

Comparison of Lipid Profile between Premenopausal and Postmenopausal Group

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Abstract

Association between menopause and dyslipidemia has been documented by several studies. Several studies have shown that serum LDL & VLDL cholesterol levels, triglycerides are significantly higher and HDL cholesterol levels are lower in postmenopausal women when compared to age matched premenopausal women. So there is an increased risk of coronary artery disease (CAD) to women after menopause. The present study was carried out among 200 subjects, who were divided into two groups, 100 premenopausal and 100 postmenopausal groups. The study was done by obtaining serum sample from study group and controls, from randomly selected postmenopausal and premenopausal women of similar height and weight of general population of city. Significantly increased proportion of total cholesterol >200 mg/dl in postmenopausal women compared to premenopausal women. Postmenopausal women have significantly increased triglycerides level >150 mg/dl compared to premenopausal women.

Keywords: Lipid Profile; Postmenopausal Women; Premenopausal Women.

Introduction

Menopause is defined as permanent cessation of menses for 1 year following the loss of ovarian activity. It is a natural event in the ageing process and is heralded by menopausal transition, a period when the endocrine, biological and clinical features of approaching menopause begins.

Postmenopausal women are more prone to atherosclerosis related disorders. This is mainly because they lose their relative protection against atherosclerosis after menopause, due to the change in the lipid profile resulting from estrogen deficiency. However, several physiological changes which develop during menopause may also influence the risk of cardiovascular disease, such as ageing effect, increased body weight or android pattern of body fat distribution, decreasing resting metabolic rate and physical activity [1].

The hormonal changes associated with menopause eg:- low plasma levels of estrogen

and marked increase in luteinizing and follicle stimulating hormone levels exert a significant effect on the metabolism of plasma lipids and lipoproteins.

Association between menopause and dyslipidemia has been documented by several studies [3]. Several studies have shown that serum LDL & VLDL cholesterol levels, triglycerides are significantly higher and HDL cholesterol levels are lower in postmenopausal women when compared to age matched premenopausal women. So there is an increased risk of coronary artery disease (CAD) to women after menopause [2].

Earlier studies in western countries have shown that there is an alteration in lipid profile, so there is an increased risk of Coronary artery disease to women after menopause based on their living style, smoking, alcohol consumption, physical activities, food habits, working hours and stress [3,4].

The present study is being done to know that whether the similar changes of lipid profile occur in

our region of postmenopausal women considering their living style, working hours, food habits and physical activities.

Early identification of alterations in these biochemical parameters can aid in the effective planning and early application of preventive and therapeutic measures to reduce morbidity, mortality and psychological factors, that lead to happy ageing days ahead.

Methodology

The present study was carried out among 200 subjects, who were divided into two groups, 100 premenopausal and 100 postmenopausal groups. The study was done by obtaining serum sample from study group and controls, from randomly selected postmenopausal and premenopausal women of similar height and weight of general population of city. The study consists of both clinical and biochemical assay.

The collection of the samples, which is an invasive procedure to be performed in the study and the need for overnight fasting, was explained to the subjects and controls in vernacular, in detail and an informed consent for the same was taken. They were advised to continue their normal daily diet and working routine.

The vital parameters like pulse rate, BP, were recorded. Blood pressure was measured by Mercury Sphygmomanometer.

The subjects and controls were measured in supine position or sitting position first by palpatory method and then by auscultatory method. According to Korotkoff sounds, appearance of sound (phase I) is taken as Systolic BP, and disappearance of (phase V) Korotkoff sound is taken as Diastolic BP.

Methods of collection of data

- Proforma are given to all postmenopausal and premenopausal women.
- Written consents are obtained during the face to face questionnaire interview.
- Height and weight of each individual was recorded. BMI was calculated.
- Vital parameter like pulse rate. BP was recorded. A detailed examination of respiratory, cardiovascular, central nervous

system and gynaecological examination was done.

- All the patients were investigated as per requirement.
- After selecting the subjects and controls, appointment was scheduled in prior and they were requested to do an overnight fasting prior to the day of the test to get fasting blood sample for lipid profile analysis.
- Serum lipid profile was analyzed in Biochemistry clinical Lab

Results

Serum Total Cholesterol (TC)

The mean value of total cholesterol in premenopausal women was 146.45 mg/dl and of postmenopausal group was 186.20 mg/dl. There is very high statistical difference in serum total cholesterol levels between the two groups.

Serum Triglycerids (STG)

The mean value of triglycerides in premenopausal group was 98.23 mg/dl and of postmenopausal group was 137.13 mg/dl. There is very high statistical difference in serum total cholesterol levels between the two groups.

High Density Lipoprotein (HDL)

The mean value of HDL cholesterol in premenopausal group was 53.77 mg/dl and of postmenopausal group was 45.50 mg/dl there is very high statistical difference in serum total cholesterol levels between the two groups.

Low Density Lipoprotein cholesterol -(LDL)

The mean value of LDL cholesterol in premenopausal group was 73.00 mg/dl and of postmenopausal group was 113.31 mg/dl. There is very high statistical difference in serum total cholesterol levels between the two groups.

Very Low Density Lipoprotein cholesterol-{VLDL}

The mean value of VLDL cholesterol in premenopausal group was 19.08 mg/dl and of postmenopausal group was 27.39 mg/dl. There is very high statistical difference in serum total cholesterol levels between the two groups. All the lipid profiles TC, TG, LDL, VLDL was significantly higher and HDL level lower in postmenopausal women.

Table 1: Lipid profile Analysis

Parameter	Premenopausal group [mean SD]	Postmenopausal group [mean SD]	Significance (z and p value)
Total Cholesterol	146.00	186.20	z=8.74 p<0.0001 HS
Triglycerides	98.23	137.23	z=5.42 p<0.001 HS
HDL	53.77	45.50	z=13.15 p<0.0001 HS
LDL	73.00	113.31	z=8.82 p<0.0001 HS
VLDL	19.08	27.39	z=5.37 p<0.001 HS
Inference	All the lipid profiles are significantly higher in post meno		

Total Cholesterol

There was significantly increased proportion of total cholesterol >200 mg/dl in postmenopausal women with compared to premenopausal women.

Table 2: Association of total cholesterol with two groups

Total cholesterol (mg/dl)	Premenopausal (n=100)	Postmenopausal (n=100)	Significance
140	45	15	$\chi^2=21.43$ p<0.0001 HS
141-170	35	17	$\chi^2=8.42'$ p<0.01 S
171.200	19	29	$\chi^2 = 2.74'$ p>0.001 HS
>200	1	39	$\chi^2 = 45.12$ p<0.0001 H
Inference	Significantly increased proportion of total cholesterol >200 mg/dl in postmenopausal women compared to premenopausal women. (p<0.0001)		

Table 3: Association of Triglycerides with two groups of women

Triglycerides (mg/dl)	Premenopausal (n=100)	Postmenopausal (n=100)	Significance
100	45	15	$\chi^2 = 16.99$ p<0.0001 HS
101-150	31	37	$\chi^2 = 0.80$ p>0.05 NS
151.200	7	17	$\chi^2=4.73$ p<0.05 S
>200	2	16	$\chi^2=11.96$ p<0.001 HS
Inference	Postmenopausal women have significantly increased triglycerides level >150 mg/dl compared to premenopausal women (p<0.001)		

Table 4: Association of LDL with two groups of women

LDL (mg/dl)	Premenopausal (n=100)	Postmenopausal (n=100)	Significance
100	82	33	$\chi^2 = 14.12$ p<0.0001 HS
101-130	17	36	$\chi^2 = 9.26$ p>0.01 NS
>30	1	31	$\chi^2=33.48$ p<0.0001 HS
Inference	Significantly increased proportion of abnormal LDL (>130 mg/dl) in postmenopausal women compared to premenopausal women (p<0.0001)		

Table 5: Association of HDL with two groups of women

HDL (mg/dl)	Premenopausal (n=100)	Postmenopausal (n=100)	Significance
45	0	56	$\chi^2 = 77.78$ $p < 0.0001$ HS
46.55	77	42	$\chi^2 = 25.42$ $p > 0.0001$ NS
>55	23	2	$\chi^2 = 20.16$ $p < 0.0001$ HS
Inference	The proportion of abnormal HDL (=45 mg/dl) is significantly higher in postmenopausal women compared to premenopausal women ($p < 0.0001$)		

Discussion

In comparing pre and post menopausal females, there is elevation of total cholesterol, triglycerides, LDL and decrease in HDL levels in the post menopausal age group, p-value is less than 0.001 in all the lipid levels.

Thus, the results of this study demonstrate that menopause has profound effect on lipid concentrations independent of any effect of the ageing processes and body mass index changes.

The mean value of total cholesterol in premenopausal women was 146.4524.84 mg/dl and of postmenopausal group was 186.2038.09 mg/dl.

The mean value of triglycerides in premenopausal women was 98.2335.25 mg/dl and of postmenopausal group was 137.1362.49 mg/dl.

The mean value of HDL cholesterol in premenopausal women was 53.774.87 mg/dl and of postmenopausal group was 45.503.97 mg/dl.

The mean value of LDL cholesterol in premenopausal women was 73.0025.41 mg/dl and of postmenopausal group was 113.3137.97 mg/dl.

The mean value of VLDL cholesterol in premenopausal women was 9.087.04 mg/dl and of postmenopausal group was 27.3912.51 mg/dl.

The mean values of total cholesterol, LDL and triglyceride levels in the postmenopausal females are significantly higher than those in the premenopausal females. The fall in HDL cholesterol level is significant as compared to the control group.

These data correlate well with the study on serum lipids in pre and postmenopausal females done by Gupta, N et al. [5], in 2009. 200 women in age group of 40-45 yrs were studied. There was significant increase ($p < 0.001$) in serum total cholesterol, LDL, VLDL, TG and significant decrease ($p < 0.001$) in HDL in postmenopausal women compared to premenopausal women. Our study was done in age group 23.56 years and $p < 0.001$ was comparable to their study.

These data also correlate well with the study done by Suman Umesh chandra et al. [6], in India, on postmenopausal women. There was significant increase in serum total cholesterol, LDL, TG and atherogenic index, significant decrease in HDL in postmenopausal women compared to premenopausal women in their study.

A study was done by Nwagha U, et al. [7], on atherogenic index of plasma as useful predictor of cardiovascular risk among postmenopausal women in Nigeria. Results showed there was statistically significant increase in STC, STG, LDL-C, VLDL-C and AI but a statistically significant decrease in HDL-C in postmenopausal women when compared with the premenopausal subjects.

A study done by Vishal R Tendon et al. [8] on the prevalence of cardiovascular risk factors in postmenopausal women in Jammu and Kashmir India in 2010 showed lipid values similar to our study. The percentage of low HDL < 40mg% was very less in our study compared to theirs.

Our study data also correlates well with other studies on serum lipids in pre and postmenopausal females in Japan by Ushiroyama et al. [9] 1993.

In our study, the mean values of total cholesterol in the premenopausal and postmenopausal women are 146.4524.84 mg/dl and 186.2038.07 mg/dl respectively. It is evident that total cholesterol in the premenopausal women is higher when compared to postmenopausal women and is statistically significant ($p < 0.0001$).

Berg, et al., [10] demonstrated higher total cholesterol, LDL-C and triglycerides in menopausal transition and postmenopausal women in comparison with premenopausal women. A similar observation was also made by Carr, et al. [11] in postmenopausal Caucasians.

In the postmenopausal women due to estrogen deficiency, as the concentration of all the atherogenic lipoproteins increase the concentration of total cholesterol also increases. TC is an independent risk factor for CAD. With the serum TC alone the detection rate of CAD was 11.6%.

In our study the mean values of triglycerides in the premenopausal and postmenopausal women are 98.23 ± 35.25 mg/dl and 137.13 ± 62.49 mg/dl respectively. Women higher and is statistically significant ($p < 0.001$).

A study done by Carr MC, et al. [12]. Showed post menopausal women had significantly higher LDL-C, Total cholesterol, Triglycerides and decreased HDL than premenopausal women. They say all women in the menopausal transition and postmenopausal had significantly more dense LCL particle during menopause transition act to worsen the lipoprotein profile.

A study done by C-J Chang, et al. [13] on the postmenopausal women showed higher android fat percentage, centrality index, increased Total cholesterol, LDL-C, and Atherogenic indices and decreased HDL-C than premenopausal women. Estrogen depletion after menopause had lower sex hormone binding globulin, higher activity of lipoprotein lipase in the abdominal subcutaneous adipose tissue than premenopausal women.

Estrogen is a regulator of lipoprotein lipase. After menopause due to estrogen deficiency, there is increased plasma lipoprotein lipase (LPL) and hepatic TG lipase activity, leading to plasma LDL accumulation and down regulation of LDL receptors and increased small dense LDL particles formation. Higher the increase in small dense particles higher is the LDL oxidation. The increase in small LDL particles is the characteristic of postmenopausal atherogenic shift. These small dense LDL particles have greater affinity for binding to proteoglycans than large buoyant LDL particles. Hence these particles are associated with three times increase in CAD risk.

In our study, the mean the values of very Low Density Lipoprotein in the premenopausal and postmenopausal women are 19.80 ± 7.04 mg/dl and 27.39 ± 12.97 mg/dl respectively. Serum VLDL in the premenopausal women is high when compared to postmenopausal women and is statistically significant ($p < 0.001$).

In the postmenopausal women due to estrogen deficiency, the concentration of small VLDL particles increases. The relative enrichment of small VLDL particles with cholesterol esters is unclear but could be due to catabolism of VLDL particles with resulting increased number of VLDL remnant particles or increased activity of cholesterol esterase transfer protein or both. These small VLDL particles contain more cholesterol esters per particle and are highly atherogenic. The VLDL have high capacity

for interacting with skin fibroblasts and arterial smooth muscle cells.

In our study, the mean values of High Density Lipoprotein in the premenopausal and postmenopausal women are 53.77 ± 4.87 mg/dl and 45.50 ± 3.97 mg/dl respectively. Serum HDL in the premenopausal women is low when compared to postmenopausal women is statistically significant ($p < 0.0001$).

HDL removes excess tissue free cholesterol via transfer from the cell membrane to the liver. So plasma concentration of HDL cholesterol is inversely related to risk of CAD. Due to estrogen deficiency, postmenopausal women have highest activity of postheparin hepatic lipase and enhances the uptake of HPL and also the catabolism of HDL thus decreasing the plasma level of HDL. In postmenopausal women there is increased accumulated LDL. Hence, postmenopausal women were having low HDL compared to premenopausal women. A reduction of plasma HDL may impair the normal clearance of cholesterol from arterial wall and thereby accelerate the development of atherosclerosis. For every 10 mg/dl of increase in HDL there is corresponding 50% reduction of CAD risk.

TC/HDL ratio:

The inverse relationship between HDL level and the incidence of coronary artery disease has demonstrated by Castell et al. [14]. His study also shows that the ratio of total cholesterol / HDL of > 4.5 is associated with greater incidence of coronary artery disease. Since the risk of CAD increases progressively in proportion to TC/HDL ratio, this may to some extent explain the waning protection of or women against CAD and other vascular diseases as the age advances.

Conclusion

In our study there was significant difference in all the lipid parameters between the two groups. Total cholesterol, was increased significantly in postmenopausal women compared to premenopausal women, this may be due to the estrogens deficiency that raises total cholesterol, lipoprotein levels providing lipid profile highly favorable to atherogenic potential. LDL was also statistically significant in postmenopausal women. The development of CAD is a function of the particle size of LDL and HDL with small particle size exhibiting great atherogenic potential.

Triglycerides, and VLDL and total cholesterol

were higher in postmenopausal women compared to premenopausal where as HDL was lower in postmenopausal women. TG are an independent risk factor for CAD. In this study total cholesterol/HDL ration >4.5 was seen 33% of women. The risk of CAD increases progressively in proportion to TC/HDL ration.

References

1. Pao-Ling Torn a, Ta-chen Su b, Fung c. Sung c, Kuo-Liong Chien b, su-cheng Huang a, Song-Nan Chow a, Yuan-Teh Lee b. Effects of menopause on intraindividual changes in serum lipids.
2. Shrivastav Vaishali, Singh Neelima, Sapre Shaila. Status of antioxidant enzymes and trace metal in postmenopausal women. *J. Obstet Gynecol India.* 2005;55(1):64-66.
3. Yamamoto A, Horibe, Mabuchi H, Kita T, Matsuzawa Y, Saito Y, Nakaya N, Fujioka T, Tenba H, Kawaguchi A, Nakamura H, Goto Y. Analysis of serum lipid levels in Japanese men and women according to body mass index. Increase in risk of atherosclerosis in postmenopausal women. Research group on serum lipid survey in Japan. *Atherosclerosis.* 1999 March;143(1):55-73.
4. BS Agrawal, A Jain, D Mahajan and C Raghundanand. Correlation of bone mineral density with biochemical markers in post menopausal women. *Indian Journal of Clinical Biochemistry* 2009;24(3):262-65.
5. Gupta N, Arora K. S et al. Estrogen depletion: A risk factor for cardiovascular disease after menopause. *Journal of cell and tissue research* 2009;9(3):1935-38.
6. Vishal R Tendon et al. Prevalence of cardiovascular risk factors in postmenopausal women. *Journal of midlife health* 2010;1(1):26-29.
7. Nwaga UT, Ikekpeazu, Ejezie FE, Maduka IC. Atherogenic index of plasma as useful predictor of cardiovascular risk among postmenopausal women in Enugu, Nigeria. *African Health Science* 2010;10(3):248-52.
8. Vishal R Tendon et al. Prevalence of cardiovascular risk factors in postmenopausal women. *Journal of midlife health* 2010;1(1):26-29.
9. Ushiroyama T, et al, Plasma lipid and lipoprotein levels in postmenopausal women. *Acta Obstet Gynecol Scand* 1993 Aug;72(6):428-33.
10. Raz R, Strauss WE. A controlled trial of intravaginal estradiol in postmenopausal women with recurrent UTI. *N Engl J Med* 1993;329:753-56.
11. Bhatia NN, Bergaman A, Karmann MM. Effects of oestrogen on urethral function in women with urinary continence. *AJOG* 1989;160:176-81.
12. Carr. M. C., K.H. Kim, A. Zambon, E.S. Mitchell, N.F. Woods, C.P. Cassazza, J.Q. Purnell, J.E Hokanson, J.D. Brunzell and R.S. Schwantz. Changes in LDL density across the menopausal transition, *J. Investigational Med.* 2000;48(4):245-50.
13. C.J. Chag, C-H Wu, W-J Yao, Yang, J-S Wu and F-H Lu. Relation of age, menopause and central obesity on cardiovascular disease risk factors in Chinese women. *International Journal of Obesity.* 2000;24:1699-1704.
14. William P. Castelli. Incidence of CAD and lipoprotein levels Framingham Heart study *Jama* 1986;256:835-38.