ORIGINAL RESEARCH

Diabetes and its Relationship with Lipid Profile: A cross sectional analysis

Dr. Rakshit Dalal[1], Dr. Rachna Mishra[2], Dr. Arpita Sutaria[3], Dr. Eshani Patel[4], Dr. Shrikant Patel[5], Dr. Foram Patel[6]

[1]Private practitioner, Dalal Dental Clinic, Mumbai, Maharashtra, India
[2]Reader, Department of Conservative Dentistry And Endodontics, Daswani Dental College And Research Centre, Kota, Rajasthan, India
[3]Private practitioner, Arpita Sutaria's Dental Clinic, Mumbai, Maharashtra, India
[4]University of Cumberlands, PhD in Executive Business Management In Healthcare Industry Kentucky State
[5]Department of Oral Pathology, Pacific Dental College and Hospital, Udaipur, India
[6]BDS, MHA, Georgia Southern University, Statesboro, GA

Corresponding author
Dr. Rakshit Dalal
Private practitioner, Dalal Dental Clinic, Mumbai, Maharashtra, India
Email id: researchguide86@gmail.com

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Abstract

Background: The development of issues in people with diabetes mellitus is predicted by HbA1c. Regular monitoring of the blood lipid profiles of diabetic patients is necessary to determine the best course of treatment based on the patient's age and type of diabetes. Even within the usual HbA1c range, there is a favourable connection between HbA1c and cardiovascular disease in nondiabetic individuals. The purpose of this study was to assess the serum lipid profile and HbA1c levels in type 2 diabetes mellitus (T2DM) and investigate the related variables such as diabetes mellitus duration among type 2 diabetes mellitus patients at a tertiary care hospital in the remote area.

Materials and methods: A tertiary care hospital in mumbai, India, provided 124 inpatients and outpatients for the study. For FLP-total cholesterol, HDL, LDL, VLDL, TGL, HbA1c, CBC, urine routine, renal function test, and thyroid function test, information on basic clinical data and blood tests in the fasting state were obtained from qualified patients.

Results: The remaining patients had acceptable glycemic control, while 80 patients (64.5%) had poor glycemic control (HbA1c >7.5%). The association between the lipid profile and the duration of diabetes and HbA1c levels showed that triglycerides, total cholesterol, LDL, and VLDL all showed significant positive correlations. Age and HbA1c have a high positive link when other numerical factors like haemoglobin, age, and HbA1c are compared to the duration of diabetes.

Conclusion: Our research revealed a strong positive correlation between lipid profiles and HbA1c, suggesting that HbA1c may be used as a dyslipidemia prediction in addition to a glycemic control indicator to help avert complications.

Keywords: Diabetes, Duration of diabetes, HbA1c level, Type 2 diabetes mellitus

Introduction

The prevalence of type 2 diabetes mellitus (T2DM) is quickly growing as a result of physical inactivity and obesity as a result of lifestyle changes.[1] Diabetes mellitus is caused by abnormalities in glucose, lipid, and protein metabolism in type 2 diabetics and insulin shortage in type 1 diabetes mellitus (T1DM).[2] Aside from metabolic syndrome, which is a mix of T2DM and systemic hypertension, aberrant lipid profile values are the most important risk factor in the development of coronary vascular disease in individuals with T2DM.[3,4]The number of low-density lipoprotein receptors increases with insulin level rising; hence, LDL receptor levels drop with insulin level decline, resulting in increased LDL cholesterol levels in T2DM patients. Dylipidemia increases the advancement of atherosclerosis, making it a controllable risk factor for cardiovascular disease in type 2 diabetes mellitus.[5,6]The HbA1c level is a superior indication for analysingthe average blood glucose level over a three-month period. It is critical to assess the lipid profile of T2DM patients in order to take appropriate therapy at the appropriate time.[7,8]Numerous research have been conducted to examine the relationship between T2DM patients'

glycemic management and their blood lipid profile. The current study will assist us to understand the pattern of dyslipidemia as well as regulate the occurrence of hyperlipidemia in T2DM patients.

Materials and Methods

A cross-sectional study design was used for this investigation, which included 124 inpatients and outpatients from the department of general medicine at a tertiary care hospital in Mumbai, India. A convenient sample strategy from outpatients and inpatients was used. The trial included all individuals with type 2 diabetes over the age of 40 who had micro- and macrovascular problems and were willing to participate. The research excluded patients on statin or fibrate medication, oral contraceptive pills, steroids, hypothyroidism, nephrotic syndrome, chronic kidney disease, and familial hyperlipoproteinemia. The prior study's minimum determined sample size with a prevalence of 61% is 115. However, we were able to gather up to 124 samples and were accepted into the research.

Procedure: Prior to the study, the institutional ethics committee approved it. The method of sequential sampling was used. The goal, technique, advantages, dangers, and confidentiality of the research were explained after building rapport with the study subject. Before the interview schedule was conducted, the study participant provided informed written consent. Data were obtained from eligible patients, and a basic patient history was acquired using a standard questionnaire, followed by a clinical examination. 5 mL of venous blood was obtained from overnight fasted (at least 10-12 hours) participants for assessment of fasting blood sugar and lipid profiles. The lipid profile was assessed using the National Cholesterol Education Programme (NCEP-ATP III) categorization. FBS, FLP (total cholesterol, HDL, LDL, VLDL, TGL), HbA1c, complete blood count, and renal and thyroid function tests were performed on fasting blood samples. A standard urine examination was also performed.

Statistics and Analysis of the Data: The data was coded and put into Microsoft Excel before being analysed using SPSS version 20. For categorical variables such as gender, treatment type, and history of previous disease, frequencies and percentages with visualisation were employed. For numerical variables from serum blood levels such as age, lipid profile parameters, diabetes duration, Hb, and HbA1c, measures of central tendency and dispersion were utilised. Statistical significance was defined as a p value less than 0.05.

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Results

There were 124 T2DM individuals in the research. Table 1 shows the research individuals' fundamental sociodemographic information. The study population's mean and median ages are 57.15 and 56 years, respectively. The majority (52, 41.8%) of the study population was between the ages of 51 and 60. There were 74 ladies (59.7%) and 50 males (40.3%). The study population's mean and median diabetes durations are 7.29 and 7 years, respectively. The study population's mean and median HbA1c levels are 8.18 and 8.1, respectively. Based on HbA1c >7.5%, approximately 64.5% had poor glycemic control, whereas the rest had adequate glycemic control. Approximately 89.5% had dyslipidemia (any of the abnormal levels of TC, LDL, VLDL, TG, and HDL). Among diabetics, 40 (32.3%) used insulin, while the remaining 84 (67.7%) used oral hypoglycemic medications.The renal function test, thyroid function test, and urine routine testing were all normal for all of them. Table 2 shows the clinical information for the study participants. The association of the lipid profile with diabetes duration and HbA1c levels reveals a significant positive correlation of total cholesterol, LDL, VLDL, and triglycerides with diabetes duration (p 0.05, using Pearson's correlation test). Table 3 shows the results on the connection of the lipid profile with HbA1c levels and diabetes duration. The association of other numerical factors such as age, Hb A1C, and haemoglobin with diabetes duration reveals a strong positive correlation of age with HbA1c. Using the Pearson's correlation test, this positive link is statistically significant with a p value less than 0.05. Table 4 shows the relationship between age, HbA1c, and haemoglobin and the duration of diabetes. Diabetes management and triglycerides, VLDL, LDL, HDL, and total cholesterol have a statistically significant relationship

Table 1: Sociodemographic details of the study subjects

S. no	*Variable*	*Category*	*Frequency*	*Percent*
1	Age	<40	4	3.2
		41–50	26	20.9
		51–60	52	41.8
		61–70	37	29.8
		>70	5	4.0
2	Gender	Female	74	59.7
		Male	50	40.3
		Total	124	100.0

Table 2: Clinical details of the study subjects

S. no	*Variable*	*Category*	*Frequency*	*Percent*
1	Treatment type for diabetes	Insulin	40	32.3
		Oral hypoglycemic drugs	84	67.7
2	Glycemic control based on HbA1c	Bad (>7.5%)	80	64.5
		Good (<7.5%)	44	35.5
3	Lipid level	Dyslipidemia	111	89.5
		Normal	13	10.5
		Total	124	100.0

Table 3: Correlation of lipid profile with HbA1c levels and duration of diabetes

Biochemical parameter	*Statistical test*	*HbA1c*	*Duration of diabetes*
Total cholesterol	Pearson correlation	0.520**	0.469**
	Sig. (two-tailed)	0.000	0.000
HDL	Pearson correlation	−0.127	−.048
	Sig. (two-tailed)	0.161	0.594
LDL	Pearson correlation	0.549**	0.541**
	Sig. (two-tailed)	0.000	0.000
VLDL	Pearson correlation	0.432**	0.297**
	Sig. (two-tailed)	0.000	0.001
Triglycerides	Pearson correlation	0.653**	0.578**
	Sig. (two-tailed)	0.000	0.000

Table 4: Correlation of age, HbA1c, and hemoglobin with duration of diabetes

Parameter	*Statistical test*	*Duration*
HbA1c	Pearson correlation	0.558*
	Sig. (two-tailed)	0.000
Age	Pearson correlation	0.582*
	Sig. (two-tailed)	0.000
Hemoglobin	Pearson correlation	0.060
	Sig. (two-tailed)	0.505

*Correlation is significant at the 0.01 level (two-tailed)

Discussion

The research was carried out in a tertiary healthcare centre in South India. The lipid profile characteristics of the patients were shown to have a strong positive connection with the duration of T2DM.[9]MangeshNanaware et al. and Moss et al. found comparableresults in their research. An earlier study in the Nepalese population found a link between lipid

profile characteristics and HbA1c levels and the time span of T2DM. Other factors, such as serum haemoglobin, time span of T2DM, and patient age, also indicate substantial favourable benefits.[10]An Iran research that correlated HbA1c levels and lipid profile characteristics in T2DM patients found that a rise in HbA1c is connected with an increase in serum lipid profile, which may be utilised as a better diagnostic predictor of cardiovascular disease in diabetic patients. In a similar research, Mahajan et al. discovered a link between HbA1c and LDL, triglycerides, total cholesterol, high-density lipoprotein, very-low-density lipoprotein, high-density lipoprotein C, and low-density lipoprotein C levels.[10,11]A cross-sectional research in Bangladesh found a strong relationship between lipid profile parameters and HbA1c levels in T2DM patients. They found that HbA1c can be utilised to better predict the occurrence and prevalence of dyslipidemia in T2DM patients.[12] Furthermore, Anand et al. found that serum HbA1c levels, adequate glycemic control, and lipid profile screening help to identify high-risk patients for timely hyperlipidemia diagnosis, lowering the incidence of cardiovascular disease and peripheral vascular complications through appropriate interventions.A study from the north eastern population investigated the lipid profile and its correlation with HbA1c levels in the incidence of myocardial infarction, concluding that 60% of patients with myocardial infarction had poor glycemic control and also discovered that the serum HbA1c level has a direct relationship with the serum lipid profile and an indirect relationship with levels of HDL cholesterol.19 A similar research from Chidambaram, Tamil Nadu, identified HbA1c as an abnormality marker in the lipid profile of T2DM patients. They also discovered an increase in HDL-C concentration in T2DM patients, as well as an increase in all other lipid profile parameters in both T1DM and T2DM.

Conclusion

Among the lipid profiles, our study found that HbA1c has a direct, substantial link with total cholesterol, triglycerides, VLDL, and LDL but not with HDL. Our study results show a significant positive association between HbA1c and lipid profiles, indicating that HbA1c might be employed as a predictor of dyslipidemia in addition to a glycemic control indicator for complication prevention.

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