levels of triglycerides. However large sample size is needed to demonstrate a better result. Further research is required in this direction to understand the impact of this association and prevent the possible cardiovascular mortality and morbidity.

### CONCLUSION

Our study has demonstrated the positive association of serum levels of glycated hemoglobin and serum levels of triglycerides. Higher the glycated hemoglobin levels, more the levels of serum triglycerides. Increased cardiovascular risk was associated with high levels of serum triglycerides.

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