EFFECT OF MENOPAUSE ON SERUM HDL-CHOLESTEROL LEVEL

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Background: There is a marked difference in the risk of coronary heart disease between men and women of reproductive age but this gap closes with advancing age. It seems likely that some factors of reproductive physiology are responsible for this. The present study was designed to evaluate the difference in HDL Cholesterol level in premenopausal and postmenopausal women in relation with change of estradiol level. **Methods:** Fifty premenopausal and 50 postmenopausal women were included in the study. Estradiol was estimated by radioimmuoassay while HDL-C was estimated by Kit method. **Results:** There was a significant ($p<0.01$) decrease in the HDL-C level of the postmenopausal women (46.72±1.009) as compared with premenopausal women (63.68±1.78). **Conclusion:** HDL-C is an independent risk factor for coronary heart disease. This study favours the view that decrease in estradiol level and associated decrease in HDL-C seen in postmenopausal women may be responsible for the increased risk of coronary heart disease after menopause.

Keywords: Menopause; HDL-Cholesterol; Risk factor; Coronary Heart Disease

INTRODUCTION

Coronary heart disease (CHD) is the foremost cause of death in women as well as men, although the onset of CHD is earlier on the average in men[1].

Men and women appear to be equally susceptible to the effects of risk factors such as elevated BP, increased plasma LDL-C and low levels of plasma HDL-C[1]. A lot of difference has been noted in the risk of CHD between men and women of reproductive age[2]. This gap closes with advancing age[3]. It seems likely that some factors of reproductive Physiology are responsible for this[4].

Oestrogens have a favourable effect on lipid profile, they lower LDL-C and elevate HDL-C[5]. Oestrogens are thought to increase HDL cholesterol by reducing hepatic triglycerides lipase activity that catabolizes HDL[6,7].

Menopause is an oestrogen deficient state but unlike other hormone deficient states menopause is not a disease, every women who lives long enough becomes postmenopausal[3]. After menopause the incidence of CHD rises to approach that for men of similar age[1,2,4-9]. This is most probably due to oestrogen deficiency because in young woman where oestrogen production is high serum lipids are normal[8]. But after menopause abnormal lipid levels and increased incidence of coronary heart disease show a possible relationship among oestrogen, normal lipid levels and a relative immunity to CHD[10].

HDL Cholesterol is a 'good cholesterol'[9] and has an inverse relationship with CHD[11]. It has been suggested that transport of cholesterol from peripheral tissues to liver for subsequent catabolism and excretion, is the function of plasma HDL-C. A reduction of plasma HDL-C may impair the normal clearance of cholesterol from arterial wall and thereby accelerate the development of atherosclerosis[12].

This study was designed to evaluate the effect of oestrogen deficiency due to menopause on serum HDL-total cholesterol level.

MATERIALS AND METHOD

This study was carried out at Department of Biochemistry, Basic Medical Sciences Institute, Jinnah Postgraduate Medical Centre, Karachi. The subjects of same weight and height range were randomly selected from women attending different units of Jinnah Postgraduate Medical Centre, Karachi.

Fifty premenopausal and fifty postmenopausal women were included in the study after taking a detailed medical history and observing the exclusion criteria that included the diseases likely to alter lipid profile.

Five ml venous blood was collected from each subject after an overnight fast of 12–14 hours. Serum was separated within one hour of blood collection and stored at -20 °C until analyzed for estradiol and HDL cholesterol.

Serum estradiol was determined by a double antibody radioimmunoassay (RIA) using a gamma-ß-direct estradiol kit cat. No. COD AA-11F1 supplied by immunodiagnostic systems Limited (IDS) UK.

Serum HDL Cholesterol was estimated by using Kit Cat. No. 1001095 supplied by Spinreact S. A. Spain.

The results were subjected to student 't-test' for determining the statistical significance.

RESULTS

The age range was 30-32 years for premenopausal women and 60-62 years for postmenopausal women. The height range was 159-162 Cm (5'-3"–5'-4") and the weight range was 60-65 kg for both the groups. This height and weight range gave a BMI range of 22.86 to 25.71 kg/m^2.

The results of this study are summarized in Tables-1, while correlation of age, estradiol and HDL cholesterol are shown in Figure-1.

Table-1: Estradiol and HDL Cholesterol Level in pre and postmenopausal women (Mean±SD)

GROUP	MEANAGE (years)	ESTRADIOL (pg/ml)	HDL CHOLESTEROL (mg/ml)
Premenopausal (n=50)	32.84 ±0.95	86.91 ±9.70	63.68 ±1.78
Postmenopausal (n=50)	60.12 ±1.06	11.85 ±2.26*	46.72 ±1.009*

* $p<0.001$

Figure-1: Relation of increasing age and decreasing estradiol with HDL Cholesterol level

DISCUSSION

Our study showed a highly significant decrease in HDL cholesterol associated with decreased estradiol in postmenopausal women. A number of studies support this finding[1,9,14-16]. Premenopausal women are said to be protected against CHD but this protection is lost once the women become postmenopausal[17]. Menopause appears to be associated with adverse changes in blood lipid profile. These changes may enhance the process of atherosclerosis and specially CHD[18] which is the major cause of death and disability in postmenopausal women[19].

A study by Shabita *et al*.[15] had suggested a strong association between female hormones and serum lipid metabolism. Among female hormones oestrogen has known beneficial effects on lipid metabolism, so it was taken into account. Among different estrogens estradiol is the most potent oestrogen and is produced almost exclusively by ovaries, so this can be taken as an index of ovarian activity.[20]

Richter *et al*,[21] had inferred from their study that between ages of 50-70 years mean total cholesterol level in women exceeds those of men. The possible mechanism is that transport of cholesterol from peripheral tissues to the liver for subsequent catabolism and excretion is the function of plasma

HDL-C[12] is reduced after menopause due to oestrogen deficiency. This leads to increased level of total cholesterol in postmenopausal women which in turn increase the incidence of CHD after menopause because total cholesterol is major indicator of risk of CHD in both sexes.[13] For every 10 mg/dl change in HDL-C there is a corresponding 50 % change in CHD risk.[22]

HDL-C can be inferred as a better marker or predictor of risk of CHD in woman[23]. It has an inverse association with the incidence of CHD in both men and women.[24]

REFERENCES

1. Arca M, Vega GL, Grundy SM. Hypercholestrolemia in postmenopausal women. JAMA 1994;27:453-9.
2. Kannel WB. Metabolic risk factors for coronary heart disease in women: Perspective from the Framingham study. Am Heart J 1987;114:413-9.

3. Connor EB, Busch TL. Estrogen and coronary heart disease in women. JAMA 1991;24:265:1861-7.
4. Tindall VR. Clinical aspects of ovulation and menstruation, In: Jeffcoat's Principles of Gynaecology, 5th ed., Butterworth and Co. (Publishers) Ltd. London 1987 pp 88-93.
5. Khan RL. Puberty, menstruation and menopause, In: Gynaecology, 2nd ed., Medical Publications, Lahore, 1992, pp 38-41.
6. Connor EB. Oestrogen and oestrogen progesterone replacement therapy and cardiovascular diseases. Am J Med 1993;95(suppl.5A):405-35.
7. Tikannen MJ, Nikkila EA, Kuvsi T, Spinen S. High density lipoprotein-2 and hepatic lipase: Reciprocal changes produced by oestrogen and norgesterol. J Clin Endocrinol Metab 1982;54:1113-7.
8. Camm AJ. Cardiovascular disease, In: Clinical medicine, 2nd ed., Kumar, PJ and Clark, ML (eds.) Bailliers Tindall, London, 1990, pp 570.
9. Castelli WP. Cardiovascular diseases in women. Am J Obstet Gynecol 1988;158:1553-60.
10. Godsland IF, Wynn V, Crook D, Miller NE. Sex plasma proteins and outstanding questions. Am Heart J 1987;114:1467-503.
11. Castelli WP, Doyle JT, Gordon T, Hames CG, Hjortland MC, Hulley SB *et al*. HDL cholesterol and other lipids in coronary heart disease. Circulation 1977;55:767-72.
12. Miller GJ Miller NE. Plasma high density lipoprotein concentration and development of ischemic heart disease. Lancet 1975;(i):16-9.
13. Jacobs D, Blackburn H, Higgins M., Reed D, Iso H, Micmillan G *et al*. Report of the conference on low blood cholesterol. Mortality associations. Circulation 1992;86:1046-60.
14. England PC, Skinner LG, Cottrell KM, Sellwood RA. Serum oestradiol 17B in normal women. Br J Cancer 1974;29:462-9.
15. Shibata H, Haga H, Sayama Y, Kumagai S, Seino T. Serum total and HDL Cholesterol according to reproductive status in Japanese females. J Chron Dis 1987;40:209-13.
16. Razay G, Heaton KW, Bolton CH. Coronary heart disease risk factors in relation to the menopause. Quarterly J Med 1992;889-96.
17. Hong MK, Romm PA, Reagan K, Green CE, Rackley CE. Effects of oestrogen replacement therapy on serum lipid values and angiographically defined coronary artery disease in postmenopausal women. Am J Cardiol 1992;69:176-8.
18. Tadmor OP, Kleinman Y, Reisin A, Livshin Y, diamante YZ. The effects of two fixed hormonal replacement therapy protocols on blood lipid profile. Eruop J Obstet Gynecol Reprod Biol 1992;46:109-16.
19. Newnham HH. Oestrogens and atherosclerotic vascular disease-lipid factors. Bailleres Clin Endocrinol Metab 1993;7:61-93.
20. Whitley RJ, Meikle AW, Watts NB. Endocrinology, In: Tietz Textbook of clinical chemistry, 2nd ed., Burtis, CA and Ashwood, ER. (eds) W.B. Saunders Company, Philadelphia, 1994; pp 1876.
21. Richter V, Rassoul F, Opitz F, Purschwitz K, Rotzch W. Age related changes in lipid metabolism parameters: screening studies on population basis. Z Gerontol 1993;26:260-4.
22. Kannel WB. High density lipoproteins: epidemiologic profile and risks of coronary artery disease. Am J Cardiol 983;52:9B-12B.
23. Larosa JC. Lipids and cardiovascular disease: do the findings and therapy apply equally to men and women? Women's Health Issues 1992;2:102-11.
24. Brunner D, Weisbort J, Meshulam N, Schwartz S, Gross J, Rennert H *et al*. Relation of serum total cholesterol and high density lipoprotein cholesterol percentage to the incidence of definite coronary events: Twenty year follow up of the Dono-Tel Aviv prospective coronary artery disease study. Am J Cardiol 1987;59:1271-6.

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