

## STUDY OF FASTING PLASMA GLUCOSE AND LIPID PROFILE IN POSTMENOPAUSAL WOMEN

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## ABSTRACT

**Objectives:** The study was designed to determine fasting plasma glucose (FPG) and lipid profiles in postmenopausal women.**Methods:** 200 postmenopausal women were enrolled for the study and were compared to 100 normal healthy women of the same age from the Outdoor Patient Department of LN Medical College and research center of Bhopal city. Those fulfilling inclusion and exclusion criteria were enrolled for the study and the blood samples were analyzed for lipid profile and FPG.**Results:** Significant higher concentrations of total cholesterol ( $p < 0.001$ ), triglyceride ( $p < 0.001$ ), low-density lipoprotein (LDL) ( $p < 0.001$ ), very LDLs ( $p < 0.001$ ), and FPG ( $p < 0.001$ ) were demonstrated in postmenopausal women when compared with normal healthy women. A significantly lower concentration of high-density lipoprotein ( $p < 0.001$ ) was demonstrated in postmenopausal women when compared with normal healthy women.**Conclusion:** Menopausal transition and the related changes in the hormonal milieu (e.g., decreased systemic estradiol (E2) levels) are linked with adverse changes in several indicators of metabolic health. For instance, during the menopausal transition elevated blood glucose levels and adverse changes in serum lipids have been reported.**Keywords:** Dyslipidemia, Post menopause, Glucose, Cardiovascular disease.© 2022 The Authors. Published by Innovare Academic Sciences Pvt Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>) DOI: <http://dx.doi.org/10.22159/ajpcr.2022v15i9.45884>. Journal homepage: <https://innovareacademics.in/journals/index.php/ajpcr>

## INTRODUCTION

Menopause is a normal physiological singularity that occurs in all women and incorporates the perimenopausal and postmenopausal periods. The climacteric or dangerous age of menopause is amid 45 and 65 years of age [1]. It is characterized by the enduring cessation of menstruation due to the loss of ovarian follicular function [2], and it is noticeable by biological, social, and psychological changes [3]. Postmenopause is the period beginning 12 months after the definitive cessation of menses [4]. After menopause, the ovaries cease to produce significant amounts of estrogen; therefore, symptoms and diseases which are associated with estrogen deficiency are of increasing importance to women's health [5].

Postmenopausal women are susceptible to increased cardiovascular risks because of the diminution in the ovarian follicles followed by a subsequent decrease in estradiol concentrations [6-8]. In addition, deranged lipid profiles with modifications in low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides (TG), total cholesterol (TC), and increased glucose levels have also been found in postmenopausal women. On the other hand, as compared to the postmenopausal phase of the women, secretion of estradiol in premenopausal women may offer a cardioprotective effect [8]. The incidence of cardiovascular disease after menopause may be partly caused by changes in the plasma lipid levels that occur following the menopausal transition [9-11]. LDL has been associated in the development of coronary heart diseases (CHD). Deposition of fatty plaques on arterial walls (arteriosclerosis) is a predisposing factor for CHD [12]. The present study is carried out to determine fasting plasma glucose (FPG) and lipid profiles in postmenopausal women.

## METHODS

The present study was undertaken in the Department of Medical Biochemistry, LN Medical College, and Research Centre Bhopal (M.P.). The study group comprises 200 postmenopausal women treated as cases and 100 Healthy women matched for age were treated as controls.

## Inclusion criteria

Postmenopausal women; aged between 45 and 64 years with a history of cessation of menses for at least 12 consecutive months were included in the study.

## Exclusion criteria

Pregnant or breastfeeding women; women who did not sign the consent form; women on medication that may affect the results; women suffering from serious chronic diseases (cancer, renal failure, etc.); and women using hormone replacement therapy were excluded from the study.

Blood sampling was performed in the morning, following a not less than 12 h. Fasting period 5 ml of blood (venous) samples were taken under aseptic conditions in sterile tubes from the normal healthy controls and the postmenopausal women. Biochemical parameters analyzed were FPG and lipid profile. The Institutional Ethics Committee granted ethical approval. All the data were computed and analyzed using Statistical Packages for the Social Science software version 20. Values are presented as Mean $\pm$ SD.  $p < 0.05$  is considered Significant and  $p < 0.001$  is considered highly significant. Anonymity and confidentiality were respected.

## RESULTS

Table 1 shows the anthropometric parameters in controls and cases. Table 2 shows the values of FPG and lipid profile between normal healthy women and postmenopausal women. It is evident from Table 1 that the mean values of TC, LDL, Very LDLs (VLDL), and FPG were found to be higher in postmenopausal women when compared with the control subjects. The mean value of HDL was found to be significantly lower in postmenopausal women when compared with the control subjects. The difference in values of TC, LDL, VLDL, HDL, and FPG in the study group and controls was found to be highly significant ( $p < 0.001$ ).

## DISCUSSION

Plasma glucose levels are one of the biochemical parameters often affected by menopause. As fertility hormones (estrogen and

**Table 1: Anthropometric parameters in normal healthy women and the postmenopausal women**

Variables	Healthy women	Postmenopausal women
Age	35±8.5	56±7.5
BMI	21.95±1.95	28.2±3.86
Waist Circumference	77±6.5	89.4±10.52

BMI: Body mass index

**Table 2: Values of FPG and lipid profile between normal healthy women and postmenopausal women**

Variables	Healthy women	Postmenopausal women	p value
FPG mg/dL	82.0±9.2	110.5±12.96	p<0.001
TC mg/dL	152±16.5	213.56±28.45	p<0.001
TG mg/dL	101.81±6.95	128.4±12.64	p<0.001
LDL mg/dL	85.65±21.9	160.4±29.87	p<0.001
HDL mg/dL	46.8±7.5	27.6±5.2	p<0.001
VLDL mg/dL	19.35±1.52	26.3±1.94	p<0.001

FPG: Fasting plasma glucose, TG: Triglycerides, LDL: Low-density lipoprotein, HDL: High-density lipoproteins, VLDL: Very low-density lipoproteins, TC: Total cholesterol

progesterone) level drop their combined effect, affects plasma glucose regulation and puts women at risk for insulin resistance which can promote the development of diabetes. The baseline FPG concentrations of postmenopausal women were toward the upper limit of the reference range. This may likely be linked to reduced estrogen and insulin production. Our findings indicate that in addition to aging, the increase in blood glucose may be explained by the decreasing Estrogen levels during the menopausal transition since estrogen is known to enhance insulin sensitivity and glucose disposal in women [13].

Menopause leads to changes in lipid profile by reducing HDL and elevating TC, TG, LDL-cholesterol (LDL-C), and VLDL cholesterol, thus increasing the risk for cardiovascular disease. A lipid outline is a blood test that is used to screen for abnormalities in lipids such as cholesterol and TG. Lipid profile measures levels of TC, LDL-C, HDL cholesterol, and TG and VLDL. It helps to identify dyslipidemia. Monitoring and maintaining healthy levels of these lipids are important in staying healthy [14]. Lipid profile is altered in menopause because of various reasons especially the changes in hormone levels, that is, estrogen which controls most other metabolic activities of the human body [15]. Estrogen is known to play a key part in the rule of the LDL-C receptors in the liver [16]. Reduced estrogen levels have been publicized to increase plasma lipoprotein and hepatic TG lipase leading to the accumulation of LDL-C fragments [17,18]. Thus, the downregulation of estrogen could account for the perturbations in lipid profile parameters observed in postmenopausal women. The results of this study were in agreement with those of earlier studies, which suggested that changes in lipid profile were caused by reduced estrogen concentrations which were seen in menopause. The results of the present study are as per the work of Jensen *et al.* [19], Stevenson *et al.* [10], Derby *et al.* [20], and Matthews *et al.* [21].

## CONCLUSIONS

Menopause leads to changes in lipid profile by elevating TC, TGs, LDL-C, and VLDL-C, thus increasing the risk for cardiovascular disease. Due to the change in the lipid pattern and loss of cardioprotective effect of estrogen, postmenopausal women are at increased risk of developing cardiovascular disease. Urgent attention needs to be focused on the cardiac health of women, especially for women who are postmenopausal and those with increased FPG levels.

## AUTHORS' CONTRIBUTIONS

Dr. Maninder Bindra has finalized the draft. Farha Ali has prepared the conceptual framework, designing of the draft, data analysis, and manuscript writing. All the authors have read and approved the final manuscript.

## CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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