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Original Research Article

A Prospective Research on Correlation between Lipid Profile and Diabetes Mellitus

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Abstract

Diabetes mellitus (DM) presents a global health challenge, often accompanied by dyslipidemia. Understanding the link between lipid profile and DM is crucial. Recent studies have explored this correlation. A study was conducted to find the relation between DM and blood lipids.

Methods: Individuals of both gender, aged > 18 years those come to this hospital for routine check-up were included. Fasting blood specimen was collected, transported to the hospital lab. Serum was used to estimate fasting blood glucose (FBG) and lipid parameters such as CL, TG and high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very-low-density lipoprotein (VLDL) were estimated by automated blood analyser. Based on the FBG levels, the members were classified to be DM and non DM.

Results: DM patients displayed markedly higher FBG levels (209 ± 63.1 mg/dL) compared to non-DM counterparts (88.4 ± 11.6 mg/dL) with a p-value of 0.0012. Additionally, DM individuals exhibited elevated TC, TG, LDL, and VLDL levels, and decreased HDL levels ($P < 0.01$), emphasizing dyslipidemia's association with DM.

Conclusion: This study found significant increases in FBG and lipid parameters, particularly TC, TG, and LDL, with notable decreases in HDL among DM patients compared to non-diabetic individuals. VLDL and TG exhibited the highest increases, correlating with TC and TG elevation. With this, managing DM's cardiovascular risks remains challenging despite available therapies.

Keywords: Diabetes mellitus, Dyslipidemia, Lipid profile, Blood glucose, Cardiovascular risk

Introduction

Diabetes mellitus (DM) represents a significant global health concern due to its increasing prevalence and associated complications. Among the numerous risk factors contributing to DM, dyslipidemia, characterized by abnormalities in lipid metabolism, has emerged as a key player. [1] Understanding the intricate relationship between lipid profile and DM is crucial for effective management and prevention strategies. Recent studies have shed light on this correlation, providing valuable insights into the pathophysiology and clinical implications of lipid abnormalities in DM.

Lipid profile, comprising cholesterol (CL), triglycerides (TG), and lipoproteins (LP), serves as a biomarker for assessing cardiovascular risk and metabolic health. Alterations in lipid levels are commonly observed in individuals with DM, contributing to the development and progression of vascular complications. A comprehensive review by Shah et al. [1] highlighted the bidirectional relationship between dyslipidemia and DM, emphasizing the role of lipid-lowering therapies in reducing cardiovascular events among diabetic patients.

Furthermore, advancements in lipidomics have enabled a deeper understanding of lipid species and their functional significance in DM. Recent studies utilizing lipidomic profiling have identified specific lipid signatures associated with insulin resistance and β-cell dysfunction in DM. [2] These findings underscore the heterogeneity of lipid metabolism in diabetes and the potential for personalized therapeutic interventions targeting lipid pathways. Moreover, emerging evidence suggests a link between novel lipid markers and diabetic complications. For instance, high-density lipoprotein (HDL) functionality, rather than absolute levels, has garnered attention as a predictor of cardiovascular risk in DM. [3] Similarly, the role of ceramides, bioactive lipid molecules, in insulin resistance and diabetic nephropathy has been

elucidated in recent studies, paving the way for targeted therapeutic approaches. [4] A study was conducted to find the relation between DM and blood lipids.

Methods:

It was a prospective study, conducted in the community Health Center, Peddapuram. Study was conducted between January 2024 to February 2024. Study protocol was approved by the Institutional Ethics Committee. Informed written consent was taken from the study members. Individuals of both gender, aged > 18 years those come to this hospital for routine check-up were included in the research. Non cooperative individuals, those on dyslipidemia medication were not considered in this research.

Initially the study was clearly explained to the members and all the doubts were clarified. It was also ensured that the non participation in the research will not influence the treatment protocol. Then demographic parameters were recorded in the proforma. After this physical examination was carried to the study members and findings were recorded in the study proforma.

As part of the study, on day 2 morning, the member of the study team visited participant's resident and blood specimen was collected by following the universal safety precautions. [5] Immediately the sample was transported to the hospital lab and serum was separated by centrifugation. With the serum, fasting blood glucose (FBG) and various lipid parameters such as CL, TG and LPs such as high-density lipoprotein (HDL), low-density lipoprotein (LDL) and very-low-density lipoprotein (VLDL) were estimated by automated blood analyser. Based on the FBG levels, the members were classified to be DM and non DM.

Statistical analysis: Statistical analysis was performed by using SPSS software version 20.0 and MS excel-2007. Descriptive data were tabulated as mean ± SD and percentages. The Chi-square test and student t test were used to assess the association among various categorical variables; $P < 0.05$ was considered statistically significant.

Results:

Total 143 members were included in this research; 82 were DM and 61 were non DM. the mean age was 49.34 ± 12.1 and 46.7 ± 11.65 years, respectively. DM individuals exhibited significantly higher FBG levels (209 ± 63.1 mg/dL) compared to Non-DM individuals (88.4 ± 11.6 mg/dL), with a p-value of 0.0012. Moreover, DM individuals had elevated levels of TC, TG, LDL and VLDL, along with reduced levels of HDL, compared to non DM individuals ($P < 0.01$). These findings underscore the association between dyslipidemia and DM, highlighting the importance of lipid profile assessment in diabetes management.

Table 1: Comparison of FBG and lipid parameters among the study members.

Parameter	DM	Non DM	P value
FBG (mg/dL)	209 ± 63.1	88.4 ± 11.6	0.0012
TC (mg/dL)	173.3 ± 34.2	145.2 ± 28.6	0.0021
TG (mg/dL)	174.32 ± 56.3	137.4 ± 35.6	0.00041
HDL (mg/dL)	38.3 ± 7.32	42.2 ± 6.98	0.0001
LDL (mg/dL)	113.62 ± 27.8	94.21 ± 19.62	0.00032
VLDL (mg/dL)	35.6 ± 18.92	24.56 ± 8.43	0.0005

Discussion:

According to a 2019 estimate, India's DM prevalence reaches about 77 million [8], with type 2 DM (T2DM) constituting 90% of cases. National Family Health Survey-4 and Longitudinal Aging Survey in India reported DM prevalence among males (15-50 years) at 2.1% (95% CI = 2.0-2.3%) and females (15-49 years) at 1.7% (95% CI = 1.6-1.8%). [9] Recent studies indicate a notable rise in death and disability-adjusted life years among T2DM patients globally, especially in Asian and southern Sub-Saharan African regions from 1999 to 2019. [10. 11] T2DM patients face heightened risks of cardiovascular disease (CVD) complications, particularly those with additional risk factors like dyslipidemia, obesity, and hypertension.

The significant disparity in FBG levels between individuals with and without DM underscores the pivotal role of FBG as a diagnostic marker for DM. A study by Xu et al. [12] corroborates these findings, demonstrating elevated FBG levels in diabetic patients compared to non-diabetic counterparts. Moreover, the observed p-value of 0.0012 indicates a strong statistical significance, further supporting the association between FBG and DM status. Similarly, research by Sharma et al. [13] highlights FBG's utility in identifying individuals at risk of developing DM due to its sensitivity to glycemic dysregulation. This stark contrast in FBG levels emphasizes the importance of regular screening and early intervention to mitigate the progression of diabetes and its complications.

Comparing FBG and lipid parameters among individuals with and without DM reveals significant differences in lipid profiles between the two groups. Elevated levels of TC, TG, LDL, and VLDL, along with reduced levels of HDL, are observed in DM

individuals compared to non-DM counterparts. Studies by Zheng et al. [14] and Wang et al. [15] corroborate these findings, demonstrating dyslipidemia's prevalence in diabetic populations, characterized by elevated TC, TG, LDL, and VLDL levels. Additionally, the observed reduction in HDL levels aligns with previous research indicating its inverse correlation with diabetes risk, as noted by Gao et al. [16]

The significant differences in lipid parameters between DM and non-DM individuals underscore dyslipidemia's association with diabetes and its complications, particularly CVD. Research by Zheng et al. [14] and Wang et al. [15] further emphasize dyslipidemia's role as a modifiable risk factor for CVD in diabetic patients, highlighting the importance of lipid management in diabetes care. Furthermore, the calculated p-values in the table indicate the statistical significance of these differences, as supported by studies emphasizing the importance of statistical rigor in clinical research, such as those by Wasserstein and Lazar [17] and Greenland et al. [18]

To conclude, this study found significant increases in blood glucose and lipid parameters, particularly TC, TG, and LDL, with notable decreases in HDL among DM patients compared to non-diabetic individuals. VLDL and TG exhibited the highest increases, correlating with TC and TG elevation. With this, managing DM's cardiovascular risks remains challenging despite available therapies.

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