

Study of Lipid Profile and Glycated Haemoglobin Level in Type 2 Diabetic Complications

Gunjan Kumar Mandal¹, Pankaj Kumar Jha²

ABSTRACT

Introduction: For predicting complications of Diabetes Mellitus (DM), HbA1c concentration is the most important risk factor. Maintaining HbA1c level below 6.5% is critical to decrease the incidence of diabetic complications and derangement of lipid profile in patients with chronic diabetic complications. The aim of this study was to see the level of HbA1c and lipid profile in patients with diabetic complications and compare with patients without complications.

Material and Methods: This study includes 20 patients with type 2 DM as control and 80 diabetic patients with complications like retinopathy, hypertension and neuropathy as subject.

Results: In our study HbA1c level was found higher in diabetic patients with chronic complications when compared with patients without complications. Also lipid profile was found deranged in complicated patients in comparison to control group.

Conclusion: HbA1c level should be maintained in normal range in diabetic patients to prevent complications in long term. It can also help to control derangement of lipid profile in diabetic patients.

Keywords: HbA1c, lipid profile, diabetic complication.

INTRODUCTION

DM is a chronic metabolic disorder in which blood glucose level increases. This increase in blood sugar level increases the risk of both micro and macrovascular diabetic complications.

If blood sugar level is persistently increased, then it raises the long term risk of vascular complications like coronary heart disease, heart attack, heart failure, stroke, kidney failure, neuropathy and blindness.¹

To identify average plasma glucose concentration in prolonged period of time, glycated haemoglobin is primarily used. It is formed by exposure of haemoglobin to high plasma glucose level by a non-enzymatic pathway.² HbA1c reflects the previous 8-10 weeks average plasma glucose level. By proving direct relationship between development and progression of chronic diabetic complications and mean blood glucose level, importance of monitoring glycemia has been established.³ In patients with DM, measurement of glycated haemoglobin is one of the most important way of monitoring glycemic control.⁴

If HbA1c level is $\geq 6.5\%$, it can be used for diagnosis of DM. It is recommended by a report published in 2009 by an international expert committee.⁵ HbA1c can be used as an objective measure of glycemic control. A valid relationship between HbA1c and average glucose level across the range of diabetic types and patients population is well established.⁶

Diabetic retinopathy (DR) is affecting 80% of diabetic patients over 20 years and it is also one of the most common microvascular complications. In developed countries, it is one of the major cause of blindness among working age groups.⁷

The progression of retinopathy, proliferative retinopathy and development of macular oedema are associated with atherogenic lipoproteins like total cholesterol, LDL cholesterol, oxidised LDL and triglycerides.⁸ The cholesterol is related to all levels of retinopathy and the triglycerides are associated with moderately severe non-proliferative and proliferative retinopathy is shown by finding of the EURO DIABIDDM complications study group.⁹

Different parts of the nervous system is affected by diabetic peripheral neuropathies (DPN) and it presented with diverse clinical manifestations.¹⁰ It affects nearly 50% of diabetic patients.¹¹ In a study done by Yacoub G. Babou, DPN was found in 61 patients with HbA1c > 8 compared with 49 patients with HbA1c < 8 thus showing a clear role of diabetic control in the occurrence of DPN.¹²

Diabetics are prone to develop hypertension (HTN) twice than normoglycemic individuals and so, approximately 70% of diabetics are hypertensive. The risk of developing diabetic complications is decreased by 12%, myocardial infarction by 11%, microvascular complications by 13% and mortality by 15%, by decreasing the mean systolic blood pressure by 10 mmHg.¹³ The aim of this study was to see the level of HbA1c and lipid profile in patients with diabetic complications and compare with patients without complications.

MATERIAL AND METHODS

This study was done in the department of Biochemistry at Prasad Institute of medical sciences, Lucknow. In this study, 100 patients with type 2 diabetes was selected. Out of which 20 patients without complications was taken as control and 20 diabetic patients were with DR, 30 patients were with DPN and 30 patients were with HTN. On the basis of history, clinical examinations and related investigations, complications were diagnosed by clinicians. HbA1c level and lipid profile were compared in diabetic patients with complications as subjects and patients without complications as control.

Inclusion criteria

- 80 Patients with type 2 diabetic complications like retinopathy, neuropathy and hypertension
- 20 patients with type 2 diabetes mellitus without complications.

Exclusion criteria

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- Patients with thyroid disorder
- Pregnancy
- Diabetic nephropathy
- Patients with chronic illness.
- Patients with Type-1 diabetes mellitus
- Patients on hormone replacement therapy
- Patients on steroids

Sample collection

Fasting blood samples were collected for estimations of lipid profile and HbA1c. Total cholesterol (TC) was measured by cholesterol oxidase, triglyceride (TGL) by glycerol oxidase-peroxidase, HDL by enzymatic assay and LDL and VLDL by friedewald’s calculation method. HbA1c was estimated by immunoturbidimetric method, using commercially available kits on the same day of collection.

STATISTICAL ANALYSIS

SPSS 20 software were used for statistical analysis and datas were expressed as the mean and standard deviation. For the analyzing statistical significance ($p < 0.05$), the student’s t-test was used. The (*) represents less significant ($p < 0.05$), (**) significant ($p < 0.01$) and (***) highly significant ($p < 0.001$).

RESULTS

In this study, we compared the level of HbA1c and lipid profile in patients with diabetic complications and patients without complications.

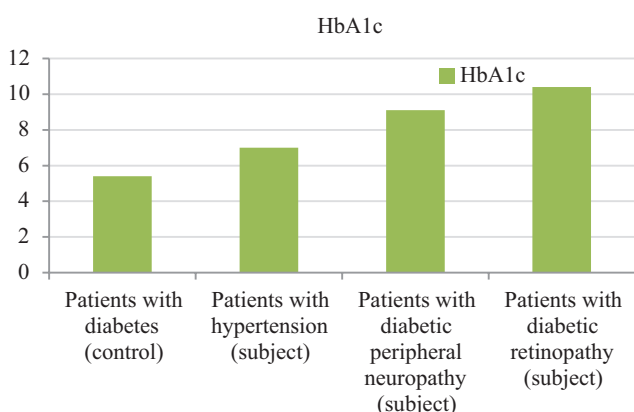


Figure-1: Mean values of HbA1c level in diabetic complications with respect to control.

In our study, HbA1c level in control was 5.4 ± 0.7 and in patients with HTN was 7.0 ± 0.7 , in patients with DPN was 9.1 ± 2.7 and in patients with DR was 10.4 ± 2.3 . (Figure 1 and Table 1)

The TC level in control was 162.0 ± 7.2 and in patients with HTN was 221.3 ± 45.4 , in patients with DPN was 222.4 ± 30.5 and in patients with DR was 231.8 ± 52.6 . The TGL level in control was 122.4 ± 17.2 and in patients with HTN was 182.5 ± 51.3 , in patients with DPN was 175.8 ± 48.5 and in patients with DR was 194.9 ± 94.3 . The HDL level in control was 40.8 ± 6.9 and in patients with HTN was 41.4 ± 9.7 , in patients with DPN was 45.1 ± 12.9 and in patients with DR was 41.6 ± 9.1 . The LDL level in control was 96.72 ± 27.4 and in patients with HTN was 143.4 ± 24.9 , in patients with DPN was 142.14 ± 10.2 and in patients with DR was 151.2 ± 27.6 . The VLDL level in control was 24.48 ± 6.3 and in patients with HTN was 36.5 ± 15.6 , in patients with DPN was 35.16 ± 4.3 and in DR was 38.98 ± 15.3 . (Figure 2 and Table 2)

DISCUSSION

Various microvascular complications occurs due to diabetes such as retinopathy, neuropathy, cardiovascular disease and nephropathy. We evaluate lipid profile and HbA1c level in diabetic complications. Our study showed that a significant increase in lipid profile and HbA1c level in the study group when compared to control group.

- Patients with diabetes (control)
- Patients with hypertension (subject)
- Patients with diabetic peripheral neuropathy (subject)
- Patients with diabetic retinopathy (subject)

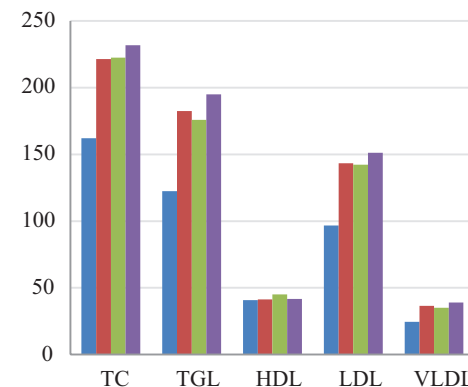


Figure-2: Mean values of lipid profile in diabetic complications with respect to control.

Parameter	Patients with diabetes (control)	Patients with hypertension (Subject)	Patients with diabetic peripheral neuropathy (Subject)	Patients with diabetic retinopathy (Subject)
HbA1c	5.4 ± 0.7	7.0 ± 0.7	9.1 ± 2.7	10.4 ± 2.3

Table-1: Mean values of HbA1c level in diabetic complications with respect to control.

Parameter	Patients with diabetes (control)	Patients with hypertension (Subject)	Patients with diabetic peripheral neuropathy (Subject)	Patients with diabetic retinopathy (Subject)
TC	162.0 ± 7.2	221.3 ± 45.4	222.4 ± 30.5	231.8 ± 52.6
TGL	122.4 ± 17.2	182.5 ± 51.3	175.8 ± 48.5	194.9 ± 94.3
HDL	40.8 ± 6.9	41.4 ± 9.7	45.1 ± 12.9	41.6 ± 9.1
LDL	96.72 ± 27.4	143.4 ± 24.9	142.14 ± 10.2	151.2 ± 27.6
VLDL	24.48 ± 6.3	36.5 ± 15.6	35.16 ± 4.3	38.98 ± 15.3

Table-2: Mean values of lipid profile in diabetic complications with respect to control.

In study of Asha Khubchandani et al. it was found that HbA1c levels measured in 60 diabetic patients were higher than in normal healthy controls. It was more in diabetic complications than without any complication. This study have shown that there is positive correlation between HbA1c with fasting blood glucose level. HbA1c increases the risk for development of microangiopathy and macroangiopathy in diabetics.¹⁴ In a study of Ishrat Kareem et al., it was found that the mean HbA1c levels in diabetic with retinopathy were higher than in diabetes without retinopathy and it was statistically significant ($p < 0.001$).¹⁵

Dornan et al (1982) study shows that there is an association between LDL cholesterol with diabetic retinopathy. Study done by Ucguna et al showed that Total cholesterol (TC) and LDL are increased in patients with macular edema and hard exudates.¹⁶ The progression to proliferative retinopathy was also shown to be related to serum triglyceride and LDL.⁹ Also several studies have shown that there was a positive correlation between elevated serum lipids (TG, LDL, TC) and macrovascular complications like ischemic heart disease.¹⁶ Study of Mohammed Salman et al. shows that there is a positive association between HTN and abnormal lipid profile in rural population of Bagulkot in karnataka.¹³

CONCLUSION

In this study we found that HbA1c level were significantly higher in patients with chronic diabetic complications with respect to patients without complications. Also lipid profile was significantly deranged in group of patients having diabetic complications. Therefore proper glycemic control should be maintained by maintaining HbA1c level less than 6.5% to prevent chronic diabetic complications and derangement of lipid profile in patients with diabetic complications.

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