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HbA1c is a biomarker of dyslipidemia in T2DM patients

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Abstract
Type 2 diabetes mellitus consists of an array of dysfunctions characterized by hyperglycemia and resulting from the combination of resistance to insulin action, inadequate insulin secretion, and excessive or inappropriate glucagon secretion. The A1C test is a blood test that provides information about a person's average levels of blood glucose, also called blood sugar, over the past 3 months. The Aim is to study roll of HbA1c as screening biomarker of dyslipidemia in Type 2 Diabetes mellitus patients. The Study consists of 120 type 2 DM patients of 40-70 year age group along with age and sex matched healthy control. Fasting Blood samples were collected from all participants for measurement of Lipid profile, Blood sugar (FBS) and HbA1c. In case group, the mean concentration of Fasting blood glucose (mg/dl), S.Cholestrol (mg/dl), S.Triglyceride (mg/dl), S.HDL(mg/dl) and HbA1c(%) is 138.5±5.2, 265±10.5, 210.9±5.2, 38.6±6.3 and 10.6±1.0. Respectively while in control group it is 85.6±6, 156.9±8.5, 119.5±7.3, 44.5±3.2 and 5.2±0.5 respectively. The HbA1C might be used as a reliable biomarker in the screening of dyslipidemia in diabetes type- 2 patients because it showed positive correlation with TC, TG, VLDL, and LDL-C but negative correlation with HDL-C.
Keywords: *HbA1c, dyslipidemia Type 2 Diabetes mellitus.*

Introduction

Type-2 Diabetes Mellitus (T2DM) is a rising pandemic with the number of patients expanding rapidly in both developed and developing countries around the world. Diabetic patients with associated dyslipidemia are easy targets for cardiovascular diseases (CVD). This study was an attempt to determine lipid abnormalities associated with Type-2 Diabetes Mellitus and association between glycated hemoglobin (HbA1c) levels and serum lipid profile to assess the importance of HbA1c as an indicator of dyslipidemia and future risk of cardiovascular disease in our local population of Patna which is situated in the Bihar, India. In this cross-sectional study, 120 known patients of Type-2 Diabetes Mellitus within 40-70 years of age were randomly selected. They were investigated for HbA1c and lipid profile. The data obtained were analyzed by appropriate statistical methods. There was exceptionally critical relationship between HbA1c and total cholesterol (TC), HbA1c and low density lipoprotein cholesterol (LDL-C), HbA1c and triglycerides (TG), HbA1c and Tc/HDL proportion and HbA1c and non HDL-cholesterol. Likewise, exceedingly huge reverse connection between HbA1C and HDL cholesterol was established. Apart from dependable glycemic

control, HbA1c can likewise be utilized as an indicator of dyslipidemia and in this way early diagnosis of dyslipidemia can be utilized as a preventive measure for the improvement of CVD in patients with T2DM.

Materials and Methods

This retrospective study was conducted at Department of Geriatrics, Patna Medical College and Hospital, Patna, Bihar, India.

Study includes 120 Type 2 Diabetes mellitus patients of age group 40-70 year who visited medicine OPD of our hospital along with 120 ages and sex matched healthy control Fasting venous blood samples was collected from all participants. Samples were centrifugated at local laboratory at 3000 RPM for a period of 10 minutes. Serum was separated from all samples. Lipid profile, Blood sugar (FBS) and HbA1c was measured from all samples by colorimetric method.

Blood Sugar was estimated by GOD-POD method, Glycated hemoglobin (HbA1C) by cation exchange resin method, Lipid profile (total cholesterol, triglycerides, HDL-C and LDL-C) out of which total cholesterol (TC), triglycerides (TG) and HDL-C are estimated by different enzymatic end–point methods. LDL-C estimation is based upon Friede wald's formula. as given below- LDL-C=TC-HDLC-TG/5 where VLDL =TG/5

Adult Treatment Panel III (ATP III) guideline was used which defined hyper cholesterolemia (total cholesterol >200mg/dl), high LDL-C when value >100mg/dl, hypertriglyceridemia when value >50 mg/dl and low HDL-C when value 40 mg/dl.

Obtained results of case group were compared with control group for determination of difference of significance. P-value was calculated by using online student t-test calculator. P-value less than 0.05 were considered as significant.

Result and Discussion

Study was conducted at and attached hospital and it consist of 120 patients of Type 2 DM and 120 Department of Geriatrics, Patna Medical College and Hospital, Patna, Bihar, India

Healthy control. Participants were divided according their age. (Table 1). Comparison of various biochemical parameters between case group and control group was done by calculating p-value. (Table 2). Correlation of HbA1C with lipid profile of diabetes type 2 patients is mentioned in Table 3.

In the study, it was found that Serum total Cholesterol, triglycerides, VLDL and LDL-C were significantly higher in diabetic type 2 groups than control group and were in borderline high risk range. While serum HDL-C was significantly lower in diabetic type 2 group than control group and was towards lower range of normal value. Thus the study showed the high prevalence of dyslipidemia, a well known risk factor for cardiovascular disease[6]. Thus the findings were in consistent with previous studies[7,8].

The cause of dyslipidemia in diabetes mellitus type 2 might be due to insulin insensitivity or resistance affecting the apoprotein production by the liver which regulates the enzymatic activity of lipoprotein lipase and cholesterol ester transport protein. A highly positive significant relationship of HbA1C with dyslipidemia was observed in the present Study. Erclays et al.; also re-ported positive correlation of HbA1C level with total cholesterol and triglycerides level in diabetic persons[9,10,11]. In diabetic persons, HbA1C≤ 7% was said to be appropriate for reducing the risk of cardiovascular complications.[9] The diabetic patients with higher HbA1C value could have significant increased level of TC,TG, LDL-C and HDL-C in com-parison to patients with HbA1C value ≤ 7% which might be responsible for the increased severity of dyslipidemia in patients with higher HbA1C values as reported by khan et al.;[12] Diabetic people can know about the status of their lipid levels by getting their HbA1C values. Until and unless HbA1C remained below 7%, lipid profile could be predicted to be nor-mal. It had been reported that reducing the HbA1C level by 0.2% could lower the mortality by 10% [13]. Thus dyslipidemia could be ruled out by their

HbA1C levels in diabetes mellitus type 2 patients.

Table 1: Age wise distribution of participants

Group	Number (n)	Age Group (yr)	Mean Age
Group 1(Case)	120	40-70	•52.5 ± 5
Group 2(Control)	120	40-70	49.5 ± 6

Table 2: Comparison of various biochemical parameter case group and control group

Parameter	Group 1 (Case) [n=120]	Group 2 (Control) [n=120]	p-Value
Fasting blood glucose(mg/dl)	138.5±5.2	85.6±6	<0.05(S)
S.Cholestrol(mg/dl)	265±10.5	156.9±8.5	<0.05(S)
S.Triglyceride(mg/dl)	210.9±5.2	119.5±7.3	<0.05(S)
S.HDL(mg/dl)	38.6±6.3	44.5±3.2	<0.05(S)
S.VLDL(mg/dl)	42.18±4.2	23.8±5.6	<0.05(S)
S.LDL(mg/dl)	184.22±10.5	87.7±8.5	<0.05(S)
HbA1c (%)	10.6±1.0	5.2±0.5	<0.05(S)

S: Significant, NS: Non significant

Table 3: Correlation of HbA1C with lipid profile of diabetes type 2 patients

Parameter	Correlation coefficient	p-value
S.Cholestrol(mg/dl)	+0.58	<0.05(S)
S.Triglyceride(mg/dl)	+0.92	<0.05(S)
S.HDL(mg/dl)	-0.19	>0.05(NS)
S.LDL(mg/dl)	+0.57	<0.05(S)
S.VLDL(mg/dl)	+0.31	<0.05(S)

S: Significant, NS: Non significant

Conclusion

From Our study it may be concluded that HbA1C might be used as a reliable biomarker in the screening of dyslipidemia in diabetes type-2 patients because it showed positive correlation with TC, TG, VLDL, and LDL-C but negative correlation with HDL- C.

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