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Glycated Haemoglobin and its Association with Lipid Profile in Type 2 Diabetes Mellitus

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Abstract

Background: . Patients with type 2 diabetes have an increased prevalence of lipid abnormalities, contributing to their high risk of cardiovascular diseases (CVD)[1]. Glycated hemoglobin (HbA1c) is the indicator of glycemic status over long term. This study is an attempt to evaluate the diagnostic value of HbA1c in predicting diabetic dislipidemia. Method: Venous blood was collected from 100 type 2 diabetic patients age 35 – 75 years, 50 males and 50 females attending the Diabetic OPD, Civil hospital Gulbarga were enrolled in the study. Investigations like fasting and post prandial blood sugar, HbA1c and lipid profile (Cholesterol, Triglycerides, HDL, LDL & VLDL). Both males and females patients with worse glycemic control (HbA1c > 9%) had significantly high cholesterol and LDL levels. Result: HbA1c showed direct and significant correlation with cholesterol, triglicerides and LDL cholesterol, and reverse correlation with HDL cholesterol. .

Keywords*: Glycemic control, HbA1c, Serum lipid profile, Type 2 diabetes*

Introduction

Diabetes mellitus is a group of metabolic disease characterized by hyperglycaemia resulting from defects in insulin secretion, insulin action, or both. Diabetes causes about 5% of all deaths globally each year[4]. The chronic hyperglycaemia of diabetes is associated with long-term damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels.50% of people with diabetes die of cardiovascular disease (primarily heart disease and stroke).The risk of chronic complications increases as a function of the duration of hyperglycemia; they usually become apparent in the second decade of hyperglycemia[2].

Glycated hemoglobin (HbA1c) is routinely used as a diagnostic tool for measuring long term glycemic control[3]. In accordance with its function as an indicator for the mean blood glucose level, HbA1c predicts the risk for the development of diabetic complication in diabetes patients.

Glycemic control with decreased level of HbA1c is likely to reduce the risk of complications.

Avogaro et all (Avogaro A et colab) have suggested that type 2 diabetic dislipidemia in females and hyperglycemia in males are important risk factors are amenable to more aggressive treatment[4].

Material and Method

Study comprised a total of 100 type 2 diabetic patients who were examined at a private laboratory, in a national study of HbA1c in type 2 diabetic patients There were 50 males and 50 females. Informed consent was taken from the subjects.Ethical clearance was taken from ethical committee of M.R.medical college and research center.The age of patients ranges between 35 and 75 years. All the patients were categorized into four age groups : < 50; 50-60; 60- 70' > 75 years. Venous blood samples from all the subjects were collected in serum separator tubes. The sera were analyzed for glycated hemoglobin (HbA1c), fasting blood glucose (FBS), total cholesterol, triglycerides (TS) and high

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density lipoprotein cholesterol (HDL) using an auto analyzer Hitachy 17 The level of low density lipoprotein cholesterol (LDL) was determined using the formula: LDL = (Cholesterol – TG) / (2,2 HDL). The impact of glycemic control on various parameters was evaluated by categorizing all the patients into 3 categories on the basis of HbA1c levels : HbA1c < 6% (good glycemic control, HbA1c > 6-9% (poor glycemic control) and HbA1c > 9 % (worse glycemic control)[4] .

Hypercholesterolemia is defined as TC > 200 mg/dl, high LDL when value > 100 mg / dl, hypertriglyceridemia as TG > 150 mg/dl and low HDL when value < 40 mg/ dl. Dyslipidemia was defined by presence of one or more than one abnormal serum lipid concentration[3] .

Statistical analysis was done by using student's unpaired 't' test using Graph pad software11. Pearson's correlation coefficient was also calculated using online calculator to find the correlation between HbA1c and lipid parameters[3]. Value of HbA1c was given as percentage of total haemoglobin and values of all other parameters were given in mg/dl. All Values are expressed as mean ± SD. The results were considered non-significant when P > 0.05.

Result

Among total 100 type 2 diabetic individuals included in this study, 50 were male and 50 were female. The mean age ± SD of male and female subjects were 51.14±6.40 and 50.46 ± 5.62 years respectively. The mean value of HbA1c and FBG were slightly higher in females in comparison to male patients but the differences were not significant. When lipid profiles were taken in to consideration, 61 patients (41.3%) had TG levels > 150 mg/dl; 28 patients (18%) had LDL > 100 mg/dl; 15patients (10.6%) had TC > 200 mg/dl & 1 (0.7%) patient had HDL < 40 mg/dl. There was no statistically significant difference in Total cholesterol, Serum Triglyceride, LDL or VLDL levels among both the genders though HDL levels in females were significantly more than males.(Table 1)

Table 1: Male and female lipid parameters results of male and female type 2 Diabetes patients

Parameter	Males (n= 50)	Females (n=50)	Total (n=100)
FBG(mg/dl)	120.64±33.80	131.05±37.71	124.92±34.51
HbA1c(%)	7.27±1.40	7.67±1.44	7.49±1.42
TC (mg/dl)	146.36 ± 34.38	155.25 ± 30.42	152.91 ± 34.06
TG(mg/dl)	143.33± 50.31	160.42 ± 65.20	152.80 ± 58.59
LDL(mg/dl)	64.87 ± 34.60	72.81 ± 28.78	71.40 ± 32.00
VLDL(mg/dl)	27.80 ±09.87	32.08 ± 12.24	30.54 ± 10.92
HDL(mg/dl)	44.70 ± 4.10	53.32 ± 3.22	51.95 ± 7.20

Table 2: Lipid parameters categorized by patient's glycaemic control (HbA1c)

Parameter	HbA1c<7 (Good glycaemic control)	HbA1c >7 (Poor glycaemic control)	P value
FBG (mg/dl)	106.19± 21.24	142.54± 37.65	P <0.0001
HbA1c(%)	6.24± 0.46	8.54 ± 1.12	P <0.0001
TC (mg/dl)	140.95 ± 27.01	158.30 ± 28.54	P=0.0010
TG(mg/dl)	136.60 ± 44.76	164.36 ± 67.42	P=0.0052
LDL(mg/dl)	64.56± 20.84	72.86 ± 22.60	P=0.0210
VLDL(mg/dl)	26.72 ± 9.12	32.08 ± 12.46	P=0.0052
HDL(mg/dl)	52.62± 7.26	50.00 ± 7.3	P=0.0320

Out of 100 patients, 50 patients had HbA1c values less than or equal to seven (Good Glycaemic control) while rest of 50 patients had HbA1c values more than seven (Poor Glycaemic Control). Strong positive correlation was observed between FBG and HbA1c as shown by pearson's correlation coeffecient. Similarly, values of TC, TG, LDL & VLDL in Good Glycaemic Control group were significantly lower than Poor Glycaemic Control group. Values of TG had Moderate positive correlation with HbA1c values while TC, LDL & VLDL values had only weak positive relationship. HDL levels were significantly high in Good Glycaemic Control group as compared to Poor Glycaemic Control group and demonstrated a weak negative correlation.

Discussion

In this study, association of glycated haemoglobin and lipid profile among diabetic patients has been studied. There is no significant difference in glycemic parameters as well as lipid profile between males and females .The HDL values which are significantly higher in females. A good number of diabetic patients have hypercholesterolemia, hypertriglyceridemia, high LDL and low HDL levels and these are risk factors for cardiovascular diseases.

There is a positive corelation between glycated haemoglobin and lipid profile. . Khan et al., also reported that severity of dyslipidaemia increases in patients with higher HbA1c value16. Khaw et al has reported that reducing the HbA1c level by 0.2% could lower the mortality by 10%17. The glycemic control is important in prevention of cardiovascular diseases in type 2 diabetics.

Conclusion

There is a greater association of HbA1c with lipid profile in type 2 diabetes mellitus and showed positive correlations with TC, TG, LDL & VLDL and negative correlations between HbA1c and HDL levels is found. HbA1c level can be used as good parameter for predicting the lipid profile of both male and female diabetic patients[9]. Timely intervention with lipid lowering drugs can be done in patient with elevated glycated haemoglobin screed for type 2 diabetes mellitus to reduce the risk of cardiovascular diseases[11].

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Conflict of Interest- None

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