

A Study of Fasting and Postprandial Lipid Profile in Patients with Type II Diabetes Mellitus

Nilima Deshpande¹, Gajanan Halkanche², Vishal Patil^{3*}, Rajaram Power⁴

¹Professor and Head of the Department, ²Associate Professor, ³Senior Resident, ⁴Dean, Department of Medicine, GMC Latur, INDIA.

Email: dr.vishalpatil13@gmail.com

Abstract

Background: DM is a common secondary cause of hyperlipidemia, particularly, if glycemic control is poor, which in turn is an important risk factor for atherosclerosis and coronary heart disease. **Aim:** To study fasting and postprandial serum lipid profile in type 2 diabetes mellitus patients. **Material and Methods:** This was a prospective observational study in which 200 patients with type 2 diabetes mellitus. Fasting and postprandial lipid profile which included serum total cholesterol, serum triglycerides, LDL cholesterol, HDL cholesterol and VLDL were estimated in all the patients on semi-automatic analyzer. **Results:** There was increase or rise of values of TC, TG, VLDL in post prandial state when compared with fasting lipid profile. The rise or increase in TG and VLDL values is statistically significant. It was also noticed that the low values of HDL and LDL cholesterol in post prandial state when compared to fasting lipid profile. This was statistically significant in case of HDL cholesterol only. **Conclusion:** Lipid profile was significantly elevated in the postprandial state as compared to fasting state in the Type 2 DM patients. Routine estimation of the postprandial lipid profile, rather than the fasting lipid parameters is advisable in the cardiovascular risk assessment in Type 2 DM. **Key Word:** Type 2 diabetes mellitus, lipid profile, Serum cholesterol, Serum triglyceride, Serum LDL

*Address for Correspondence:

Dr. Vishal Patil, Senior Resident, Department of Medicine, Government Medical College, Latur, INDIA.

Email: dr.vishalpatil13@gmail.com

Received Date: 06/01/2019 Revised Date: 10/02/2019 Accepted Date: 23/04/2019

DOI: <https://doi.org/10.26611/10211023>

Access this article online	
Quick Response Code:	Website: www.medpulse.in
	Accessed Date: 04 May 2019

INTRODUCTION

Diabetes mellitus (DM) is a common metabolic disorder characterized by absolute or relative deficiencies in insulin secretion and/or insulin action associated with chronic hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism.¹ DM is a common secondary cause of hyperlipidemia, particularly, if glycemic control is poor, which in turn is an important risk factor for atherosclerosis and coronary heart disease. The lipid abnormalities are prevalent in diabetes mellitus because insulin resistance or deficiency affects key enzymes and pathways in lipid metabolism.²

Microvascular and macro-vascular complications, including cardiovascular disease (CVD), retinopathy, nephropathy, and neuropathy, occur due to chronic uncontrolled hyperglycemia in diabetics.^{3,4} It has been proposed that the composition of lipid particles in diabetic dyslipidemia is more atherogenic than other types of dyslipidemia.⁵ The causal association between atherosclerosis and dyslipidemia is well established. Several previous studies have attempted to correlate blood glucose levels with serum lipid profile parameters.^{6,7} Research findings show that mainly body fat is responsible for increase in prevalence of this disease among the body composition components.^{1,8,9} The present prospective observational study was conducted to study fasting and postprandial serum lipid profile in type 2 diabetes mellitus patients.

MATERIAL AND METHODS

This study was conducted in Department of Medicine of at tertiary care center and teaching institution after obtaining permission from Institutional ethical committee. This was a prospective observational study in which 200 patients with type 2 diabetes mellitus meeting

the inclusion criteria and have given such written informed consent were included and were analyzed.

Inclusion criteria

- Patients with Type 2 Diabetes Mellitus of all age group, both male and female.

Exclusion criteria

- Type 1 diabetes
- Patients with hepatic disease, hypothyroidism, nephrotic syndrome
- Those using medications that affect lipid metabolism such as statins, beta blockers, thiazides and oral contraceptive pills,
- Unstable patients with type 2 DM, with deranged vital parameters.

A detailed clinical examination was done. Laboratory parameters including fasting and postprandial blood glucose, renal function tests, liver function tests, ECG and routine urine examination. Fasting and postprandial lipid profile which included serum total cholesterol, serum triglycerides, LDL cholesterol, HDL cholesterol and VLDL were estimated in all the patients. Blood was collected from patients after an overnight (12hour) fast and two-hour postprandial (after a standard meal) for lipid profile measurements. The standard meal consisted of a diet that provided 600 KCal of energy. (20% proteins, 50% carbohydrates and 30% fat).HbA1c could

not be done. (As the facility was not available in the institute). Lipid profile estimation was done on semi-automatic analyzer.

Statistical analysis: Data entered in Microsoft world 2010 and assessed by SPSS 20.0. Quantitative data was presented with the help of Mean, Standard Deviation, Median and IQR, comparison among study group was done with the help of appropriate statistical tests. Statistical tests applied: t-test (for n<30) z-test (for n>30). Qualitative data was presented with Frequency and Percentage tables. Association among study parameters is assessed with the help of paired t - test. P value less than 0.05 is taken as significant level.

RESULTS

Out of 200 patients, 87 (43.5%) were males and 113 (56.5%) were females in each group. In present study DM was found more in females. In present study, post prandial values of TG, TC and VLDL are higher comparative to fasting state. These higher values are statistically significant in case of TG only, both in male and female. Lower values of HDL and LDL in post prandial state were observed comparative to fasting state, but this change was statistically not significant. There was no statistically significant difference in fasting and postprandial lipid profile values in male and female.

Table 1: Gender and lipid profile in DM cases

Lipid Profile		Fasting		Post prandial	
		Male	Female	Male	Female
TC	Mean± SD	171.64±49.06	173.14±50.20	173.60±50.30	174.40±50.10
	P value	0.8327		0.9987	
TG	Mean± SD	195.02±104.25	194.15±103.49	232.70±132.93	232±132.07
	P value	0.9599		0.9705	
HDL	Mean± SD	33.15±9.74	33.66±10.44	31.25±9.80	31.57±10.01
	P value	0.7248		0.8213	
LDL	Mean± SD	100.14±42.11	100.76±42.01	97.60±44.45	98.25±44.10
	P value	0.9178		0.9181	
VLDL	Mean± SD	37.83±17.63	38.02±18.45	41.98±20.59	41.91±20.54
	P value	0.9414		0.981	

Present study included 4.5% cases between 31-40 years, 24.5% cases between 41-50 years, 43.5% cases between 51-60 years, 16% cases between 61-70 years and 11.5% cases are above 70 years. Most patients are from age group 51-60 years. In present study, there was no statistically significant difference observed in fasting and postprandial values of lipid profile in all age group. The only notable exception was TG values in the age group 51-60 years, which shows statistically significant difference in fasting and postprandial lipid profile.

Table 2: Age wise lipid profile in DM cases

Age in years		TC		TG		HDL		LDL		VLDL	
		F	PP	F	PP	F	PP	F	PP	F	PP
31-40	Mean	171.35	173.42	196.35	234.40	32.98	31.07	99.78	97.25	38.08	42.25
	SD	48.95	50.01	104.55	133.30	9.60	9.71	42.19	44.34	17.64	20.61
	P	0.9304		0.51		0.6803		0.9029		0.6509	

41-50	Mean	173.44	174.63	193.76	231.71	33.65	31.58	101.16	98.54	37.93	41.81
	SD	50.16	50.12	103.83	132.61	10.46	10.05	41.75	43.98	18.49	20.59
	P	0.9067		0.5087		0.3171		0.763		0.3288	
51-60	Mean	172.76	174.07	194.11	232.08	33.45	31.43	101.03	98.09	37.62	41.80
	SD	49.52	49.85	104.06	132.99	10.24	9.91	41.85	44.05	17.58	20.56
	P	0.8622		0.0367		0.1879		0.6523		0.1513	
61-70	Mean	171.70	173.74	194.58	232.32	33.19	31.25	100.24	97.85	37.75	41.92
	SD	48.82	50.07	103.86	132.31	9.2	9.76	41.91	44.29	17.57	20.50
	P	0.8695		0.2091		0.4287		0.8253		0.385	
70 and Above	Mean	171.92	173.79	195.05	232.81	33.10	31.26	100.49	97.73	37.80	41.95
	SD	48.47	49.84	104.54	133.47	9.72	9.84	41.56	44.00	17.66	20.63
	P	0.8979		0.2913		0.5268		0.8279		0.4675	

In the present study, it was observed that there is increase or rise of values of TC, TG, VLDL in post prandial state when compared with fasting lipid profile. The rise or increase in TG and VLDL values is statistically significant. It was also noticed that the low values of HDL and LDL cholesterol in post prandial state when compared to fasting lipid profile. This was statistically significant in case of HDL cholesterol only.

Table 3: Fasting and postprandial lipid profile in DM cases

Variables		Mean±SD	P value
Serum TC (mg/dl)	Fasting	173.14±50.20	0.8018
	PP	174.4±50.09	Not Significant
Serum TG (mg/dl)	Fasting	194.14±103.5	0.0016
	PP	231.99±132.06	Significant
Serum HDL(mg/dl)	Fasting	33.66±10.44	0.0417
	PP	31.57±10.01	Significant
Serum LDL(mg/dl)	Fasting	101.07±41.88	0.6637
	PP	99.19±44.5	Not Significant
Serum VLDL(mg/dl)	Fasting	37.93±18.35	0.0313
	PP	442.16±20.69	Significant

DISCUSSION

Lipid abnormalities are prevalent in diabetes mellitus because insulin resistance or deficiency affects key enzymes and pathways in lipid metabolism.² Lipid abnormalities associated with diabetes are termed as dyslipidemia rather than hyperlipidemia because there may be changes in both quality and quantity of the lipoproteins. Diabetes mellitus is a common secondary cause of hyperlipidemia, particularly, if glycemic control is poor. The dyslipidemia in type 2 DM is characterized by elevated plasma triglycerides levels, low levels of high-density lipoproteins (HDL) cholesterol.¹⁰ The distribution of patients according to gender of participants. Out of 200 patients 87 (43.5%) were males and 113 (56.5%) were females in each group. In our study DM was found more in females. In the study by Wali VV *et al*¹¹ there were 39 males and 36 females which is opposite to present study which had more number of females as compared to males. According to the Harrison(19th edition), the prevalence is similar in men and women throughout most age ranges (14% and 11%, respectively, in individuals age >20 years).¹² In present study, HDL, LDL values were low and TC, TG, VLDL values were high in postprandial state compared to fasting state, irrespective of the gender. This change was

statistically significant in case of TG only when compared to in both males and females. In the study of Lokhande *et al*,¹³ it was concluded that lipid profile as a risk factor for CVD, was significantly elevated in post prandial state as compared to that fasting state and that it was significantly elevated in the postprandial and fasting state in the type 2 DM as compared to the levels in their respective control group. In the study by Veeramalla V *et al*,¹⁴ it was concluded that the incidence of raised lipids levels in the diabetic patients is very high compared to non-diabetics. Similar results were found in the study by Uttra KM *et al*.¹⁵ In the study by Stamouli M *et al*,¹⁶ it was found that, 70% of diabetic patients presented with at least one lipid abnormality. The combination of elevated TG and reduced HDL-C was the most prevalent of the combined lipid abnormalities. Present study included 4.5% cases between 31-40 years, 24.5% between 41-50 years, 43.5% between 51-60 yrs, 16% between 61-70 years and 11.5% above 70 years. Average age in the study was 56.57±10.35 years. This was consistent with a similar study done by Sumesh Raj *et al*,¹⁷ wherein the mean age of the cases was 56.6±11.9 years. In the study by Wali VV *et al*¹¹ the mean age was 44.5±7.78 years which was much lower than present study. In the study by Uttra KM *et al*¹⁵ mean age was 53.73±7.88 years. In

present study, it was observed that lower values of HDL, LDL and higher values of TC, TG, VLDL in postprandial state when compared to fasting, was statistically not significant when compared in all age groups. In the study by Singh G *et al.*,¹⁸ results strongly suggest the lipid profile abnormalities in type 2 DM patients in the age range from 30 to 70 years. Similar results of lipid profile abnormalities in different age group was found in the study by Bhambhani GD *et al.*¹⁹ It was observed that TC, HDL and LDL values, both fasting and postprandial, were significantly lower in present study when compared to similar study done by Lokhande *et al.*¹³ and Wali *et al.*¹¹ Whereas TG values were higher in present study when compared to Lokhande *et al.*¹³ and Wali *et al.*¹¹ both in fasting and postprandial state. In present study VLDL values were lower in fasting state and higher in post prandial state when compared to study done by Wali *et al.*¹¹ In similar study done in Korean population by Mikyung Kim *et al.*,²⁰ TC, TG and LDL values, both in fasting and postprandial state, was significantly lower when compared to present study. The values of HDL cholesterol were higher in both fasting and post prandial state when compared to the present study. In the study of Mikyung Kim *et al.*,²⁰ it was concluded that fasting and post prandial lipids are not significantly different from each other and can be used in the assessment of achieving target goals in type 2 diabetic patients.

CONCLUSION

To conclude, lipid profile was significantly elevated in the postprandial state as compared to fasting state in the Type 2 DM patients. This signified a routine estimation of the postprandial lipid profile, rather than the fasting lipid parameters, in the cardiovascular risk assessment in Type 2 DM.

REFERENCES

1. Abou-Seif MA, Youssef AA. Evaluation of some biochemical changes in diabetic patients. *ClinicaChimica Acta* 2004; 346: 161–170.
2. Taskinen MR. Diabetic dyslipidemia. *Atheroscler Suppl* 2002; 3(1):47-51.
3. Folli F, *et al.* The role of oxidative stress in the pathogenesis of type 2 diabetes mellitus micro- and macrovascular complications: avenues for a mechanistic-based therapeutic approach. *Curr Diabetes Rev* 2011;7(5):313–324.
4. Maritim AC, Sanders RA, Watkins JB: Diabetes, oxidative stress, and antioxidants: a review. *J Biochem Mol Toxicol* 2003; 17(1):24–38.
5. Mahato RV, *et al.* Association between glycemic control and serum lipid profile in type 2 diabetic patients: glycated hemoglobin as a dual biomarker. *Biomed Res* 2011; 22(3):375–380.
6. Gadi R, Samaha FF. Dyslipidemia in type 2 diabetes mellitus. *Current Diabetes Report* 2007; 7(3):228–234.
7. Khan SR, Ayub N, Nawab S, Shamsi TS. Triglyceride profile in dyslipidemia of type 2 diabetes mellitus. *J Coll Physicians Surg Pak* 2008; 18(5):270–273.
8. Elnasri HA, Ahmed AM. Patterns of lipid changes among type 2 diabetes patients in Sudan. *Eastern Mediterranean Health Journal* 2008; 14(2):314–324.
9. Unalacak M, Kara IH, Baltaci D, Erdem O, Bucaktepe GE. Effects of Ramadan fasting on biochemical and hematological parameters and cytokines in healthy and obese individuals. *MetabSyndrRelatDisord.* 2011; 9(2):157–161.
10. Harper HA, *Lipids of Physiologic Significance.* In: RK Murray, DA Bender, KM Botham, PJ Kennely, VW Rodwell and PA Weil editors. *Harpers Illustrated Biochemistry* 29th Edition. New York: McGraw Hill Medical education; 2012. pp. 240- 58.
11. Wali *et al.* A Comparative Study on the Fasting and Postprandial Dyslipidemia in Type 2 Diabetes Mellitus. *International Journal of Clinical Biochemistry and Research* 2016; 3(2):177-180.
12. Alvin C Powers. *Diabetes mellitus. Harrison's principles of internal medicine.* 2015: 19th edition Vol II: McGraw Hill, USA. 2399-2430.
13. Lokhande S L *et al.*, Significance of Postprandial Lipid Profile in Type 2 Diabetes Mellitus; *Journal of Clinical and Diagnostic Research.* 2013 April, Vol-7(4): 627-630.
14. Veeramalla V, *et al.* Comparison of lipid levels in the diabetic and non diabetic patients: a study in a tertiary care hospital. *Int J Adv Med.* 2017 Dec; 4(6):1573-1577.
15. Ultra KM, *et al.* Lipid Profile of Patients with Diabetes mellitus (A Multidisciplinary Study). *World Applied Sciences Journal* 2011;12 (9):1382-1384.
16. Stamouli M, *et al.* Evaluation of the lipid profile in type 2 diabetes mellitus patients in Greece. *Clin Lab.* 2014; 60(10):1593-600.
17. Raj S, Rajan GV. Correlation between elevated serum ferritin and HbA1c in type 2 diabetes mellitus. *Int J Res Med Sci* 2013;1: 12-5.
18. Singh G, Kumar AK. A Study of Lipid Profile in Type 2 Diabetic Punjabi Population. *Journal of Exercise Science and Physiotherapy*, 2012; 8(1):7-10.
19. Bhambhani GD, Bhambhani RG, Thakor NC. Lipid profile of patients with diabetes mellitus: a cross sectional study. *Int J Res Med Sci* 2015;3: 3292-5.
20. Mikyung Kim *et al.* Post-prandial Lipid Levels for assessing goal achievement in type 2 diabetic patients taking statin. *Journal of Korean Medical Science.* 2010;25(3):387-392.

Source of Support: None Declared
Conflict of Interest: None Declared