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Original Research Article

Comparison of Lipid Profiles in Diabetic Patients and Non-Diabetic Controls

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Abstract:

Background: Diabetes mellitus is associated with disturbances of carbohydrate and lipid metabolism. Alterations in lipoprotein fractions may accompany poor glycemic control and may contribute to cardiovascular risk. This study evaluated lipid and related biochemical parameters in patients with diabetes mellitus compared with age- and sex-matched healthy controls.

Materials and Methods: This comparative study included 40 participants: 20 clinically diagnosed patients with diabetes mellitus and 20 age- and sex-matched healthy controls at BRIMS Bidar from March 2023 to feb 2024. Fasting blood glucose (FBS), postprandial blood glucose (PPBS), glycated hemoglobin (HbA1c), triglycerides (TAG), total cholesterol, HDL-C, LDL-C, VLDL-C, lipoprotein(a) [Lp(a)] and selected ratios were assessed. Descriptive statistics were expressed as mean ± SD, and an independent two-tailed Student t-test was used for intergroup comparisons; statistical significance was set at 5%.

Results: Compared with controls, diabetic patients had significantly higher FBS (167.70±59.80 vs 86.20±8.28 mg/dL), PPBS (238.30±81.31 vs 107.20±19.11 mg/dL), HbA1c (9.44±2.31% vs 5.41±0.30%), TAG (195.25±102.65 vs 128.60±28.25 mg/dL), VLDL-C (36.60±18.59 vs 24.95±5.98 mg/dL), and Lp(a) (46.20±22.92 vs 20.16±6.26 mg/dL). HDL-C was lower in patients (37.25±8.03 vs 45.05±6.64 mg/dL). Total cholesterol and LDL-C did not differ significantly. The cholesterol/HDL-C, HbA1c/HDL-C and HbA1c/LDL-C ratios were significantly higher in diabetic patients, whereas HbA1c/Lp(a) was not significantly different.

Conclusion: The study demonstrates a pattern of diabetic dyslipidemia characterized mainly by increased triglycerides and VLDL-C, reduced HDL-C, and increased Lp(a), with significant changes in selected lipid-to-HbA1c ratios. These findings support assessment of the broader lipid profile alongside glycemic indices in diabetes mellitus.

Keywords: Diabetes mellitus; Lipid profile; HbA1c; Triglycerides; HDL-C; VLDL-C; Lipoprotein(a); Dyslipidemia.

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Introduction

Diabetes mellitus is a common metabolic disorder characterized by hyperglycemia resulting from abnormalities in insulin secretion, insulin action, or both. The metabolic disturbance extends beyond carbohydrate metabolism and affects lipid and protein metabolism. The source dissertation describes diabetes as a condition in which impaired glucose utilization is accompanied by changes in lipid profile and proposes that lipid abnormalities may relate to disease severity as assessed by glycated hemoglobin.

Diabetic dyslipidemia commonly involves increased triglyceride-rich lipoproteins and reduced HDL-C, while LDL-C concentration may not necessarily be markedly elevated. The source study specifically examined triglycerides, total cholesterol, HDL-C, LDL-C, VLDL-C, Lp(a), HbA1c and selected ratios to characterize these changes.

Aim and Objectives

To study changes in serum lipoprotein levels in diabetes mellitus and examine their relationship with glycemic severity as adjudged by HbA1c.

- FBS
- Triglycerides (TAG)
- Total cholesterol
- VLDL-C
- LDL-C
- HDL-C

- HbA1c
- Lipoprotein (a) [Lp(a)]
- HbA1c/Lp(a)
- Total cholesterol/HDL-C
- HbA1c/HDL-C
- HbA1c/LDL-C
- HbA1c/total cholesterol

Materials and Methods

Study Design and Participants: The source dissertation describes a comparative study of 40 participants comprising 20 patients with diabetes mellitus attending the hospital outpatient department and 20 healthy persons matched for age and sex at BRIMS Bidar from March 2023 to feb 2024.

Study Variables: FBS, PPBS, HbA1c, TAG, total cholesterol, HDL-C, LDL-C, VLDL-C and Lp(a) were evaluated, together with HbA1c/Lp(a), cholesterol/HDL-C, HbA1c/HDL-C, HbA1c/LDL-C and HbA1c/total cholesterol ratios.

Laboratory Methods: The dissertation describes enzymatic/colorimetric procedures for glucose and triglycerides and an immunoturbidometric endpoint method for Lp(a). The Lp(a) assay used latex-sensitized reagent and optical density measurement at 600 nm. The glucose assay was based on glucose oxidase-peroxidase chemistry, and triglycerides were estimated by the GPO-Trinder method.

Statistical Analysis: Continuous variables were reported as mean ± SD (with minimum and maximum in the source), categorical variables as number and percentage.

Significance was assessed at the 5% level using a two-tailed independent Student t-test for intergroup comparisons.

Results

The study included 20 diabetic patients and 20 healthy controls. Patients were aged 17–66 years (mean 50.10±12.86 years); 8 were male and 12 female. Controls were aged 27–56 years (mean 39.50±9.66 years); 13 were male and 7 female.

Table 1: Comparison of biochemical and lipid parameters between diabetic patients and healthy controls.

Parameter	Diabetes (n=20)	Control (n=20)	p value
FBS (mg/dL)	167.70±59.80	86.20±8.28	<0.001
PPBS (mg/dL)	238.30±81.31	107.20±19.11	<0.001
HbA1c (%)	9.44±2.31	5.41±0.30	<0.001
TAG (mg/dL)	195.25±102.65	128.60±28.25	0.008
Total cholesterol (mg/dL)	174.25±42.86	169.20±24.57	0.650
HDL-C (mg/dL)	37.25±8.03	45.05±6.64	0.002
LDL-C (mg/dL)	100.40±34.83	100.95±21.22	0.952
VLDL-C (mg/dL)	36.60±18.59	24.95±5.98	0.011
Lp(a) (mg/dL)	46.20±22.92	20.16±6.26	<0.001
HbA1c/Lp(a)	0.36±0.43	0.31±0.14	0.641
Total cholesterol/HDL-C	4.79±1.21	3.81±0.68	0.003
HbA1c/HDL-C	0.26±0.07	0.12±0.02	0.001
HbA1c/LDL-C	0.10±0.04	0.06±0.01	0.001
HbA1c/total cholesterol	0.06±0.01	0.03±0.01	<0.001

Values are mean ± SD. The source dissertation reports significant increases in FBS, PPBS, HbA1c, TAG, VLDL-C and Lp(a), a significant reduction in HDL-C, and no significant difference in total cholesterol or LDL-C.

Discussion

The findings demonstrate clinically relevant dyslipidemia in the diabetic group. Glycemic indices were markedly higher in patients, with mean FBS and HbA1c substantially above those observed in controls. The dissertation interprets HbA1c as an index of mean glycemia and a marker associated with risk of diabetic complications. Triglycerides and VLDL-C were significantly increased, while HDL-C was significantly reduced. This pattern is consistent with the diabetic dyslipidemia described in the source material, in which high triglycerides and low HDL-C are accompanied by potentially more atherogenic LDL particle characteristics even when measured LDL-C is not significantly increased. Total cholesterol and LDL-C were not significantly different between groups. Nevertheless, the cholesterol/HDL-C ratio was significantly higher in patients, and the HbA1c/HDL-C and HbA1c/LDL-C ratios were also significantly increased. The dissertation suggests that these ratios may provide additional information regarding cardiovascular risk beyond individual LDL-C or total cholesterol measurements.

Lp(a) was significantly higher in diabetic patients, but HbA1c/Lp(a) did not differ significantly between groups. The source dissertation therefore concludes that Lp(a), although elevated in diabetes, was not demonstrably associated with HbA1c in this small sample. The study should be interpreted in light of its small sample size and comparative

design. In particular, the data establish differences between the two groups but do not by themselves establish causality or prospective cardiovascular outcomes.

Conclusion

In this comparative study of 20 patients with diabetes mellitus and 20 healthy controls, diabetes was associated with significantly higher FBS, PPBS, HbA1c, triglycerides, VLDL-C and Lp(a), together with lower HDL-C. Total cholesterol and LDL-C were not significantly different. Cholesterol/HDL-C, HbA1c/HDL-C and HbA1c/LDL-C ratios were significantly higher in diabetic patients, whereas HbA1c/Lp(a) was not significantly different. These findings highlight the importance of assessing the complete lipid profile and glycemic status rather than relying on total cholesterol or LDL-C alone.

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