ASSOCIATION AMONG HbA$_1$C AND LIPID PROFILE IN KOLAR TYPE 2 DIABETIC POPULATION

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ABSTRACT

Study was planned to evaluate the relationship among glycated hemoglobin (HbA$_1$C) and lipid profile in type 2 diabetic population. A total of 750 type 2 diabetic patients (males, 493; females, 257; mean age, 55.65 ± 12.47) were included in our study. Venous blood samples were collected from all the subjects after at least 8 hours fasting. The sera was analyzed for HbA$_1$c, fasting blood glucose (FBG), total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-c) and low-density lipoprotein cholesterol (LDL-c). The statistical analysis was done by SPSS. The mean HbA$_1$C was 9.18 %. Female patients showed more mean values for FBG (155 ± 75), TC (189 ± 103), TG (190 ± 96), LDL-c (106 ± 39) and HbA$_1$C (9.65 ± 9.65). The HbA$_1$C showed significant positive relationship with TC (r = 0.144) and LDL-c (r = 0.086). It was concluded from the results of this study that HbA$_1$ C can be used as a predictor of dyslipidemia used as a preventive measure for the development of cardiovascular disease in type 2 diabetes and study also suggested relative risk of cardiovascular disease is higher in diabetic women compared to diabetic men.

Keywords: Diabetes mellitus, Dyslipidemia, Glycated hemoglobin, lipid profile

INTRODUCTION

Diabetes currently affects more than 170 million people Worldwide and a projection for the future is alarming. Diabetes mellitus is a group of metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both.[1] Diabetes causes about 5 % of all deaths globally each year.[2] Hyperglycemia is the apparent feature of diabetes due to diagnostic dependency of patients on blood glucose measurements.[3] However, most of the individuals may also carry unnoticed dyslipidemia, characterized by increased levels of triglycerides and LDL-c.[4] Glycated hemoglobin (HbA$_1$c) is a routinely used marker for long-term glycemic control. In accordance with its function as an indicator for the mean blood glucose level, HbA$_1$c predicts the risk for the development of diabetic complications in diabetes patients.[5,6] Apart from classical risk factors like dyslipidemia, elevated HbA$_1$c has now been regarded as an independent risk factor for CVD in subjects with or without diabetes. Estimated risk of CVD has shown to be increased by 18 % for each 1 % increase in absolute HbA$_1$c value in diabetic population[7]. Positive relationship between HbA$_1$c and CVD has been demonstrated in non-diabetic cases even within normal range of HbA$_1$c and CVD has been demonstrated in non-diabetic cases even within normal range of HbA$_1$c.[8,9] Hence, the aim of this study was to observe the relationship among glycated hemoglobin (HbA$_1$c) and serum lipid profile in type 2 diabetic patients.

MATERIALS AND METHODS

The present study was conducted in R L Jalappa hospital attached to Sri Devaraj Urs Medical College, Kolar, India. Randomly selected 750 type 2 diabetes and non-diabetes patients attending medicine outpatient department from September 2012 to February 2013 were included in the study. The study was approved by institutional ethical committee with clearance number of DMC/KLR/MEU/IEC-CER/99/2013-14 and a written informed consent was obtained from all the participants. Patients suffering from other causes of secondary dyslipidemia were excluded. Self-reported pregnancy, any chronic infectious disease and weight loss > 6 kg during past 6 months were also excluded from the study. Fasting blood samples were analyzed for total cholesterol (TC) by enzymatic cholesterol oxidase/peroxidase method, triglycerides (TG) by enzymatic glycerol kinase/peroxidase method, high density lipoprotein cholesterol (HDL-C) by precipitation method, low density lipoprotein cholesterol (LDL-C) was calculated by Friedewald's (TC−TG/5+HDL) considering its limitations. The glycated haemoglobin (HbA$_1$ C) was estimated by high pressure liquid chromatography method. Patients having one or more parameters (TG, HDL-c, or LDL-C) outside the targets recommended by American Diabetes Association (ADA) were considered to have dyslipidemia.[10] The data was analyzed with SPSS. The mean, SD and correlation (Pearson's) test was used to interpret results.

RESULTS AND DISCUSSION

The mean age, HbA$_1$c, total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c) and very low density lipoprotein cholesterol (VLDL-c) were 55.65 ± 12.47 years, 9.18 ± 2.86 %, TC 166.87 ± 37.32 mg/dl, 38.09 ± 20.27 mg/dl, 92.62 ± 34.63 mg/dl, 36.33 ± 19.54 mg/dl and 180.87 ± 94.26 mg/dl respectively (Table 1). The mean age ± SD of male and female subjects were 152.06 ± 75.40 and 155.78 ± 75.10 respectively. The mean value of HbA$_1$c and FBG slightly higher in females in comparison to male subjects, but the differences were not significant. Among the circulating lipids, TC, TG and LDL-c were higher in females than males; these differences were statistically not significant (Table 2). Further it was found from correlation analysis, glycated hemoglobin (HbA$_1$c) was showed significant positive relation with TC (r = 0.114) and LDL-c (r = 0.086) (Table 3).

However TG and HDL-c not showed any significant relationship with HbA_1C.

Table 1: Mean ±SD of HbA_1C and lipid profile of type 2 diabetics

Variables	Mean ± SD
Age (years)	55.65 ± 12.47
HbA1c (%)	9.18 ± 2.86
TC (mg/dl)	166.87 ± 37.32
HDL-c (mg/dl)	38.09 ± 20.27
LDL-c (mg/dl)	92.62 ± 34.63
VLDL-c (mg/dl)	36.33 ± 19.54
TG (mg/dl)	180.87 ± 94.26

HbA_1C: Glycated hemoglobin, TC: Total cholesterol, HDL-c: High-density lipoprotein cholesterol LDL-c: Low-density lipoprotein cholesterol, VLDL-c: Very Low-density lipoprotein cholesterol and TG: Triglycerides

Table 2: Lipid profile parameters result of male and female type 2 diabetic patients

Parameters	Male (n = 493) Mean ± SD	Female (n = 257) Mean ± SD
FBG	152.06 ± 75.40	155.78 ± 75.10
TC	166.87 ± 37.32	189.41 ± 103.18
TG	180.87 ± 94.26	190.71 ± 96.38
HDL-c	38 .09 ± 20.27	38.74 ± 8.07
LDL-c	92. 62 ± 34.63	106. 15 ± 39.59
VLDL-c	36.33 ± 19.54	40.64 ± 38.92
HbA_1C	9.18 ± 2.86	9.65 ± 3.01

FBS: Fasting blood glucose, TC: Total cholesterol, TG: Triglycerides, HDL-c: High-density lipoprotein cholesterol, LDL-c: Low-density lipoprotein cholesterol, VLDL-c: Very Low-density lipoprotein cholesterol and HbA_1C: Glycated hemoglobin

Table 3: Correlation among HbA1c and lipid profile of type 2 diabetes

Variables	TC	HDL-c	LDL-c	VLDL-c	TG
HbA1c	0.114*	0.035	0.086*	0.062	0.073
TC	-	0.039	0.398	0.150	0.189
HDL-c		-	-0.044	0.033	-0.151
LDL-c			-	0.087	-0.050
VLDL-c				-	-0.621

*Significant at P < 0.01
TC: Total cholesterol, TG: Triglycerides, HDL-c: High-density lipoprotein cholesterol, LDL-c: Low-density lipoprotein cholesterol, VLDL-c: Very Low-density lipoprotein cholesterol and HbA_1C: Glycated hemoglobin

High prevalence of hypercholesterolemia, hypertriglyceridemia and high LDL-c and low HDL-c was found in type 2 diabetes which is well known risk factors for cardiovascular diseases[11]. The cause of dyslipidemia in type 2 diabetes mellitus may be that, insulin is not working properly and which affects the liver Apo lipoprotein production[12]. The apolipoprotein regulates the enzymatic activity of lipoprotein lipase and cholesterol ester transport protein.[12] A highly positive significant relationship of HbA_1C with dyslipidemia was observed in the present study. Erciyas *et al*[13] also reported positive correlation of HbA_1C level with TC and TG in diabetic patients. Female diabetic patients showed higher mean values for FBG, TC, TG, and LDL-c than male diabetic patients. Study suggests relative risk of cardiovascular disease is higher in diabetic women compared to men. The diabetes complication and control trail established HbA_1C as the gold standard of glycemic control. The level of HbA_1C value ≤ 7.0 % was said to be appropriate for reducing the risk of cardiovascular complications. The diabetic patients with higher HbA_1C value can exhibit a significant increase in TC, LDL-c TG and HDL-c in comparison to patients with HbA_1C

value ≤ 7.0 %[14]. Khan *et al*.[15] reported the severity of dyslipidemia increases in patients with higher HbA_1C value. As elevated HbA1c and dyslipidemia are independent risk factors of CVD, diabetic patients with elevated HbA_1c and dyslipidemia can be considered as a very high risk group for CVD. Improving glycemic control can substantially reduce the risk of cardiovascular events in diabetes[16] and also reported that reducing the HbA_1C level by 0.2 % could lower the mortality by 10 %.[17]

CONCLUSION

The findings of this study clearly suggest that HbA_1C endures the ability of predicting serum lipid profile in both males and female diabetic patients. Thus, monitoring of glycemic control using HbA_1C along with lipid profile could have additional benefits of identifying diabetic patients who are at a greater risk of cardiovascular complications and study suggest that relative risk of cardiovascular disease is higher in diabetic women compared to diabetic men, but the mechanism behind the increased risk need to be studied further.

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