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STUDY ON COMPARISON BETWEEN FASTING AND RANDOM LIPID LEVELS IN TYPE 2 DIABETES MELLITUS IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: Type 2 Diabetes Mellitus (T2DM) is a chronic condition linked to increased cardiovascular risk, primarily due to postprandial hyperglycemia and hypertriglyceridemia.

Aim: To compare fasting and random lipid profiles in diabetic patients and assess the clinical utility of random lipid testing.

Methods: A case-control study was conducted at a Tertiary Care Center in Puducherry involving 110 diabetic patients and 110 non-diabetic controls. Fasting lipid samples were taken after 8 hours of fasting, and random samples were collected 2 hours post-meal.

Results: Significant differences in all lipid parameters (triglycerides, LDL-C, VLDL-C, HDL-C, total cholesterol) were observed between diabetics and non-diabetics, in both fasting and random states. Among diabetics, only triglyceride levels differed significantly between fasting and random tests ($p < 0.001$), while other lipid values showed no significant variation.

Conclusion: Random lipid profiling may be a practical alternative to fasting tests for diabetic patients, but further large-scale studies are needed for validation.

INTRODUCTION

Diabetes Mellitus (DM) is a chronic, non-communicable metabolic disorder marked by persistent hyperglycemia, primarily due to impaired insulin secretion, insulin resistance, or both. Globally, it has reached epidemic levels, affecting 415 million people between the ages of 20 and 79 as of 2015, with projections estimating over 600 million by 2040.[1] Type 2 Diabetes Mellitus (T2DM) accounts for over 90% of all diabetes cases and is characterized by insulin resistance. In Type 2 Diabetes Mellitus, hyperglycemia is due to the decreased response to insulin action, defined as insulin resistance.[2]

Chronic hyperglycemia in DM can result in significant organ damage and complications, reducing quality of life and increasing mortality. These complications are classified as microvascular (e.g., retinopathy, nephropathy, neuropathy) and macrovascular (e.g., cardiovascular diseases, peripheral artery disease, strokes). Cardiovascular disease (CVD) risk in T2DM patients increases 2–4 times due to factors like dyslipidemia and postprandial metabolic disturbances. The increased prevalence of cardiovascular disability (CVD) among patients with Type 2 Diabetes Mellitus is because of the prolonged and exaggerated postprandial dysmetabolism and primarily due to the dysmetabolism of hyperglycemia and hypertriglyceridemia which causes endothelial dysfunction and oxidative stress.[3] Postprandial hypertriglyceridemia, even in individuals with normal fasting triglyceride levels, contributes significantly to endothelial dysfunction and atherosclerosis.

Managing lipid levels through fasting lipid profiles is standard practice, but this can be challenging for patients on insulin or living in rural areas. Recent studies suggest that random lipid profiles may serve as reliable alternatives. Research shows strong correlation between fasting and random lipid profiles in patients with T2DM, regardless of lipid-lowering medications.

This study aims to evaluate the effectiveness of random lipid profiles in comparison to fasting lipid profiles among the South Indian T2DM population, irrespective of medication use, to enhance diagnosis and management of diabetic dyslipidemia.

MATERIALS AND METHODS

Study Overview

This case-control study was conducted in the Department of General Medicine at a tertiary care centre at Puducherry, over an 18-month period (October 2022–March 2024). The study was started after obtaining Institutional Ethical Clearance (Ref. no: 24/SVMCH/IEC-Cert/Oct 22). A total of 220 participants were selected through convenient sampling. T2DM patients aged above 18 years, diagnosed according to ADA guidelines, were included as cases. Age- and gender-matched healthy individuals served as controls. Patients with conditions like Type 1 DM, thyroid disorders, pregnancy, chronic organ diseases, malignancies, or those unwilling to participate were excluded.

Data Collection and Methods

After obtaining informed consent, a clinical history and examination were recorded using a structured proforma. Fasting and random lipid profiles were assessed by drawing 2 ml of venous blood under aseptic conditions. Fasting samples were taken after 8 hours of overnight fasting; random samples were taken 2 hours post-meal. Parameters measured included total cholesterol, triglycerides, LDL-C, VLDL-C, and HDL-C using standardized biochemical methods. Blood glucose levels and HbA1c were also recorded.

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS v23. Descriptive statistics were used for demographic variables, while independent t-tests compared fasting and random lipid profiles. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic Distribution

The study included 110 patients with Type 2 Diabetes Mellitus and 110 healthy controls. The majority of patients were aged 45-55 years in both groups, with a mean age of approximately 48 years. The demographic characteristics are listed in table 1.

Table 1: Demographic characters of participants based on Age, Gender, Socioeconomic status, occupation, residence, BMI, Smoking & Alcohol History

Distribution of patients based on age				
Age (in years)	Cases		Controls	
	Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
25-35	12	10.9	12	10.9
35-45	26	23.6	28	25.5
45-55	49	44.5	40	36.4
>55	23	20.9	30	27.3
Distribution of patients based on Gender				
Male	75	68.2	70	63.6
Female	35	31.8	40	36.4
Distribution of patients based on socioeconomic status				
Class I	22	20	25	22.7
Class II	31	28.2	32	29.1
Class III	31	28.2	31	28.2
Class IV	26	23.6	22	20
Distribution of patients based on occupation				
Unskilled	15	13.6	15	13.6
Semiskilled	29	26.4	29	26.4
Skilled	39	35.5	35	31.8
Professional	27	24.5	31	28.2
Distribution of patients based on residence				
Rural	34	30.9	44	40
Urban	76	69.1	66	60
Distribution of patients based on BMI				
≤23	49	44.5	58	52.7
>23	61	55.5	52	47.3
Distribution of patients based on smoking history				
Present	53	48.2	64	58.2
Absent	57	51.8	46	41.8
Distribution of patients based on Alcohol history				
Present	66	60	72	65.5

Absent	44	40	38	34.5

BMI: Body Mass Index

Socioeconomic and Occupational Profile

Most patients belonged to Class II and III socioeconomic categories. A significant portion of the cases (35.5%) were skilled workers, followed by professionals and semi-skilled workers. Similar distributions were observed in controls.

Residential, BMI, and Lifestyle Factors

Most participants were from urban areas (69.1% of cases and 60% of controls). Over half of the diabetic patients (55.5%) had a BMI above 23, while most controls had a BMI below this threshold. Among the diabetic group, 48.2% had a smoking history and 60% reported alcohol consumption.

Clinical Profile

Most patients (66.4%) had been diagnosed with diabetes for less than 10 years and were managed primarily with oral hypoglycemics. HbA1c levels were below 7 in 53.6% of patients, indicating moderate glycemic control in table 2.

Table 2: Distribution of patients based on duration of Diabetes Mellitus

Duration of diabetes	Cases	
	Frequency (n)	Percentage (%)
1-10 years	73	66.4
>10 years	37	33.6

Lipid Profile Comparison

Diabetic patients had significantly higher fasting and random levels of triglycerides, LDL, VLDL, and total cholesterol, and lower HDL compared to controls. A comparison within diabetic patients showed higher triglyceride levels in the random state, with minimal changes in other lipid parameters in table 3.

Table 3: Comparison of fasting triglyceride level between cases and control

Lipid Profile parameter (Fasting)	Control		Case		t-test	p-value
	Mean	SD	Mean	SD		
Triglycerides	132.77	3.66	175.20	5.72	65.53	<0.001

DISCUSSION

This study aimed to assess the effectiveness of random lipid profile testing compared to fasting lipid profile testing in South Indian individuals diagnosed with Type 2 Diabetes Mellitus. A total of 110 diabetic patients and 110 healthy controls participated. The majority of diabetic patients were aged 45–55, with an average age of 48.34 years, and most were male (68.2%). In line with our research, Kamrul-Hassan et al.'s study revealed that approximately 190 participants with Type 2 Diabetes Mellitus were over 45, and Raghavendra S. et al.'s study revealed that approximately 45 participants with the disease were between the ages of 50 and 60.[4,5]

Similar to our study, the study by Nadeem S et al. also showed that the mean age of the patients with diabetes was found to be 45.2 years, and the mean age of the patients in the control group was found to be 45.6 years. But in the study by Chahal J et al., the mean age of the patients with Diabetes Mellitus was found to be 51.86 years.[6,7]

Many patients belonged to Class II and III socioeconomic groups and worked in skilled or semiskilled jobs. Urban residency was more common among diabetic patients, possibly due to lifestyle changes and greater healthcare access. The study by Habu M et al., also showed that Diabetes Mellitus were more commonly seen among salespersons, manufacturers and office workers, similar to the skilled category of the work.[8]

The study by Hwang J et al., the people with low socio-economic status were at a higher prevalence of developing Diabetes Mellitus.[9] The study by Funakoshi M et al. showed an inverse relationship between Diabetes Mellitus and socioeconomic status.[10] However the study by Agardh E et al., showed that the prevalence of Type 2 Diabetes Mellitus was more prevalent in low socioeconomic status in high-income countries, whereas in middle and low- income countries, it was more commonly seen in people with higher socioeconomic status.[11]

Over half of the diabetic individuals had a BMI above 23, and nearly half had a history of smoking Kamrul-Hassan et al. similarly demonstrated that approximately 49% of the patients had a BMI between 23 and 27.5, and approximately 38% of the patients had a BMI more than 27.5.[4] The study classified the patients' obesity using the WHO guidelines. Alcohol consumption was reported in 60% of the diabetic group. Two-thirds had been living with diabetes for less than 10 years. Most patients were receiving oral hypoglycemic medication, while a third were on insulin. Around 53.6% of patients had HbA1c levels below 7, suggesting moderate glycemic control. According to Kamrul-Hassan et al.'s study approximately 59.30% of patients with diabetes mellitus were using medications that decrease cholesterol.[4]

Lipid profile comparisons between diabetic and control groups showed significantly elevated levels of triglycerides, LDL-C, VLDL-C, and total cholesterol, while HDL-C was significantly lower in the diabetic group. A study by Chakraborty M et al. also showed a significant difference between the case and controls in the HDL-C values.[12]

A consistent pattern was observed in both fasting and random lipid values. Notably, triglyceride levels were higher in random samples (201.52 mg/dL) compared to fasting samples (175.20 mg/dL), while other lipid parameters remained largely unchanged between the two states. The findings support the clinical relevance of random lipid testing, especially for

triglycerides, in monitoring lipid abnormalities in diabetic patients. This study had certain limitations, due to the small sample size; the findings of the study may not be applicable to the broader population. As the study was conducted in a single centre, the results may be influenced by specific demographic and social factors, limiting their applicability to a more diverse or random population.

CONCLUSION

India is rapidly emerging as the diabetes capital of the world, with a rising number of individuals developing dyslipidemia, a condition that significantly increases the risk of cardiovascular diseases. In diabetic patients, triglycerides tend to remain elevated in the bloodstream for 6 to 8 hours post-meal, whereas in non-diabetics, they usually normalize within 2 to 3 hours. This study found a notable increase in both fasting and random lipid levels among diabetic individuals compared to non-diabetics, with the exception of HDL-C, which showed a significant decrease. Importantly, the study observed minimal differences between fasting and random lipid parameters in diabetic patients, apart from triglyceride levels. Based on these findings, the study suggests that random lipid profiling could serve as a reliable alternative to fasting lipid testing for evaluating dyslipidemia in diabetic patients. This approach may also offer greater convenience in clinical settings. However, the study emphasizes the need for further research involving larger sample sizes to validate these results and support widespread adoption of random lipid profiling in clinical practice.

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