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A Comparison of the Lipid Profiles of Postmenopausal Women with and without Diabetes

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ABSTRACT

Background: Post-menopausal women without diabetes, diabetic women have a much-increased chance of developing lipid problems, particularly atherogenic dyslipidaemia. The study aims to compare the lipid profiles of postmenopausal women with and without diabetes. **Methods:** This study is a comparative case-control study conducted over 6 months, from November 2025 to April 2026. The study takes into account 76 post-menopausal non-diabetic women (control group) and 76 post-menopausal diabetic women (study group) who visited Era Hospital in Lucknow. In all groups, a lipid profile was done. **Results:** Serum levels of TCHO, TGs, VLDL-C, LDL-C, and HDL-C (p = 0.012, 0.000, 0.001, 0.055 and 0.464, respectively). HDL-C decreased statistically significantly. **Conclusions:** According to the study, postmenopausal women with diabetes had a significant frequency of lipid problems. These results emphasise the necessity of routine lipid monitoring in postmenopausal women with diabetes.

KEYWORDS: *Amenorrhea, Diabetes, Menopause, Lipid profiles.*

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INTRODUCTION

During menopause, a woman is no longer able to get pregnant and does not have a monthly cycle. Post-menopause was defined as amenorrhoea for 12 consecutive months with no other explanation.[1] Menopause is regarded as a complex physiological phenomenon that greatly affects the quality of life as well as the risk of different diseases. The threat of CVD increases with the beginning of menopause, particularly in women with early menopause.[2] The menace of cardiovascular events is greater in post-menopausal women with obesity and T2DM.[3] A significant factor influencing women's well-being in the future is the age at which menopause begins.[4] The age at which menopause begins is predisposed by a variety of complex factors, which is why its onset can vary across different regions of the world.[5] Menopause typically occurs between the ages of 40 and 45.[6,7] The timing of menopause may be linked to various health conditions such as diabetes, gastrointestinal disorders, etc.[8] Nowadays, women are likely to spend roughly one-third of their lives after menopause. During this stage, the ovaries significantly reduce estrogen production, making health conditions and symptoms related to estrogen deficiency increasingly important for women's overall well-being.[9]

Lipoproteins, consisting of lipids and proteins, are essential for transporting endogenous lipids. These lipids are processed mainly in the liver rather than absorbed directly from the intestine. Based on increasing density, lipoproteins are categorised as chylomicrons, VLDLs, LDLs, and HDLs.[10,11] LDL, the chief transporter of cholesterol, transports nearly 60% of cholesterol to tissues, where it supports membrane structure and hormone production.[12] High LDL levels contribute to plaque buildup and atherosclerosis, increasing CVD risk.[13] In type 2 diabetes, dyslipidemia is common, marked by low HDL, high triglycerides, and elevated LDL due to insulin resistance.[14] By removing free cholesterol from cells and other lipoproteins and transferring it to the liver for excretion through bile, HDL helps prevent the accumulation of LDL-C.[15] By clearing excess cholesterol from blood vessels, HDL protects against the formation of plaque and atherosclerosis.[16] Around 25–33% of blood cholesterol is carried by HDL.[17]

TGs are fats primarily involved in energy metabolism, unlike lipoproteins. They make up about 95% of dietary fat and serve as the main form of stored body fat. For energy production, TGs in fat tissue release free fatty acids (FFAs), which bind to albumin and are transported to tissues. High blood TG levels are linked to cardiovascular disease.[18]

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Menopause leads to a decrease in estrogen and luteinizing hormone, which negatively impacts lipid metabolism. This results in increased levels of LDL and cardio-protective cholesterol.[19] Women with diabetes having risk of heart disease and heart failure compared to non-diabetic individuals.[20,21] This investigation aims to assess the lipid profile, which is a vital element in the management of postmenopausal women with diabetes, aiming to mitigate the heightened risk of cardiovascular diseases through early detection and comprehensive care.

MATERIALS AND METHODS

Study Subject

A total of 152 participants were included in this study, which was split into two groups. Seventy-six postmenopausal women without diabetes made up the first group, and seventy-six postmenopausal women with diabetes made up the second. All of the women were older than forty. The OPD Department of General Medicine and Obstetrics and Gynaecology provided diagnosed and confirmed T2DM patients for the study. All patients provided appropriate informed consent for this study.

Sample Collection

The antecubital vein in the front of the forearm was chosen for venous blood collection. A spirit cotton swab was used to sterilise the skin over the vein. Additionally, a disposable syringe was used to draw roughly 2 millilitres of blood. The lipid profile was estimated using the separated serum.

Inclusion and exclusion criteria

Women who have experienced a natural menopause in the past and who have not had a period for at least a year. The study included both diabetic and non-diabetic women. Women who were less than 40 years of age, on lipid-lowering drugs. Known patients with thyroid dysfunction and known patients with familial dyslipidemias were excluded from this study.

Biochemical assessment

The Erba-chem-5 plus2 semi-automated analyser was used to assay samples for all estimations. The TCHO, HDL, and TG were analysed by using the kit method according to the manufacturer's protocols. LDL and VLDL were calculated by using the formula.

RESULT

In a comparative study involving postmenopausal women, two groups were analysed: one comprising women with diabetes and the other without (Table 1).

Each group included 76 participants aged over 40 years. The mean age of women with diabetes was 54.71 years, with a standard deviation (SD) of 9.60 years, while the mean age of women without diabetes was 56.34 years, with an SD of 9.73 years. This indicates that, on average, postmenopausal women with diabetes were slightly younger than their non-diabetic counterparts.

In this analysis of lipid parameter between postmenopausal women with and without diabetes, significant differences were observed across several lipid parameters (Table.2). The diabetic group exhibited higher mean levels of TC at 181.8 ± 53.22 mg/dL, TG at 202.02 ± 96.51 mg/dL, low-density LDL at 101.78 ± 44.40 mg/dL, and VLDL at 39.80 ± 17.93 mg/dL, related to the non-diabetic group, which had TC at 161.11 ± 46.38 mg/dL, TG at 155.67 ± 71.30 mg/dL, LDL at 89.04 ± 36.40 mg/dL, and VLDL at 31.28 ± 14.69 mg/dL. The p-values for TCHO (0.012), TG (0.000), and VLDL (0.001) demonstrate that the groups' differences are statistically significant. However, the difference in LDL levels approached significance (p = 0.055), and HDL levels were similar between the groups (44.32 ± 14.96 mg/dL in diabetics vs. 42.63 ± 13.48 mg/dL in non-diabetics; p = 0.464).

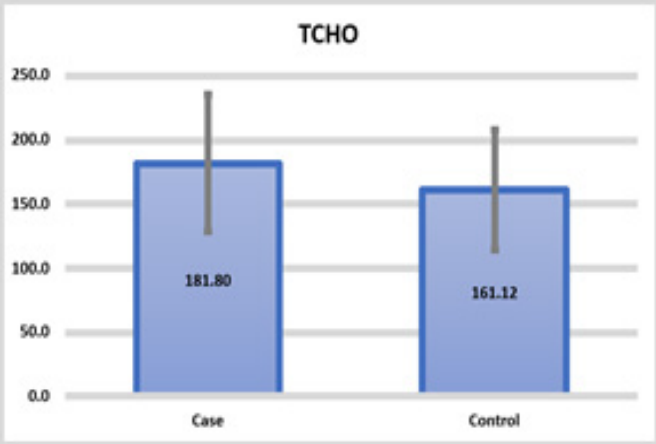


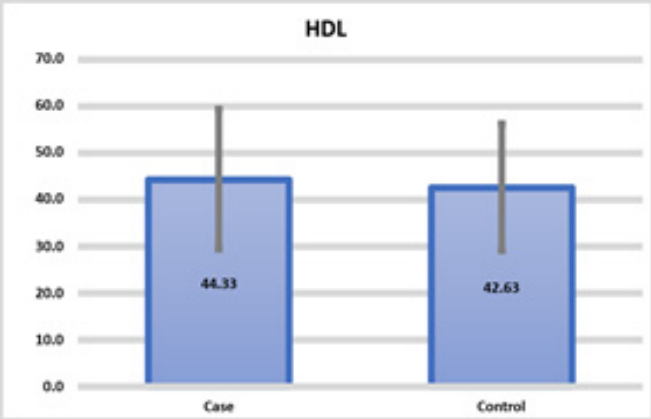
Figure 1: Bar Graph comparing the lipid profiles of two groups: Case and Control

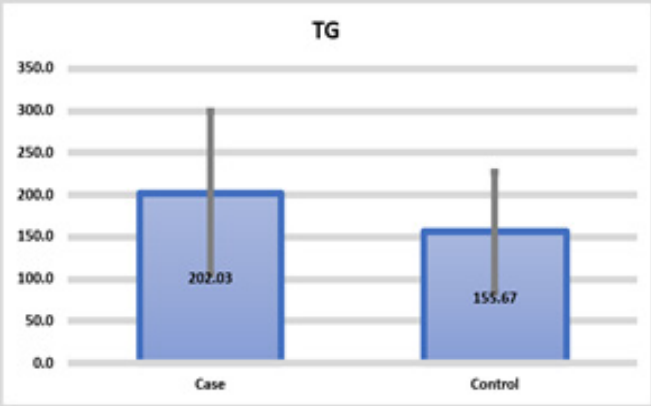
Table 1: Showing the number and age of participant in this study

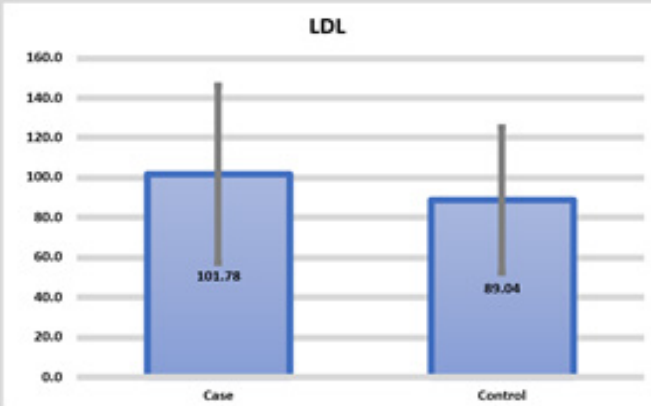
Study groups	No of participant	Age
Postmenopausal women with diabetes	76	Above 40 (54.71 ± 9.60)
Postmenopausal women without diabetes	76	Above 40 (56.34 ± 9.73)

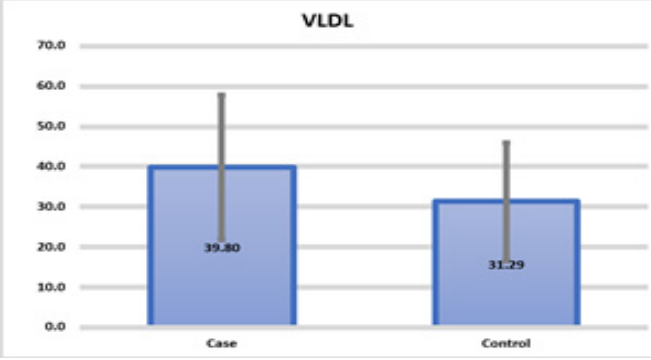
Table 2: Serum lipid profile and p-value in study groups

Study Groups	TCHO	TG	HDL	LDL	VLDL
Postmenopausal women with diabetes	181.8 ± 53.22	202.02 ± 96.51	44.32 ± 14.96	101.78 ± 44.40	39.80 ± 17.93
Postmenopausal women without diabetes	161.11 ± 46.38	155.67 ± 71.30	42.63 ± 13.48	89.04 ± 36.40	31.28 ± 14.69
p-value	0.012	0.000	0.464	0.055	0.001









Cont. Figure 1: Bar Graph comparing the lipid profiles of two groups: Case and Control

A series of bar graphs that contrast the two groups' lipid profiles: Case and Control. Each graph represents the mean values of different lipid parameters- TCHO, HDL, TG, LDL, and VLDL-with accompanying error bars that likely indicate standard deviation or standard error. In the TCHO graph, the Case group shows a higher mean total cholesterol level compared to the Control group. This elevation suggests a less favourable cholesterol profile in the Case group, though the overlapping error bars may indicate that the difference is not statistically significant. The HDL values are relatively similar between the two groups, with the Case group at 44.33 mg/dL and the Control group slightly lower at 42.63 mg/dL. The difference appears in the TGs values, where the Case group has a higher mean of 202.03 mg/dL, and 155.67 mg/dL in the Controls. This specifies an elevation in triglycerides. Similarly, LDL values-often labelled "bad" cholesterol—are elevated in the Case group at 101.78 mg/dL versus 89.04 mg/dL in the Control group, further reinforcing the presence of a less favourable lipid profile. Lastly, the VLDL levels are higher in the Case group (39.80 mg/dL) compared to the Control group (31.29 mg/dL), which corresponds with the elevated triglyceride levels, since VLDL is a major carrier of triglycerides in the blood.

DISCUSSION

Metabolic disorders influence lipid profiles, and changes in lipid metabolism have been linked to coronary heart disease and atherosclerosis. The mean TCHO level in diabetic women was 181.80 mg/dL, compared to 161.12 mg/dL in non-diabetic controls ($p = 0.012$). Similarly, TG levels were markedly higher in diabetics (202.03 mg/dL) than in controls (155.67 mg/dL). VLDL levels followed the same trend, with diabetic women showing a mean of 39.80 mg/dL versus 31.29 mg/dL in controls.

The mean HDL was somewhat higher in diabetics (44.33 mg/dL) than in controls (42.63 mg/dL). Although the mean LDL was higher in the diabetic group (101.78 mg/dL) than in the controls (89.04 mg/dL, $p = 0.055$). However, another study indicated that post-menopausal women's HDL concentrations were the same across all groups, while other characteristics were significantly higher.[24] Similarly, studies of Danquah et. al. showed that HDL-C has been reported to remain unpretentious.[25] Ogurtsova K et.al. reported that there were significantly higher Total Cholesterol-C, TG levels in postmenopausal than perimenopausal women, whereas HDL-C were significantly lower.[26]

A significant frequency of dyslipidaemia (69.7%) in postmenopausal women was also found by another Oguoma study and Stevenson et al.[27,28]

CONCLUSION

The study concludes that postmenopausal women with diabetes had significantly higher levels of TCHO, TGs, and VLDL compared to non-diabetic women, indicating increased cardiovascular risk. HDL levels decreased,

showing no significant difference, and LDL levels were slightly increased in diabetics, with no statistically significant difference. A large sample size must be studied to get more information about this comparison.

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