

Correlation between Non-High-Density Lipoprotein-Cholesterol and Hba1c Levels in Patients with Type 2 Diabetes Mellitus of Bengaluru City

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Abstract

Background: The common macrovascular complications of diabetes are heart disease and stroke, which accounts for about 50% of death in diabetic patients.^{1,2} Diabetes mellitus (DM) is a common secondary cause of hyperlipidemia, particularly, if glycaemic control is poor.³ Non-high-density lipoprotein-cholesterol (non-HDL-C) is a better measure of cardiovascular disease prediction in contrast with glycosylated hemoglobin (HbA1c) in type 2 diabetic patients.

Objectives: In the present study, the correlation of non-HDL-C with HbA1c were examined and evaluated in patients with type 2 diabetes mellitus.

Materials and Method: A total of 50 type 2 diabetics were included in the study with a mean age of 55.78(SD:13.77)years of both gender previously diagnosed regardless of their sociodemographic characteristics and were invited for the assessment of lipid profile and HbA1c levels in Infilife healthcare private limited of Bengaluru city.

Results: Mean (SD) Hba1c levels and Non-HDL levels were 7.60% (2.01) & 159.32(95.60) mg/dL respectively. The study revealed a significant correlation between Hba1c levels and Non-HDL levels with a correlation coefficient(r) of 0.29[p<0.05].

Conclusion: The present study showed that non-HDL-C positively correlates with HbA1c indicating better predictor of glycemic control among Type 2 Diabetes

Keywords: Glycosylated hemoglobin, non-high-density lipoprotein, type 2 diabetes mellitus

Introduction

In type 2 diabetic patients, dyslipidemia is depicted by raised triglyceride and triglyceride-rich lipoproteins, including very low-density lipoprotein (VLDL) and intermediate-density lipoprotein (IDL), decreased high-density lipoprotein cholesterol (HDL-C), and small dense LDL particles.⁴ Usually, patients with type 2

diabetes have atherogenic lipid profile increasing the risk of coronary vascular disease compared to people without DM. It has been confirmed that an early intervention to normalize circulating lipids enables to decrease the cardiovascular-related complications and mortality.⁵

Non-HDL-C calculating through total cholesterol (TC) minus HDL-C is an appropriate indicator for the cholesterol content of all atherogenic lipoproteins. Hence, elevated levels of atherogenic triglyceride-rich remnants add a potential risk related with LDL-cholesterol (LDL-C).⁶

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It has been shown that non-HDL-C is a strong predictor for future cardiovascular risk in patients with or without exhibiting symptoms of vascular diseases. Furthermore, it has been suggested as a secondary therapeutic target following LDL-C among patients with raised Triglyceride (TG) by the National Cholesterol Education Program Adult Treatment Panel III⁷ owing to its proatherogenic, apo-B-containing lipoprotein fraction of circulating lipid.⁸ Type 2 diabetic patients have significantly elevated levels of non-HDL-C compared to controls; therefore, it can be used as a dyslipidemia marker and a predictor for CVD^{9,10} and vascular inflammation¹¹ in type 2 diabetic patients.

Non-HDL-C level measurement in type 2 diabetic patients is simple, cost-effective, and appropriate as it does not need 12-h fasting giving an opportunity to clinicians to use it as a routine measurement criterion in clinical settings.¹²

Therefore, the level of non-HDL in patients with type 2 diabetic patients in correlation with HbA1c levels was examined in the present study.

Materials and Method

In the current, cross-sectional investigation, a total of 50 patients with mean age of 55.78(SD:13.77)years of both gender and previously diagnosed with type 2 diabetes recorded in their medical records and confirmed by the study author in Infilife healthcare private limited, Bengaluru, were invited for the study purposes between December 2017 and April 2018.

The patients met eligibility criteria if they were male or female, on insulin, oral anti-diabetic agents, or its combination regardless of their sociodemographic aspects. The patients with pregnancy, Type 1, or gestational diabetes and those with acute conditions such as acute myocardial infarction, acute diabetic ketoacidosis, acute pulmonary embolism, acute pulmonary edema, and acute chest infection were not included in the study. Laboratory investigations of 50 patients were used for the study analysis.

Diagnosis and measurement criteria

The diagnosis of type 2 diabetes was established in the time, and HbA1c was $\geq 6.5\%$ according to the American Diabetes Association.¹³

Biochemical measurements

For the biochemical measurements purposes, the venous blood samples were collected from all patients after at least 8 h fasting in Medical Laboratory of Infilife healthcare private limited by an experienced technician in Bengaluru city after taking their informed written consents. The serum obtained from the blood samples were used to calculate the lipid profile parameters, including HDL-C, serum TC, TG, LDL-C, and HbA1c by Roche autoanalyzer 6000 Cobas (Roche Diagnostics, Mannheim, Germany). Non-HDL-C was calculated through subtracting HDL-C from the TC.

Results

A total of 50 diabetics were included in the study with a mean (SD) age of 55.78(13.77) years.

Table 1

AGE (YEARS)	MALE	FEMALE	TOTAL(%)
25-45	10(34.48%)	3(14.29%)	13(26%)
46-65	10(34.48%)	9(42.86%)	19(38%)
>65	09(31.03%)	9(42.86%)	18(36%)
TOTAL	29(100%)	21(100%)	50(100%)

Among 50, 29(58%) were males with a mean (SD) age of 53.20(14.29) years and the rest 21(42%) were females with a mean (SD) age of 59.33(12.48) years

Table 2:

VARIABLE	Mean	SD
HbA1c(%)	7.6	2.0021
FBS (Mg/dl)	144.04	70.572
PPBS(Mg/dl)	202.64	100.5353
Non HDL(Mg/dl)	159.32	95.6047

There was no significant difference between Males and Females in the levels of HbA1c, Non-HDL, FBS, PPBS levels There was a statistically significant correlation between HbA1c levels and FBS ($r=0.87$,

$p < 0.05$), PPBS ($r = 0.87$, $p < 0.05$).

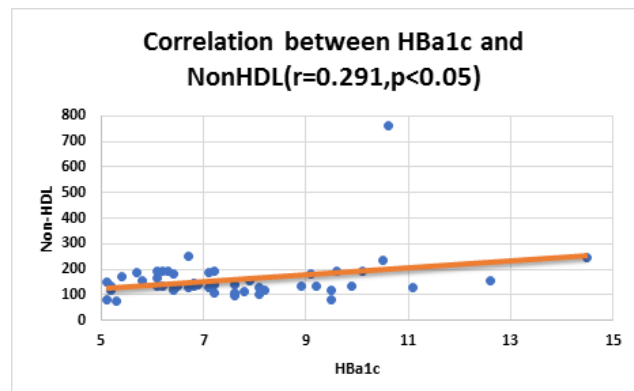


Figure 1

Mean (SD) HbA1c levels and Non-HDL levels were 7.60% (2.01) & 159.32(95.60) mg/dL respectively. There was a significant correlation between HbA1c levels and Non-HDL levels with a correlation coefficient (r) of 0.29 [$p < 0.05$]. The minimum and maximum HbA1c levels among study participants were 5.1% and 14.5% respectively

Discussion

The current study showed a significant positive correlation of HbA1c level with non-HDL-C in type 2 diabetic patients. A few studies have attempted to examine and evaluate the correlation of HbA1c levels with non-HDL-C in type 2 diabetic patients. For example, a recent study conducted by Senghor and William¹⁴ revealed that the comparison of lipid profiles parameters was performed between 60 patients with controlled DM (HbA1c $< 6.5\%$) and 60 patients with uncontrolled DM (HbA1c $\geq 6.5\%$) with disease duration between 1 and 5 years. In agreement with the current study, a positive correlation was found between non-HDL-C and HbA1c ($r = 0.49$, $P < 0.05$). The positive correlation was found by Hamed et al.¹⁵ between HbA1c and non-HDL ($P < 0.001$) among 450 patients with type 2 diabetes with a mean age of 55.5 (9.35) years.

LDL-C is being used as the primary therapeutic target to lower lipids for primary and secondary prevention of CVDs.^{16,17} However, still, the patients have a risk of recurrent coronary artery disease despite achievement in LDL goal.¹⁸ The possible analysis for this residual risk could be a high level of non-HDL-C in these kinds of patients. Therefore, the particular importance must be given to measuring non-HDL-C in type 2 diabetes patients in routine clinical practices as it has been shown

to be a superior predictor for risk of CVD.^{18,19,20,21,22} In addition, it has all cholesterol contents for atherogenic particles, including LDL, VLDL, lipoprotein A, VLDL remnant, and IDL.^{23,24,25}

It is recommended to involve the non-HDL-C lipid plan parameters in routine clinical practice as it has been shown to improve the goal achievement.²⁶ Importantly, although HbA1c has been considered to be a reliable measure for chronic hyperglycemia and is associated with risk of long-term diabetes complications, HbA1c single test has not been mentioned to be used a reliable biomarker for diabetes diagnosis and prognosis and some testing strategies and cutoffs are still being discussed and debated.²⁷

T2DM patients are at a much higher risk of cardiovascular complications than the non-diabetics. Thus, the risk of cardiovascular events in diabetics can be reduced by improving the glycemic control.²⁸ Hence it is important to focus on HbA1c control and targeting lipids to avoid morbidity and mortality in diabetic patients. HbA1c measurement helps to control DM and helps identify dyslipidemias.²⁹

Limitations of the present study was small sample size; further large sample size prospective studies are required in this direction.

Conclusions

The current study showed that non-HDL-C is above the optimal line and has positive correlation with HbA1c in type 2 diabetic patients. It is recommended to use non-HDL-C level for routine clinical purposes to type 2 diabetic patients as it is a simple, cost-effective tool and has better representation for diabetic dyslipidemia.

Conflict of Interests: This study authors declare that there is no conflict of interests regarding the publication of this article.

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Ethical Clearance: Taken

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