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Original Research Article

HbA1c as screening biomarker of dyslipidemia in Type 2 Diabetes mellitus 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.TheHbA1C 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:

Diabetes mellitus is a major health problem for India. It is associated with the development of a variety of complications that have a significant impact on morbidity and mortality. The long-term complications of type 1 and type 2 diabetes include the microvascular complications of retinopathy, nephropathy and neuropathy, but the major health problem in type 2 diabetes is the increased risk of macrovascular complications, such as coronary artery disease and peripheral artery disease. In India alone, 31.7 million people had diabetes in year 2000 which latter on increased to 61.3 million in 2011 and is ex-pected to reach 101.2 million by 2030 (International Diabetes Federation) [3]. Thus India is the 2nd largest country in world diabetes prevalence [3]. The maximum burden of diabetes in society is mainly contributed by DM type 2 which accounts for about 90% cases of diabetes [4]. And it is said that DM type 2 will alone affect 300 million people world-wide by 2025 [5].

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 A1C test is sometimes called the hemoglobin A1C, HbA1c, or glycohemoglobin test. The A1C test is the primary test used for diabetes management and diabetes research.

The A1C test is based on the attachment of glucose to hemoglobin, the protein in red blood cells that carries oxygen. In the body, red blood cells are constantly forming and dying, but typically they live for about 3 months. Thus, the A1C test reflects the average of a person's blood glucose levels over the past 3 months. The A1C test result is reported as a percentage. The higher the percentage, the higher a person's blood glucose levels have been. A normal A1C level is below 5.7 percent [6].

MATERIALS AND METHODS:

This retrospective study was conducted at department of biochemistry at RNT medical college, Udaipur, Rajasthan, 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

central 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 Friedewald's formula. as given below-

LDL-C=TC-HDLC-TG/5where VLDL =TG/5

Adult Treatment Panel III (ATP III) guideline was used which defined hypercholesterolemia (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 department of biochemistry RNT medical college, Udaipur, Rajasthan and attached hospital and it consist of 120 patients of Type 2 DM and 120 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**.**

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

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.

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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