

ORIGINAL RESEARCH ARTICLE

SERUM LIPID PROFILE AMONG POST-MENOPAUSAL WOMEN ATTENDING TERTIARY HOSPITAL AT CHITWAN, NEPAL

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ABSTRACT

**Background:** Menopause is a phase of woman's natural aging process and is marked by the cessation of ovarian function. The increased incidence of cardiovascular risk in post-menopausal women may be due to hormonal imbalance leading to derangement of lipid profile. The aim of study was to study the serum lipid profile among post-menopausal women attending at a tertiary care hospital in Nepal.

**Methods:** This was a hospital based descriptive cross-sectional study carried out among 156 post-menopausal women attending Medicine Out Patient Department at Chitwan medical college and teaching hospital. Serum Lipid profile were measured by an automated on Dimension® clinical chemistry analyzer and serum estrogen was measured by CLIA on Siemen ADVIA Centaur XP immunoassay. Data were analyzed using SPSS version 20.

**Results:** Study finding suggests that serum Triglycerides, Total cholesterol, and LDL were found to be elevated in 48.7%, 23.7% and 14.7% study participants respectively while serum HDL level was found to be low in 10.9% study subjects. Serum HDL had significantly associated with different age groups and estrogen ( $p < 0.05$ ). The serum TG, TC, and LDL were negatively correlated ( $r = -0.096$ ,  $p = 0.23$ ), ( $r = -0.09$ ,  $p = 0.22$ ), ( $r = -0.18$ ,  $p = 0.04$ ) with estrogen respectively while serum HDL was positively correlated ( $r = 0.32$ ,  $p = 0.01$ ) with estrogen. The serum TG, TC, LDL were negatively correlated with age and serum HDL was positively correlated with age.

**Conclusions:** Due to changes in lipid profiles and the loss of estrogen's cardio preventive impact, post-menopausal women are at an increased risk of developing cardiovascular disease.

INTRODUCTION

A woman's reproductive existence comes to an end during the menopause, a natural physiological process. The ultimate atresia of practically all oocytes in the ovaries leads to the cessation of menstruation.<sup>1</sup> For Nepalese women, the average age of menopause is 48.7 years.<sup>2</sup> Most women go through a variety of symptoms at this point, which can range from minor to severe.<sup>3</sup>

Due to the lack of a negative feedback mechanism, post-menopausal women have a drop in blood levels of estrogen and progesterone and an increase in luteinizing hormone (LH) and follicle stimulating hormone (FSH).<sup>4</sup> Post-menopausal women with low estrogen production experience changes in body fat distribution, vascular endothelium dysfunction, and lipid profile.<sup>5,6</sup>

A series of biochemical tests known as lipid profiles are frequently employed in the prognosis, diagnosis, and treatment of lipid-related illnesses, such as atherosclerosis. It includes cardiac risk factors, triglycerides (TG), total cholesterol

(TC), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very-low-density lipoprotein (VLDL).<sup>7</sup> coronary artery disease and HDL have an antagonistic relationship. LDL/HDL ratio is therefore utilized as a measure for predicting coronary artery disease.<sup>8,9</sup> Due to their low concentration, postmenopausal women lose the heart preventive effects of estrogen.<sup>10,11</sup> One of the main risk factors for CVD in postmenopausal women is estrogen insufficiency.<sup>12</sup> The study's objectives are to determine how menopause affects blood lipid profiles and to estimate postmenopausal women's likely CVD risk.

METHODS

This was a hospital based descriptive cross-sectional study was carried out in Department of Biochemistry in collaboration with Department of Medicine, Chitwan Medical College and Teaching Hospital, Bharatpur, Nepal. Ethical clearance was obtained from institutional review committee of Chitwan Medical College prior the data collection. (Ref no. 078/79-120). A total of 156 post-menopausal women were included following convenience sampling technique in this research

after taking informed consent. A details information of all study subjects along with lipid profile and serum estrogen were entered in a proforma constructed in Microsoft excel and later on transferred into SPSS.

A structured questionnaire was constructed to record their socio-demographic details including age. The data were collected from February 2022 to April 2022. All the apparently healthy aged 55 years and above who have attended at least 1 year of menopause were included in this study whereas patients with substance abuse like chronic smoking, and alcoholism, patients on medications that could alter the lipid profile (eg. acitretin, antipsychotics,  $\beta$ -blocking agents), women undergone hysterectomy and/or hormone replacement therapy were excluded from the study.

To analyze lipid profile and estrogen level, 5 ml blood sample were drawn from antecubital vein in vacuum gel tube. Blood sample was centrifuged at 3000 RPM for 5 minutes and serum were separated. Serum Total Cholesterol (TC), Triglycerides (TG), High density lipoproteins (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL), were measured by automated biochemistry analyzer on Dimension® clinical chemistry<sup>13-19</sup> and serum estrogen were measured by automated CLIA on Siemen ADVIA Centaur XP immunoassay system.<sup>20</sup> IBM SPSS (version 20) was used for data analysis. Descriptive and inferential analysis were done to see the relationship between lipid profile and some independent variables along with level of serum estrogen.

## RESULTS

Table 1 shows that out of 156 study subjects, post-menopausal subjects were highest 30.1% in the age group of 55-59 years and lowest 10.3% in the age group of 70-74 years.

**Table 1: Age distribution among post-menopausal women attending Chitwan medical college (n=156)**

Age group	Frequency (%)
55-59 years	47(30.10)
60-64 years	38(24.40)
65-69 years	33(21.20)
70-74 years	16(10.30)
75 and above	22(14.10)

**Table 2: Descriptive analysis on serum lipid profile among post-menopause (n=156)**

Variables	Statistics	Min/Max	Normality test*
TG	Median (IQR) = 140.5 (78.4)	53.43/466	Not-normal
TC	Mean $\pm$ SD = 185.62 $\pm$ 44.17	101/332	Normal
HDL	Median (IQR) = 49 (13)	20.47/81	Not-Normal
LDL	Median (IQR) = 104 (48.6)	46/203	Not-normal

\*Normality test was done through Shapiro wilk test at 5% level of significance, SD denotes standard deviation, IQR denotes inter quartile range

Table 2 shows the descriptive analysis on serum lipid profile among post-menopausal women. The Mean  $\pm$  SD of serum TC was 185.62 $\pm$  44.17. The Mean (IQR) of serum TG was 140(78.4), serum HDL was 49 (13) and serum LDL was 104(48.6) with 46/203(min/max).

In Table 3, post-menopausal women attending CMCTH were shown the relationship between the level of serum lipid profile and various age groups. While the blood HDL level was low in 10.9 percent of the participants, the serum triglyceride, total cholesterol, and LDL were all found to be increased in 48.7 percent, 23.7 percent, and 14.7 percent of the subjects, respectively. HDL was statistically significant in those cases (p 0.05).

**Table 3: Association between level of serum lipid profile and age group among post-menopausal women (n=156)**

Variables	Normal (%)	Age group		p-value
		55 to 65	Above 65	
TG	80 (51.3%)	43 (46.7%)	37 (57.8%)	0.17
TC	119 (73.6%)	68 (73.9%)	68 (73.9%)	0.40
HDL	139 (89%)	78 (84.8%)	61 (95.3%)	<b>0.03**</b>
LDL	133 (85.3%)	78 (84.8%)	55 (85.9%)	0.84

\*\* denotes significant association (by applying Pearson chi-square test at 5% level of significance).

The degree of linear association between serum lipid and age and serum estrogen level is seen in Table 4. Age and estrogen were strongly linked with serum HDL (p 0.005). While serum HDL was positively connected with estrogen (r=0.32, p=0.01), serum TG, TC, and LDL were all adversely correlated with estrogen (r=-0.096, p=0.23, r=-0.09, p=0.22, and r=-0.18, p=0.04). Serum TG, TC, and LDL had negative correlations with age (r=-0.13, p=0.09, r=-0.02, p=0.78, and r=-0.06, p=0.40, respectively), but serum HDL had a positive correlation (r=0.17, p=0.03).

**Table 4: Degree of linear relationship of serum lipid profile with age and estrogen (n=156)**

Serum lipid profile	Vs. Age		Vs. Estrogen	
	correlation	p-value	correlation	p-value
TG	-0.13	0.09	-0.096	0.23
TC	-0.02	0.78	-0.09	0.22
HDL	0.17	0.03**	0.32	0.01**
LDL	-0.06	0.40	-0.18	0.04**

\*\* denotes significant correlation (by applying spearman rank correlation coefficient).

## DISCUSSION

Low serum estrogen level in post-menopause leads

to dyslipidemia. Dyslipidemia is a major risk factor for atherosclerosis. Low serum estrogen level increases the plasma LPL activity and decreases the number of LDL receptors which leads to rise in plasma LDL level and in turn increases the CVD risk in postmenopausal women. So, estrogen deficiency is a major risk factors for CVD in postmenopausal women.

In present study, the serum Triglycerides, Total cholesterol, and LDL level were found to be elevated in 48.7%, 23.7% and 14.7% study subject respectively while serum HDL level was found to be low in 10.9% study subjects. The elevated serum TG, TC, and LDL-C in postmenopausal women has been attributed due to hormonal changes and failure of follicular development. The present study is similar to the study conducted by Jan Krakowiak *et al.*, and, Usoro *et al.*, and Sapkota A *et. Al*, who showed that serum TC, TG and LDL were elevated and serum HDL decreasesd in post-menopausal women.<sup>21-23</sup>

Hypercholesterolemia in postmenopausal women is due to impairment of the LDL receptor.<sup>24</sup> Serum TC is an independent risk factor for CVD and every 1% rise in TC is associated with at least 2% increase in the incidence of CVD.<sup>25</sup> Estrogen and progesterone level in plasma declines following menopause. Adipocyte size increases and lipoprotein lipase activity rises as a result of estrogen deprivation. The serum TG are subsequently released from adipocytes as a result of this. Triglycerides are also released from the liver as a result of the decreased progesterone level. Finally, postmenopausal women have greater levels of triglycerides.<sup>26</sup> The findings of the study is alike to ours. The similarity is because of increased lipoprotein lipase activity

Low serum estrogen level increases the plasma LPL activity and decreases the number of LDL receptors which leads to rise in plasma LDL level. According to Wakatsuki *et al.*, a decrease in estrogen levels during the post-menopausal era causes lipoprotein lipase activity to increase, which raises the

concentration of low density lipoproteins<sup>27</sup>. The findings of the study is similar to the findings of ours which is because of increased lipoprotein lipase activity and impairment in LDL receptor. Low levels of blood estrogen elevate plasma hepatic lipase activity, which boosts HDL absorption and catabolism and lowers plasma HDL levels.<sup>12</sup>

In present study, estrogen had positively correlated with HDL and negatively correlated with LDL, VLDL, TC, TG which is similar to the study conducted by Swarnalatha *et al.*<sup>28</sup> which showed positive correlation with HDL and negative correlation with LDL, VLDL, TC, TG.

## CONCLUSION

From this study, it was concluded that menopause is associated with altered serum lipid profile. The present study showed that the serum Triglycerides, Total Cholesterol and LDL were elevated while serum HDL was decreases in post-menopausal women. Increased LDL, Triglycerides, Total cholesterol and decreased HDL is an important risk factor for development of cardiovascular diseases. Therefore, it is important to consider each and every postmenopausal woman to undergo screening for abnormal lipid profile to prevent the associated co-morbidity. So in all post-menopausal women, specific health education strategies should be strongly recommended to prevent the emerging cardiovascular diseases.

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**CONFLICT OF INTEREST:** None

**FINANCIAL DISCLOSURE:** None

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