Study of Lipid Profile in patients with Diabetes Mellitus presenting at tertiary referral center in Nepal

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ABSTRACT

Introduction: Diabetes mellitus is a metabolic disorder associated with dyslipidemia especially in type 2 diabetes mellitus. Lipid abnormalities are associated with increased risk of cardiovascular diseases. The aim of the study was to find out the incidence of dyslipidemia in patients with diabetes mellitus presenting at tertiary referral center of Kathmandu, Nepal. .

Methods: This was a retrospective study conducted in Medicine and Endocrine OPD of Shree Birendra Hospital, Chhauni, Kathmandu, Nepal after approval from the Institution Review committee. Cases within the period from December 2019 to January 2021 were studied. Data were analyzed using SPSS 21.0.

Results: Out of 150 patients with diabetes mellitus, 32.6% had total cholesterol > 200 mg / dl, 60% had elevated LDL, 26.67% patient had elevated TG and 36% patients had low HDL level. Poor glycemic control (HbA1c > 7%) was observed in 86 (57.33%) subjects. Among patients with HbA1c > 9, 3.33% patients had cholesterol > 200, 4.67% patients had TG > 250, 5.33% patients had LDL > 100 and 6.67% patients had HDL < 40.

Conclusions: Diabetes mellitus is associated with high incidence of dyslipidemia. The most common pattern observed was elevated level of low-density lipoprotein, cholesterol and triglyceride and low level of HDL. Routine monitoring of lipid profile should be part of patient care.

Key Words: Diabetes; dyslipidemia; glycated-hemoglobin

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DOI: 10.3126/mjsbh.v20i2.30726

Submitted on: 2020-08-21

Accepted on: 2021-06-07

INTRODUCTION

Diabetes mellitus is a metabolic syndrome characterized by increased blood sugar levels in the body. Type 2 Diabetes Mellitus (T2DM) is associated with a marked increased risk of cardiovascular diseases (CVD).[1] Individuals with T2DM have an absolute risk of major coronary events similar to that of non-diabetic individual with established coronary heart disease (CHD).[2] T2DM is caused by deficiency of the pancreatic hormone insulin which results in failure to metabolize sugars and starch.[3] Sugar accumulates in the blood and urine and by-products of alternative fat metabolism disturb acid-base balance of the blood causing a risk of convulsions and coma. Defects in insulin action and hyperglycemia could lead to changes in plasma lipoproteins in patients with diabetes. Alternatively, especially in the case of T2DM, the obesity / insulin resistant metabolic disarray is present. This could be at the root of this form of diabetes could itself, lead to lipid abnormalities exclusive of hyperglycemia.[4]

In our day-to-day practice, all diabetic patients on follow up are not regularly monitored for the status of their dyslipidemia which may be responsible for increasing number of cardiovascular events in the future. Prevention and treatment of dyslipidemia is essential for prevention of cardiovascular events in patients with T2DM and is closely related to glycemic control.

There is a lack of study of the prevalence of lipid abnormalities in T2DM patients, especially in resource limited set up like ours. Hence, we conceptualized this study to evaluate the incidence of dyslipidemia among the T2DM patients and its association with the glycemic control.

METHODS

This was a retrospective study conducted among diabetic adult participants presenting to endocrine OPD in Shree Birendra Hospital, Chhauni, Kathmandu, Nepal between 2019 January and 2021 December. All patients were either army personnel, retired army personnel or their families. The study was approved by the Institutional Review Committee of Nepalese Army Institute of Health Sciences. Informed consent was taken and the data were collected. The data was based on their medical records and data entered into Departmental data bank. Participants were defined as having diabetes when they self-reported the abnormal blood sugar level clinical reports and used anti-diabetic agents as per American Diabetes Association criteria. Serum lipid profile was estimated in fasting state. Demographic data like height, weight and blood pressure were recorded. Various biochemical parameters were done in our lab as per the standard methods. The biochemical parameters included were blood glucose level both fasting and post prandial, serum lipid profile comprising total cholesterol, low density lipoprotein cholesterol (LDL-C), high density lipoprotein cholesterol (HDL-C) and Triglyceride (TG). Classification of different components of serum lipid (Total cholesterol, LDL cholesterol, Triglyceride and HDL cholesterol) was followed according to the recommendation of NCEP ATP III.[5] Continuous variables were described using means and standard deviations. Chi square test was used for categorical data comparison. ANOVA test was used to compare the means among the groups. The statistical analysis was conducted with SPSS version 21.0 for Windows.

RESULTS

Total 150 cases with diabetes were included in the study. Mean age was 55.67 ± 11.53 years, with youngest being 32 years and oldest being 91 years of age. Most of the patients with diabetes were in the age group 40 to 49 years (32.67%) followed by 60 to 69 years (26.67%) and 50 to 59 years (24.67%). Most of the diabetic patients were females 77 (51.33%). The blood glucose levels on multiple visits to the OPD were recorded. Observation showed fasting level ranging from 77 to 430 mg / dl while post prandial level ranged from 105 to 649 mg / dl. Uncontrolled post prandial (PP) blood glucose level was detected in less than half patient enrolled for this study, 44.67% (n = 67) while uncontrolled fasting blood glucose (> 140 mg / dL) was seen in 32% (n = 48). Glycated hemoglobin was < 7 in 42.66% (n = 64) patient, 7 to 9 in 39.33% (n = 59) patient while 18% (n = 27) patient had HbA1C > 9. Amongst all diabetic patients, 54.67% (n = 82) patients had associated hypertension and 45.33% (n = 68) patients had normal blood pressure level.

Table 1. Baseline characteristic of the study population

Parameters	Values		
Age in years (Mean ± SD)		55.67 ± 11.53	
Female		77	51
Age group (Years)	< 40	6	4
	40 to 49	49	32.67
	50 to 59	37	24.67
	60 to 69	40	26.67
	≥ 70	18	12
Hypertension	Yes	82	54.67
	No	68	45.33
HbA1c	< 7	64	42.66
	7 to 9	59	39.33
	> 9	27	18
Fasting sugar	< 100	49	32.67
	100 to 140	53	35.33
	> 140	48	32
Postprandial	< 200	83	55.33
	> 200	67	44.67
	> 200	67	44.67

Table 2. Lipid profile of the study population

	Values	Number	%
Total Cholesterol	<180	64	42.67
	180 to 200	37	24.67
	> 200	49	32.67
TG	< 150	47	31.33
	150 to 250	40	26.67
	> 250	63	42.00
LDL	< 70	42	28.00
	70 to 100	60	40.00
	> 100	48	32.00
HDL	< 40	38	25.33
	40 to 50	54	36.00
	> 50	58	38.67

Lipid profile of the study population is as shown in table 2. The value of total cholesterol level at different age group was different. Majority of the patients 67.33% (n = 101), had desirable cholesterol level. High level of total cholesterol (≥ 200 mg / dl) was seen in 32.7% of the patients. Only 49 patients of age 40 to 49 years had total cholesterol level > 200 mg / dl. Approximately 28% patients were found to have optimal level of serum LDL cholesterol; 40% had near optimal / above optimal level of serum LDL cholesterol; 32% had borderline high; mean LDL-C was higher in 48 patients (32%). Most of the patients had normal serum TG level (n = 47, 31.33%), among rest, 40 (26.64%) had borderline high serum TG level; 63 (42%) had a high serum TG levels. HDL-C was lower than normal in 38 (25.3%) of the studied population. Fifty eight patients had more than 50 mg / dl (38.6%) of HDL-C whereas 54 (36%) patients had normal level of HDL-C.

HbA1c level was compared with lipid profile. Among patients with HbA1c > 9, 3.33% patients had cholesterol > 200, 4.67% patients had TG >250, 5.33% patients had LDL > 100 and 6.67% patients had HDL < 40.

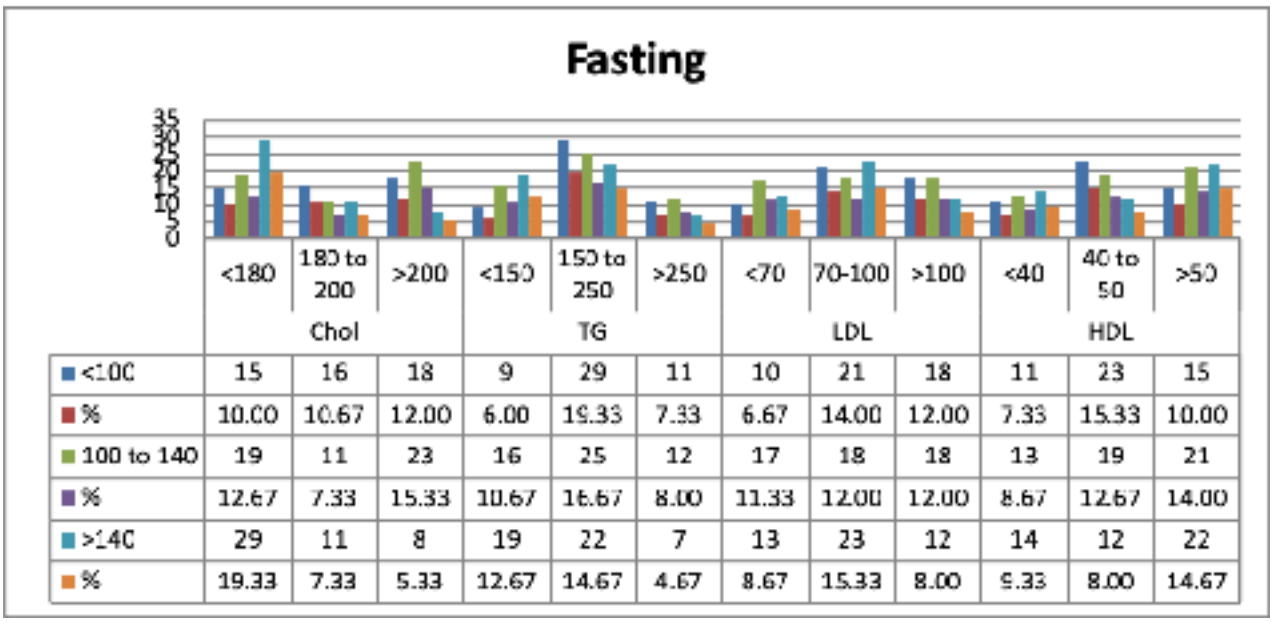
While comparing fasting sugar levels with various parameters of lipid profile, 5.33% patient had cholesterol > 100, 4.67% patients had TG > 250, 8% patients had LDL > 100 and 9.33% patients had HDL < 40. In comparing postprandial sugar level with lipid profile, 11.33% patients had cholesterol > 200, 6% patients had TG > 250, 19.33% patients had LDL > 100 and 11.33% patients had HDL< 40.

DISCUSSION

Diabetes is a symptom complex of metabolic dysfunction. There is an alteration in glucose as well as lipid metabolism in relation to insulin deficiency or insulin resistance. This forms the basis of metabolic dysfunctions and leads to various issues as well as complications. In T1DM, lipid profile is similar to control in glycemic control is good. In T2DM, there is increased triglycerides, VLDL, IDL, non-HDL-C and decreased HDL-C, normal LDL-C but increase in small dense LDL, LDL particle number and apolipoprotein B. If glycemic control is poor, there is increased TGs, VLDL and IDL and decreased HDL-C along with modest increase in LDL-C with increase in small dense LDL and particle number.

Certain pharmacological agents have direct or indirect effect on altering the lipid components which are well established facts. Metformin modestly decreases triglycerides and LDL-C. Sulfonylureas & insulin have no effects while DPP4 inhibitors and GLP1 analogues decreases fasting and postprandial triglycerides. Acarbose also decreases postprandial triglycerides.

Our study showed that one third of the participants had elevated cholesterol level. This was comparable with the Framingham Heart Study, where 13% of men and



	<180	180 to 200	>200	<150	150 to 250	>250	<70	70-100	>100	<40	40 to 50	>50
	Chol			TG			LDL			HDL		
<100	15	16	18	9	29	11	10	21	18	11	23	15
%	10.00	10.67	12.00	6.00	19.33	7.33	6.67	14.00	12.00	7.33	15.33	10.00
100 to 140	19	11	23	16	25	12	17	18	18	13	19	21
%	12.67	7.33	15.33	10.67	16.67	8.00	11.33	12.00	12.00	8.67	12.67	14.00
>140	29	11	8	19	22	7	13	23	12	14	12	22
%	19.33	7.33	5.33	12.67	14.67	4.67	8.67	15.33	8.00	9.33	8.00	14.67

Figure 1. Co-relation of fasting blood sugar with lipid profile. (Chol: Cholesterol, TG: Triglycerides, LDL: Low density lipoprotein, HDL: High Density Lipoprotein)

24% of women with diabetes mellitus had increased total plasma cholesterol levels, compared with 14% of men and 21% of women without diabetes mellitus.[6] The prevalence of high LDL cholesterol levels in men and women with diabetes mellitus (9% and 15% respectively) did not differ significantly from the rates in non-diabetic men and women (11% and 16% respectively). By contrast, the prevalence of high plasma triglyceride levels in individuals with diabetes mellitus (19% in men and 17% in women) was significantly higher than in those without diabetes mellitus (9% of men and 8% of women).[7] In patients with T1DM with good glycemic control, the lipid profile is very similar to lipid profiles in the general population.[8] In some studies HDL-C levels are modestly increased in patients with T1DM.[9] In contrast, in patients with T2DM, even when in good glycemic control, there are abnormalities in lipid levels.10,11 It is estimated that 30-60% of patients with T2DM have dyslipidemia.[7,12]

The commonest form of dyslipidemia observed in our study was elevated LDL level which was seen in almost two thirds of them. This was in contrary with other studies where the patients with T2DM often have an increase in serum TG levels. The postprandial increase in serum triglycerides is accentuated in diabetic patients and elevations in postprandial lipids may increase the risk of cardiovascular disease.[10,11] Abbate and Brunzell reported that the increase in triglycerides in poorly controlled patients was related to the decrease of activities of adipose tissue and muscle lipoprotein lipase activity.[13]

In patients with T1DM in good glycemic control, the lipid profile is very similar to lipid profiles in the general population.[8] In our study, the incidence of dyslipidemia was seen more commonly in the diabetic population with poor glycemic control. Some studies have shown that despite good glycemic control, there can be abnormalities in lipid levels.[10,11] It is estimated that 30-60% of patients with T2DM have dyslipidemia.[7,12]

The limitation of the study was being a retrospective in nature and small sample size. Large sample studies with prospective designs are recommended to study the association between the level of dyslipidemia and the occurrence of complications.

CONCLUSIONS

Diabetes is associated with high incidence of dyslipidemia with elevated level of LDL, cholesterol and Triglyceride and low level of HDL. Poor glycemic control is associated with increased lipid levels. Routine monitoring of the lipid levels is essential during management of diabetic population.

To cite this article: Shrestha R, Adhikari S. Factors Affecting Choice Of Health Care Facilities Among The Adults of an Urban Community. MJSBH. 2021;20(2):123-9.

Conflict of Interest: None declared

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