

Effect of Menopause on Lipid Profile and Its Correlation with Coronary Artery Disease

Dipen R Damor¹, Mina D Varlekar², Hardika R Upadhyay³, Pradip H Damor⁴, Mukesh S Suvera^{5*}

¹Assistant Professor, Department of Medicine,
Dr M. K. Shah Medical College & Research Center, Ahmedabad, Gujarat, India.

²Tutor, Department of Physiology,
Dr M. K. Shah Medical College & Research Center, Ahmedabad, Gujarat, India.

³Tutor, Department of Physiology, GMERS Medical College, Junagadh, Gujarat, India.

⁴Assistant Professor, Department of Pulmonary Medicine,
Smt SCL Hospital and Smt NHL Municipal Medical College, Ahmedabad, Gujarat, India.

^{5*}Associate Professor, Department of General Surgery,
Smt SCL Hospital and Smt NHL Municipal Medical College, Ahmedabad, Gujarat, India.

ABSTRACT

Background: Menopause is a physiological event in every woman's life which is characterized by cessation of menses due to hormonal changes. Menopause occurs between the late 40s and early 50s. Postmenopausal women are particularly at risk of cardiovascular complications due to loss of protective effect of estrogen on cardiovascular system.

Aims and Objectives: Compare lipid profile (a risk factor for CAD) between Pre-Menopausal (Reproductive age) group and Post-Menopausal group in women.

Materials and Methods: Total 100 subjects which include 50 pre-menopausal and 50 post-menopausal healthy women without any major medical illness, who give consent were included for study. Physical parameter recorded and fasting blood sample was taken to evaluate serum lipid profile.

Results: Our study revealed that serum levels of TC, TG and LDL-C were higher in post-menopausal women group in comparison to their pre-menopausal women group. Similarly, HDL-C levels were lower in post-menopausal women group as compared with pre-menopausal women group.

Conclusion: Postmenopausal women have lack of cardioprotective action of estrogen causes they are prone to cardiovascular diseases. Decreased physical activity, faulty

habits of diet and lifestyle further increase the risk of cardiovascular disease. Awareness among perimenopausal women about menopause and cardiovascular health should be given to adopting healthy life style modification including physical exercise, diet, eating habits, yoga, and meditation.

Keywords: Menopause, Lipid Profile, Body Mass Index, Triglycerides, Estrogen.


*Correspondence to:

Dr. Mukesh S Suvera,
Associate Professor,
Department of General Surgery,
Smt SCL Hospital and Smt NHL Municipal Medical College,
Ahmedabad, Gujarat, India.

Article History:

Received: 28-05-2020, **Revised:** 26-06-2020, **Accepted:** 22-07-2020

Access this article online

Website: www.ijmrp.com	Quick Response code 
DOI: 10.21276/ijmrp.2020.6.4.012	

INTRODUCTION

Menopause is a permanent cessation of menstruation resulting from loss of ovarian function. menopause occurs between the late 40s and early 50s average being 50 years.¹ Menopause is a natural event in the aging process and signifies the end of reproductive years with the cessation of cyclic ovarian function as manifested by cyclic menstruation. Menopause is an estrogen-deficient state, but unlike other hormone deficient states, it is not a disease.² The time following menopause is referred to as post-menopause. With women living longer than before, a majority

would spend one third of their lives in post-menopausal stage. The health problems cropping up during this period are now obvious and better understood. It is therefore important to address all these menopause related diseases and apply prophylactic measures so that these women can lead an enjoyable and healthy life.

There is a fall in estrogen and progesterone levels which are synthesized and released by ovaries. There is a tendency to put on weight after menopause which is predisposing factor for

cardiovascular disease, hypertension, etc. After menopause, there is increasing fat mass and a change in fat storage distribution to deposit fat in central part of body that is abdominal location. The body mass index (BMI) has influenced on blood pressure and lipid profile and is a good predictor of hypertension and hyperlipidemia.³ The hormonal changes can cause development of metabolic syndrome after menopause and metabolic syndrome is a cluster of risk factors for further development of cardiovascular diseases.⁴ The hormonal changes associated with menopause, e.g., low plasma levels of estrogen and marked increase in follicle stimulating hormone levels exert a significant effect on metabolism of plasma lipids and lipoproteins. Studies by Swapnali et al. and Kalavathi et al. have shown altered lipid profile in post-menopausal women.^{5,6} Oestrogens have a protective effect against cardiovascular system as oestrogen lowers the LDL-cholesterol by acting on LDL-receptors. Apart from maintaining friendly lipid profile, oestrogens change the vascular tone by increasing nitrous oxide production. It stabilises the endothelial cells, enhances antioxidant effect and alters fibrinolytic protein. All these are cardio-protective mechanisms, which are lost in menopause due to reduced oestrogen levels. This leads to hyper-cholesterolemia, which is a key factor in the pathophysiology of atherosclerosis. High levels of LDL and low levels of HDL are strongly associated with increased incidence of cardiovascular disease. The risk of coronary artery disease (CAD) increases in women after menopause.^{7,8} Increase in the incidence of cardiovascular disease is related to many risk factors such as increase in body weight, ageing process, dyslipidaemia, physical inactivity, mental stress, smoking and alcohol intake.⁸ Recent evidence suggests that post-menopausal estrogen replacement therapy, which is commonly administered after bilateral oophorectomy is associated with a decreased risk of CAD.⁹

AIMS AND OBJECTIVES

To study lipid profile in Pre-Menopausal Group and Post-Menopausal Group this is a risk factor for CAD in women.

MATERIALS AND METHODS

Study conducted from September 2019 to February 2020 at Dr M K Shah Medical College and Research Centre.

Before selection of subjects aims of study, plan of investigation, informed consent was taken and its benefits were explained to the volunteers in their vernacular language. A detailed history of subjects and physical parameters like, height, weight and body mass index were recorded. Systemic examination of each subject was carried out.

Ages between 25 to 40 years were included in reproductive age group and Age between 45 to 55 years (whose menstruation had ceased 2 years back) was included in post-menopausal age group. The subjects with history of Diabetes mellitus, hypertension, any major illness, taking medicine for lowering lipid levels, family history suggestive of coronary heart disease (CHD), Smoking, drinking alcohol, tobacco chewing etc were excluded from study.

Instructions were given to all subjects to take dinner at 9-10 p.m. and remain fasting overnight until blood samples were collected in the next day morning. Fasting blood samples were collected in the next day morning by venepuncture of antecubital vein, with all aseptic precautions. A test dose of 5 ml of blood was collected with disposable syringe in plain bulb. Clear, unhemolyzed serum was obtained by centrifuging blood at 3000 rpm for 15 min. lipid profile was done by semi-automated analyser using enzymatic method. Lipids analysed were total cholesterol, triglycerides, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol.

Methods of Estimation:

Estimation of TC was done by CHOD-PAP method. [Cholesterol + oxygen --(enzyme cholesterol oxidase)--> cholestenone + hydrogen peroxide. Hydrogen peroxide + 4-aminophenazone + phenol --(enzyme peroxidase)--> colored complex]. Estimation of HDL cholesterol was done by phosphotungstic acid method, of TGs by enzymatic calorimetric method, of LDL-cholesterol by using Friedewald formula and of VLDL-cholesterol by using the formula: VLDL = TG/5.

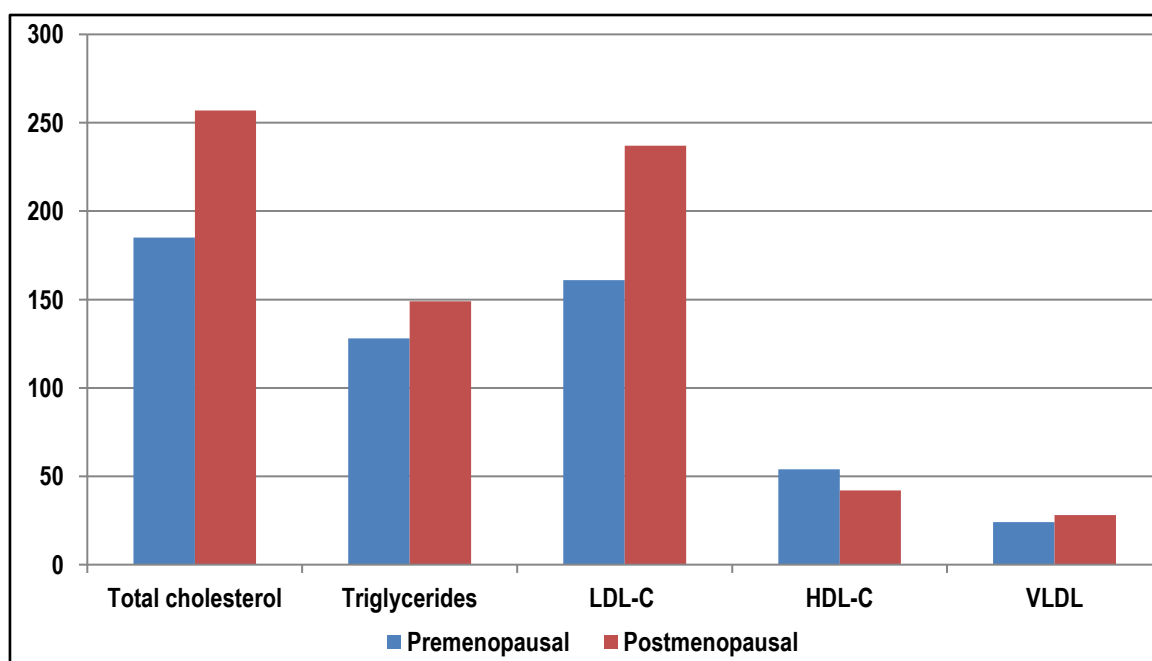


Fig 1: Lipid Profile in Both Pre-Menopausal and Post-Menopausal Group.

Table 1: Physiological Parameter in Both Pre-Menopausal and Post-Menopausal Group.

Parameters (Average)	Pre-Menopausal (n-50)	Post-Menopausal (n-50)
Age	36.5 ± 3.2	47.8 ± 3.1
Heights	154.1 ± 8.2	151.75 ± 6.02
Weights	58.8 ± 6.52	58.92 ± 6.68
BMI	24.76 ± 4.52	25.65 ± 4.24

Table 2: Lipid Profile in Both Pre-Menopausal and Post-Menopausal Group.

Parameters	Pre-menopausal	Post-menopausal
Total cholesterol	185.5 ± 26.72	257.5 ± 26.60
Triglycerides	128.5 ± 21.80	149.3 ± 19.22
LDL-C	161.5 ± 25.58	237.6 ± 29.70
HDL-C	54.3 ± 7.12	41.5 ± 5.20
VLDL	25.4 ± 3.36	28.5 ± 4.26

RESULTS

Total 100 women included in study which contain 50 women in Pre-Menopausal group contain age of 25 to 40 years and 50 women in Post-Menopausal Group contain age of 45 to 55 years. Average age in Pre-Menopausal Group and Post-Menopausal Group were 36.5 ± 3.2 years and 47.8 ± 3.1 years respectively. When compared Pre-Menopausal to Post-Menopausal women group Total Cholesterol, Triglycerides and LDL-C level were increased while HDL-C level was decreased.

DISCUSSION

In our study the age, weight, BMI values were within physiological limits in both groups. There was no significant difference in weight and BMI between pre and post- menopausal women. As compared Pre-Menopausal to Post-Menopausal women group Total Cholesterol, Triglycerides and LDL-C level were increased while HDL-C level was decreased. These changes are independent of BMI as the similar changes were found in women having normal weight as well as overweight. The findings of the present study correlated with previous study done by Bade G et al.¹⁰ and Ingale SS et al.¹¹

Estrogen play role in regulation of LDL receptors in lipid metabolism causes increased clearance of LDL particles by hepatocytes and reduction in plasma LDL-C. Estrogens can reduce remnants of TG-rich lipoproteins i.e., VLDL remnants and chylomicron remnants concentrations by increased elimination through hepatic LDL receptors. Estrogen increases HDL cholesterol by several mechanisms, which mainly includes increased hepatic production of apolipoprotein A and decreased hepatic elimination of HDL2 cholesterol by reducing activity of hepatic lipase.^{12,13} In Post-menopausal women estrogen level is low, which causes all of above mechanism hampered which lead to Total Cholesterol, Triglycerides and LDL-C level increased while HDL-C level decreased.

A major effect of estrogen on lipid metabolism is up to the regulation of LDL receptors, resulting in increased clearance of LDL particles by hepatocytes and reduction in plasma LDL-C. The elimination of normal LDL-C is accelerated more than the clearance of small dense LDL particles. This results in the relative increase in small dense LDL particles. Subjects having a large amount of small dense LDL particles are characterized by

increased plasma TG, reduced HDL cholesterol, higher fasting insulin levels and elevated visceral adipose tissue accumulation.¹⁴ Thus estrogen improves the turnover of both normal and small dense LDL-C. Remnants of TG-rich lipoproteins i.e., VLDL remnants and chylomicron remnants, are atherogenic particles that are being increasingly considered to be cardiovascular risk factors. Estrogen can reduce remnant.

Physical activity also plays a very important role in alteration of lipid profile. During physical activity or exercise free fatty acids are the main source of energy. Physical activity causes stored TGs are hydrolyzed to form free fatty acids and glycerol by enzyme TG lipase¹⁵ and also increases activity of the enzyme lipoprotein lipase lining the capillary endothelium. So physical activity in pre-menopausal and post-menopausal women also play important role in alteration in lipid profile. When physical activity increase serum levels of TC, TG and VLDL decreases while HDL level increase and vice a versa.¹³ Adrenal cortex and gonads are extremely active in LDL degradation.¹⁵ As gonadal activity decreases during menopause, LDL level increases.

Increase in incidence of cardiovascular disease in menopausal women may be attributed to increase in LDL cholesterol and serum triglycerides and decrease in high-density cholesterol during perimenopause. Whereas increase in blood pressure, fasting blood glucose level, weight, and waist circumference increase after menopause. Because the risk increases in postmenopausal women, there is a need for an increased awareness of the importance of cardiovascular disease. Risk of cardiovascular disease is high in postmenopausal women. By changing the lifestyle and with the help of exercise, there will be definitely reduced cardiovascular risk in postmenopausal women.

Our study emphasizes on postmenopausal health in women and the likely risks they are exposed to menopause is a phase of transition in women associated with a constellation of physical changes. This study tries to bring awareness about the likely changes and estrogen deficient risks. To reduce these complications, the postmenopausal women should take preventive majors such as change in lifestyle, change in food habits, daily exercise, yoga, and meditation. These may reduce the risk of cardiovascular disease in postmenopausal women. Further, non-invasive and invasive evaluation of cardiovascular system should also be undertaken if required.

CONCLUSION

We observed that high BMI, triglyceride, and LDL values in postmenopausal women increase the risk of cardiovascular disease. Women with increased BMI were convinced about adopting healthy lifestyle modifications including physical exercise, diet, yoga, meditation and eating habits. It is important to educate each and every postmenopausal woman to undergo screening for abnormal lipid profile. Specific health education strategies are required to prevent the emerging cardiovascular diseases among postmenopausal women. It also determines which patient should be referred to undergo further non-invasive and invasive evaluation of cardiovascular system.

REFERENCES

1. Kumar S, Shah C, Oommen ER. Study of cardiovascular risk factors in pre and postmenopausal women. *Int J Pharm Sci Res* 2012;3:560-3.
2. Pandey S, Srinivas M. Menopause and metabolic syndrome. *J Mid Life Health* 2010;2:63-9.
3. Mogra RK. Association of body mass index, body fat and hypertension among postmenopausal women. *J Hum Ecol* 2006;20:171-5.
4. Menthevis A, Lewis H. Changes in cardiovascular risk factors during the perimenopause and postmenopause and carotid artery atherosclerosis in healthy women. *Stroke* 2001;32:1104-11.
5. Swapnali RK, Kisan R, Murthy DS. Effect of menopause on lipid profile and apolipoprotein. *Al Ameen J Med Sci* 2011;4:221-8.
6. Kalavathi L, Dhruvanarayan HR, Zachariah E. Plasma estradiol and lipid profile in perimenopausal women. *Indian J Physiol Pharmacol* 1991;35:260-2.
7. Usoro CA, Adikwuru CC, Usoro IN, Nsonwu AC. Lipid profile of postmenopausal women in Calabar, Nigeria. *Pak J Nutr* 2006;5:79-82.
8. Gupta R, Rastogi P, Sarna M, Gupta VP, Sharma SK, Kothari K. Body-mass index, waist-size, waist-hip ratio and cardiovascular risk factors in Urban subjects. *J Assoc Physicians India* 2007;55:621-7.
9. Crawford SL, Johannes CB. The epidemiology of cardiovascular disease in postmenopausal women. *J Clin Endocrinol Metab* 1999;84:1803-6.
10. Bade G, Shah S, Nahar P, Vaidya S. Effect of menopause on lipid profile in relation to body mass index. *Chron Young Sci* 2014;5:20-4.
11. Ingale SS, Deshpande AA. A study of correlation between body mass index and lipid profile in postmenopausal women. *Natl J Physiol Pharm Pharmacol* 2019;9(6):481-484.
12. Medina RA, Aranda E, Verdugo C, Kato S, Owen GI. The action of ovarian hormones in cardiovascular disease. *Biol Res* 2003;36:325-41.
13. Satyanarayan U. Textbook of Biochemistry. 1st ed. Kolkata, India: Books and Allied Pvt. Ltd.; 1999. p. 293-339.
14. Park K. Park's Textbook of Preventive and Social Medicine. 20th ed. Jabalpur: M/S Banarsidas Bhanot; 2009. p. 345-9.
15. McArdle WD. Exercise Physiology, Energy, Nutrition and Human Performance. 3rd ed. Philadelphia, USA: Lea and Febiger; 1991. p. 398-623.

Source of Support: Nil.

Conflict of Interest: None Declared.

Copyright: © the author(s) and publisher. IJMRP is an official publication of Ibn Sina Academy of Medieval Medicine & Sciences, registered in 2001 under Indian Trusts Act, 1882.

This is an open access article distributed under the terms of the Creative Commons Attribution Non-commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Cite this article as: Dipen R Damor, Mina D Varlekar, Hardika R Upadhyay, Pradip H Damor, Mukesh S Suvera. Effect of Menopause on Lipid Profile and Its Correlation with Coronary Artery Disease. *Int J Med Res Prof.* 2020 July; 6(4): 55-58. DOI:10.21276/ijmrp.2020.6.4.012