A Study on Hba1c Values and Its Relation with Lipid Profile in Type 2 Diabetes Mellitus

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Abstract: There are studies recognising a positive correlation between HbA1c level and lipid profile in patients of type 2 diabetes mellitus. This study is taken up to identify the same in southern Chennai population attending Sree Balaji Medical College and Hospital. To study the level of HbA1c in type 2 diabetes mellitus and evaluate their relationship with lipid profile level, a total of 100 type 2 diabetes mellitus patients within aged group 30-75 years were enrolled in the study after taking written consent. HbA1c and lipid profile were measured by standard procedures. Data collected was analysed using SPSS software. Result shows that there is significant positive relation between HbA1c level with cholesterol, triglycerides, LDL and negative correlation with HDL. It was concluded from the findings that HbA1c level can be used as a parameter for predicting dyslipidemia in diabetic patients.
Keywords: Type 2 DM, HbA1c, dyslipidemia, CVD.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder that occurs as a result of a complex interaction of genetic, environmental factors, and lifestyle choices. It is characterized by elevated glucose and HbA1c level, frequently associated with impaired lipid metabolism and its complication[1, 2]. It is a global endemic with rapidly increasing prevalence in both developing and developed countries. The recent statistics showed 424.9 million adults between age of 20 to 79 years, have DM worldwide, and the number is expected to increase up to 628.6 million by 2045[3]. About 79% of people with the disease live in low and middle income countries[3].

WHO has declared India as diabetic capital of the world[4]. DM is a metabolic disorder that has a long-term impact on different body systems, contributing to the huge burden of morbidity associated with it.

Cardiovascular disease (CVD) is one of the major complications of DM. CVD in DM has two to four folds higher mortality than in non DM[5]. DM is an independent risk factor for CVD and it increases the effects of other common risk factors such as smoking, hypertension and dyslipidemia[6].

Glycated hemoglobin (HbA1c) is routinely used as a diagnostic tool for measuring long term glycemic control [7]. In accordance with its function as an indicator for mean blood glucose level, HbA1c predicts the risk for the development of diabetic complication in diabetic patients. Estimated risk of cardiovascular diseases has shown to be increased by 18% for each 1% increase in absolute HbA1c value in diabetic[8].

MATERIALS AND METHODS

A total of 100 non obese patients of type2 DM reporting to Medicine OPD, Sree Balaji Medical College and Hospital, Chromepet, Chennai meeting the following criteria were enrolled in the study.

After obtaining informed consent from patient, a detail history was taken followed by laboratory investigation as under:
- Estimation of HbA1c by immuno-turbidimetry
- Estimation of serum TC by cholesterol oxidase peroxidase method
- Estimation of serum TG by enzymatic method (glycerol phosphate oxidase-phenol aminoantipyrine method)
- Estimation of serum HDL by cholesterol oxidase-phenol aminoantipyrine method)
- Estimation of serum LDL by Friedewald formula

The data was entered in SPSS software, where mean, standard deviation, correlation coefficient and percentage were calculated and results were obtained

RESULTS

The mean and standard deviation of age, HbA1c, Total Cholesterol, Triglycerides, HDL and calculated LDL are given in table 1. According to NCEP- ATPIII guideline, hypercholesterolemia is when TC>200 mg/dl, high LDL-C when value >100 mg/dl, hypertriglyceridemia as TAG >150 mg/dl, and low HDL-C when value <40 mg/dl.

Table-1: Mean ± SD of HbA1c & lipid profile of type 2 diabetes

Variables	Mean ± SD
HbA1c (in %)	7.85 ± 1.43
HDL (in mg/dl)	38.51 ± 6.04
Triglyceride (in mg/dl)	183.66 ± 82.24
LDL (in mg/dl)	130.74 ± 37.99
Total Cholesterol (in mg/dl)	205.98 ± 47.24
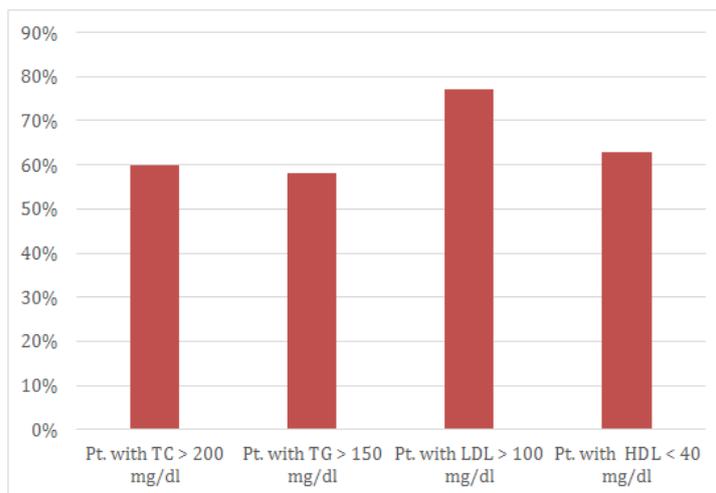
Fig-1: Bar diagram showing percentage of patients with abnormal values of lipid profile

Table-2: Pairwise correlation table

	HbA1c	*HDL*	*TG*	*LDL*
HbA1c	-			
HDL	-0.216[*]	-		
TG	0.360[**]	-0.753[**]	-	
LDL	0.234[*]	-0.807[**]	0.801[**]	-
TC	0.286[**]	-0.783[**]	0.896[**]	0.980[**]

*. Correlation is significant at the 0.05 level (p-value).
**. Correlation is significant at the 0.01 level (p-value).

In the study, it was found that HbA1c level has significant positive correlation with total cholesterol (p-value < 0.01), triglyceride (p-value < 0.01) and LDL (p-value <0.05). And HbA1c level has negative correlation with HDL level with p-value significance of <0.05.

DISCUSSION

From this study we observed that type 2 diabetic patients have hypercholesterolemia, hypertriglyceridemia, high LDL, low HDL levels which are well known risk factors for cardiovascular diseases. Goldberg reported that the cause of dyslipidemia in type 2 diabetes mellitus may be that insulin is not working properly which affects the liver apolipoprotein production[9].

Goldberg proposed that several factors are likely to be responsible for diabetic dyslipidemia such as insulin effects on liver apoprotein production, regulation of lipoprotein lipase (LpL), actions of cholesteryl ester transfer protein (CETP), and peripheral actions of insulin on adipose and muscle[10].

Increased inflammatory state in DM results in formation of dysfunctional HDL which acts as a proatherogenic particle[11]. Some studies showed that HDL levels were decreased in T2DM with a

predominance of small dense HDL, and the small HDL particles are rapidly catabolized[12, 13]. This change is due to increased activity of several lipolytic and HDL modifying enzymes[11].

A highly positive significant relationship of HbA1c with dyslipidemia was also observed in the present study. The Diabetes complications and control trial (DCCT) established HbA1c as the gold standard of glycemic control[14]. Khan *et al.* also reported that severity of dyslipidemia increases in patients with higher HbA1c value[15]. Improving glycemic control can substantially reduce the risk of cardiovascular events in diabetics [16]. Khaw *et al*. has reported that reducing the HbA1c level by 0.2% could lower the mortality by 10%[17]. Thus, the results of the present study suggest the importance of glycemic control to manage dyslipidemia and risk for cardiovascular diseases in type 2 diabetics.

CONCLUSION

HbA1c level show positive correlation with TC, TG, LDL and negative correlation with HDL levels suggesting that HbA1c level can be used as a parameter for predicting dyslipidemia in diabetic patients and can thus decreases the risk of cardiovascular events in diabetic patients.

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