PLASMA ESTRADIOL AND LIPID PROFILE IN PERIMENOPAUSAL WOMEN

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Abstract: This study was conducted to examine the estradiol level and plasma lipid profile in perimenopausal women. The estradiol and HDL levels were higher and LDL levels lower in premenopausal women than in postmenopausal women of the same age group. Higher HDL and lower LDL levels in premenopausal women are likely to protect them against atherosclerosis, and the difference may be causally related to estradiol levels.

Key words: estradiol, atherosclerosis, LDL, HDL, cholesterol, triglyceride, hepatic lipase, menopause, premenopausal women, postmenopausal women

INTRODUCTION

Atherosclerosis is less frequent in premenopausal women than in post menopausal women. Several investigators have attributed this difference to the characteristic changes in lipid metabolism at menopause giving rise to a lipoprotein profile which is considered to increase the risk of ischaemic heart disease (1,2).

Many workers have shown increased prevalence of coronary heart disease among women who had premature menopause or surgical menopause (3,4). In these women, plasma cholesterol levels and triglyceride levels are invariably increased after menopause (3,5,6). A decrease in HDL level in postmenopausal women may predispose them to increased atherosclerotic heart disease (1,7) besides an increase in LDL level (8).

This study was conducted to examine the change in lipoprotein profile after menopause when compared to perimenopausal women of nearly the same age group.

METHODS

Forty healthy women (age 40-50 years, weight 40-60 kg) were selected from the general population, of which 20 were premenopausal and 20 were postmenopausal. Premenopausal women had regular periods of menstruation. Blood samples were taken between day 10 and 17 of the cycle. Postmenopausal women had amenorrhea for a minimum period of 1 year without any irregular bleeding during that period.

After an overnight fast, 5 ml blood was collected by venipuncture and plasma was separated. The following were estimated:

(a) Plasma Estradiol by Radio Immuno Assay kit (Diagnostic Products Corporation, Los Angeles).
(b) Plasma lipid profile by enzymatic methods using kits (Boehringer Mannheim GmbH Diagnostica, Germany). Lipid profile included Cholesterol, Triglyceride and High Density Lipoprotein Cholesterol (HDL)

Low Density Lipoprotein Cholesterol (LDL) level was determined by calculation using the formula,

\[
\text{LDL (in mg/100 ml)} = \frac{\text{Total Cholesterol} - \text{Triglyceride}}{5} - \text{HDL}
\]

RESULTS

Estradiol levels and the levels of various lipids both groups are given in Table I. The estradiol levels in postmenopausal women are lower than in premenopausal women (\(P < 0.001\)). Cholesterol and triglyceride levels in the two groups are not statistically significant. The HDL level is significantly lower and LDL level significantly higher in postmenopausal women than in premenopausal women.

TABLE I : Estradiol and serum lipids in premenopausal and postmenopausal women.

<table>
<thead>
<tr>
<th></th>
<th>Premenopausal women</th>
<th>Postmenopausal women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estradiol (pg/ml)</td>
<td>Range 110-516.8</td>
<td>Mean 226.32</td>
</tr>
<tr>
<td></td>
<td>Range 114.16</td>
<td>Mean 4.5-53</td>
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<tr>
<td></td>
<td></td>
<td>Mean 12.48**</td>
</tr>
<tr>
<td>Cholesterol (mg/100 ml)</td>
<td>Range 147-226</td>
<td>Mean 181.95</td>
</tr>
<tr>
<td></td>
<td>Range 132-269</td>
<td>Mean 197.85</td>
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<tr>
<td></td>
<td></td>
<td>Mean 42.02*</td>
</tr>
<tr>
<td>Triglycerides (mg/100 ml)</td>
<td>Range 53-202</td>
<td>Mean 117.9</td>
</tr>
<tr>
<td></td>
<td>Range 68-254</td>
<td>Mean 150.85</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean 73.19*</td>
</tr>
<tr>
<td>HDL Cholesterol (mg/100 ml)</td>
<td>Range 58-77.5</td>
<td>Mean 58.97</td>
</tr>
<tr>
<td></td>
<td>Range 35-59.5</td>
<td>Mean 46.9</td>
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<tr>
<td></td>
<td></td>
<td>Mean 11.49**</td>
</tr>
<tr>
<td>LDL Cholesterol (mg/100 ml)</td>
<td>Range 42-133.9</td>
<td>Mean 98.64</td>
</tr>
<tr>
<td></td>
<td>Range 76-157.7</td>
<td>Mean 120.78</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean 38.03*</td>
</tr>
</tbody>
</table>

***, \(P < .001\)
***, \(P < .01\)
***, \(P < .05\)
NS, Not significant

DISCUSSION

Our findings are consistent with the findings of Paterson et al (9) who has compared cholesterol and triglyceride levels in pre and postmenopausal women and found them to be raised significantly in postmenopausal women. Varma (10) has shown that cholesterol and triglyceride concentration decrease in postmenopausal women after exogenous estrogen administration. Sherwin et al (11) conducted a study on oophorectomised postmenopausal women with estrogen replacement. They found that on exogenous estrogen administration, cholesterol and LDL levels were reduced and HDL levels were increased.

Estrogen exerts its action on Hepatic Lipase also known as Heparin Releasable Hepatic Lipase (HRHL), to influence the metabolism of HDL. Hepatic Lipase is located on the luminal surface of the hepatic endothelial cells (12). Hepatic lipase binds to HDL\(_2\) (13) and hydrolyzes the phospholipid in HDL\(_2\) in preference to those in HDL\(_3\) or LDL (14,15). It has been suggested that hepatic lipase is a relatively specific HDL\(_2\) phospholipase and that it may act in the hepatic uptake of cholesterol and in the conversion of HDL\(_2\) to HDL\(_3\) (12, 16). HDL\(_3\) accepts cholesterol from tissues and is converted to HDL\(_2\), which is then internalised in the liver. Estrogen decreases the hepatic lipase activity and thereby increases the plasma HDL\(_2\) level. The precise mechanism by which estrogens regulate the activity of hepatic lipase remains unknown. Probably they repress the synthesis of the enzyme protein or they could bind to the enzyme and cause conformational changes which decrease the enzyme activity (17,18).

Estrogen decreases the plasma LDL level, at least in rats by increasing its hepatic catabolism (19). Amount of LDL that enters the arterial wall decreases and foam cell formation rich in cholesterol esters is reduced.

The findings of the study are consistent with the protective role of estrogens against atherosclerosis in premenopausal women.

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REFERENCES


