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Original article

Fasting and postprandial lipid profile in type 2 diabetes mellitus patients: A descriptive observational study

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Abstract

Background: Diabetes mellitus (DM) referred as a group of metabolic disorders characterized by high blood sugar levels over an extended period. Hyperglycaemia occurs due to increase in high blood sugar levels by a deficiency in insulin action or secretion or both. It may lead to disturbances in the metabolism of Lipid, carbohydrates, and protein. Diabetic dyslipidaemia introduces further risks for several macro-vascular complications that could affect a large proportion of the population, and around 80% of Indian diabetic patients are likely to have such cardiovascular diseases (CVD). Hence, attempts for adequate control of dyslipidaemia clinically could help to manage the DM and related complications. However, this aspect has been largely overlooked and remains underdiagnosed.

Objectives: To study and compare the serum lipid profile values in patients with type-2 diabetes mellitus in fasting status and post prandial state.

Methodology: The present descriptive observational study was carried out at Department of General Medicine, Government Medical College and General Hospital, Mahabubnagar, Telangana involving 100 patients of diabetes type 2 that were selected from wards and Medicine OPD**.** Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA.

Results: Mean age of the study population was 59.98±9.84 years. 51% were females and 49% were males. Triglyceride value was elevated in 63% diabetic patients in fasting status and in 68% of diabetic patients in post prandial status. VLDL value was elevated in 63% diabetic patients in fasting status and in 66% of diabetic patients in post prandial status.

Conclusion: Prevalence of dyslipidaemia in fasting state in our study was: elevated TC-16%, elevated TG-63%, elevated LDL-17%, elevated VLDL-63% and reduced HDL-96%. There is

very negligible difference in the mean values of fasting and postprandial lipid profile in our study

Key words: serum lipid profile, type-2 diabetes mellitus, fasting and post prandial status

Introduction

Diabetes mellitus (DM) referred as a group of metabolic disorders characterized by high blood sugar levels over an extended period. Hyperglycaemia occurs due to increase in high blood sugar levels by a deficiency in insulin action or secretion or both. It may lead to disturbances in the metabolism of Lipid, carbohydrates, and protein.[1,2,3,4]

Worldwide, among DM the prevalence of type 2 or non-Insulin dependent diabetes mellitus (NIDDM) increasing significantly in South Asian population, especially in developing country like India. The incidence is increasing due to several factors like high BMI, a top body fat percentage, high upper body adiposity, a high degree of genetic predisposition, high level of insulin resistance, and high susceptibility to an environmental factor. Globally, over 382 million people involving age group of 20-79 years have Type 2 DM making it a significant health disease. India has the highest prevalence (estimated 65.1 million) of this disease in the world and hence WHO considered India as the diabetic capital of the world.[5,6,7] Deficiency of Insulin or resistance to Insulin may affect the vital enzymes and pathways in lipid metabolism resulting lipid abnormalities in DM.[8]

In a standard human diet, cholesterol and triglycerides are the significant fats that are taken up by the body. Insulin, the hormone that is primarily affected by diabetes has a role in esterification of fat in addition to assisting the glucose uptake and subsequent conversion into fat in the periphery and inhibition of hormone-sensitive lipase. Hence, in type 2 DM, the state of hyperinsulinemia hampers the entire downstream process that results in an abnormal increase of lipids especially triglycerides (TG) and cholesterol in the bloodstream, i.e., diabetic dyslipidaemia. Also, it also reported that half-life of HDL reduced whereas, the half-life of LDL increased that exerts immunogenic effects on diabetic patients causing damage to arterial endothelium.[9] It may introduce further risks for several macro-vascular complications that could affect a large proportion of the population, and around 80% of Indian diabetic patients are likely to have such cardiovascular diseases (CVD). Hence, attempts for adequate control of dyslipidaemia clinically could help to manage the DM and related complications. However, this aspect has been largely overlooked and remains underdiagnosed.[10]

Hence the present study aimed to compare fasting lipid levels with post-prandial lipid levels in type 2 DM.

Objectives

- To study and compare the serum lipid profile values in patients with type-2 diabetes mellitus in fasting status and post prandial state.

Methodology

Study setting: Department of General Medicine, Government Medical College and General Hospital, Mahabubnagar, Telangana

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Study population: Patients of diabetes type 2 were selected from wards and Medicine OPD of Government Medical College and General Hospital, Mahabubnagar, Telangana

Study period: January 2022 to May 2022

Study design: Descriptive observational study

Sample size: 100 Patients of diabetes type 2 was selected from wards of Government Medical College and General Hospital, Mahabubnagar, Telangana

Sampling technique: Simple Random sampling method

Inclusion criteria:

- Known cases of type-2 diabetes mellitus (According to ADA definition; Fasting plasma glucose ≥7.0 mmol/L (126 mg/dL), 2 hr plasma glucose or random plasma glucose ≥11.1 mmol/L (200 mg/dL) or HbA1C ≥6.5%.)
- Those willing to participate in the study after consent

Exclusion criteria:

- Known cases of type-1 Diabetes Mellitus
- Known cases of hypothyroidism and hyperthyroidism
- Known cases of Familial Dyslipidemia Syndromes

Methods of data collection:

Details of all the participants like age, name, gender, history of diabetes, treatment details were recorded. Anthropometric details were weight, height, BMI, waist circumference, WHR were recorded. Blood samples were collected for BSL fasting and postprandial, HBA1c and lipid profile.

After an overnight fast of 8 h, all the participants were requested to visit a nearby field centre. Initially, a sample of 8 mL of venous blood was collected on arrival for fasting glucose (FPG), lipid profiles and insulin measurements. Another 3 mL venous blood was taken 2 h after a 75 g glucose (2hPG) drink. Plasma glucose was measured by the glucose oxidase method using Dimension RxL Max (Siemens AG, Erlangen, Germany). Serum lipids were measured by standard enzymatic procedures (Dimension RxL Max; Siemens AG, Erlangen, Germany). HDL-C was assessed by the direct assay method, and Friedewald's formula estimated LDL-C. Lipid profile after 8 hours fasting and Lipid profile 2 hours after major meal was assessed.

All biochemical assays were carried out by the same laboratory technician teams using the same methods throughout the study period.

Statistical analysis:

Data was collected by using a structure proforma. Data entered in MS excel sheet and analysed by using SPSS 24.0 version IBM USA. Qualitative data was expressed in terms of proportions. Quantitative data was expressed in terms of Mean and Standard deviation. Association between two qualitative variables was seen by using Chi square/ Fischer's exact test. A p value of <0.05 was considered as statistically significant whereas a p value <0.001 was considered as highly significant.

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Results

Table 1: Distribution according to age and gender

		Frequency	Percent
Age group in years	30-40	4	4
	41-50	8	8
	51-60	38	38
	61-70	46	46
	> 70	4	4
	Total	100	100
Gender	Male	49	49
	Female	51	51
	Total	100	100

We included total 100 patients of type 2 diabetes mellitus in our study. Out of 100 cases, majority i.e. 46% were from 61-70 years, 38% from 51-60 years, 8% from 41-50 years and 4% each from 30-40 years and above 70 years. Mean age of the study population was 59.98±9.84 years.

51% were females and 49% were males. Females were predominant in our study with male to female ratio as 0.96:1

Table 2: Distribution of total cholesterol value in fasting and postprandial

		Fasting		Postprandial		Total	p value
		Frequency	Percent	Frequency	Percent		
TC	Normal	84	84	84	84	168	1.00 not significant
	Elevated	16	16	16	16	32	
Total		100	100	100	100	200	

Total cholesterol value was elevated in 16% diabetic patients in fasting status and also in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status ($p>0.05$)

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Table 3: Distribution of triglycerides value in fasting and postprandial

		Fasting		Postprandial		Total	p value
		Frequency	Percent	Frequency	Percent		
TG	Normal	37	37	32	32	69	0.45 Not significant
	Elevated	63	63	68	68	131	
Total		100	100	100	100	200	

Triglyceride value was elevated in 63% diabetic patients in fasting status and in 68% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05)

Table 4: Distribution of VLDL value in fasting and postprandial

		Fasting		Postprandial		Total	p value
		Frequency	Percent	Frequency	Percent		
VLDL	Normal	37	37	34	34	71	0.65 Not significant
	Elevated	63	63	66	66	129	
Total		100	100	100	100	200	

VLDL value was elevated in 63% diabetic patients in fasting status and in 66% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05)

Table 5: Distribution of LDL value in fasting and postprandial

		Fasting		Postprandial		Total	p value
		Frequency	Percent	Frequency	Percent		
LDL	Normal	83	83	84	84	167	0.84 Not significant
	Elevated	17	17	16	16	33	
Total		100	100	100	100	200	

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LDL value was elevated in 17% diabetic patients in fasting status and in 16% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05)

Discussion

Demographic information

We included total 100 patients of type 2 diabetes mellitus in our study. Out of 100 cases, majority i.e. 46% were from 61-70 years, 38% from 51-60 years, 8% from 41-50 years and 4% each from 30-40 years and above 70 years. Mean age of the study population was 59.98±9.84 years. 51% were females and 49% were males. Females were predominant in our study with male to female ratio as 0.96:1.

Madhu SV et al[11] in 2005 conducted the study with the objective to study the postprandial lipid abnormalities in patients with type 2 diabetes mellitus and included 20 male type 2 diabetic subjects (age 49.75 ± 4.82years).

Sujaya Raghavendra et al[13] in his study included 200 subjects and divided them into two groups, 100 controls (non-diabetic) and 100 cases (type 2 DM) with the age range of 30 – 60 years. Out of 100 non-diabetic controls, 58 were males and 42 females, and in 100 diabetic cases, 52 were males and 48 women.

In our study, total cholesterol value was elevated in 16% diabetic patients in fasting status and also in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05). Triglyceride value was elevated in 63% diabetic patients in fasting status and in 68% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05). LDL value was elevated in 17% diabetic patients in fasting status and in 16% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05). VLDL value was elevated in 63% diabetic patients in fasting status and in 66% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05). HDL value was reduced in 96% diabetic patients in fasting status and in 90% of diabetic patients in post prandial status. We observed no difference in the number of patients in both fasting and post prandial status (p>0.05)

Conclusion: Prevalence of dyslipidaemia in fasting state in our study was: elevated TC-16%, elevated TG-63%, elevated LDL-17%, elevated VLDL-63% and reduced HDL-96%. There is very negligible difference in the mean values of fasting and postprandial lipid profile in our study

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