Study the Relationship Between Estrogen Hormone and Calcium in Normal Females Before and After Menopause in Baghdad / Iraq

*Sameerah S. Mustafa¹  Asal Aziz Tawfeeq²  Hadeel A. Hasan¹
¹AL Mansour Medical Institute / Baghdad/Iraq
²Kirkuk Technical College / Kirkuk/ Iraq
*Samiramustafa77@yahoo.com

Abstract

This study involved the collection of (90) samples of women serum which included (30) serum samples collected from women before menopause (reproductive women) in the age range of (22-43) years and were considered as (group A- control). While, (group B) included (30) serum samples collected from women using oral contraceptive pills between the ages of (22-43) years old. Whereas, another (30) serum samples were collected from women after menopause between the ages of (43-54) years and were considered as (group C). All of the collected serum samples were subjected to a number of serological and chemical tests for the measurement of (E₂, HDL, LDL and Ca). Then, the obtained data were statistical analyzed and results showed a significant decrease (p˂ 0.05) in (E₂, Ca and HDL) levels in menopausal women compared to that of the normal healthy controls. While, there were non-significant decrease (p> 0.05) in (E₂, Ca and HDL) levels in women taking oral contraceptive when compared to the normal healthy controls.

On the other hand, a significant increase (p< 0.05) was recorded in LDL level in menopausal women compared to that of the normal healthy controls whereas, no-significant increase (p> 0.05) in the LDL level in women taking oral contraceptives when compared to the control women.

Keywords: Hormones, Estrogen, Calcium, Menopause, Females, Baghdad.
Dr. Samira Mustafa

The word "Menopause" literally means the "end of monthly cycle" because the word "menopause" was created to describe this change in human females, where the end of fertility is traditionally indicated by the permanent stopping of monthly menstruation or menses [1]. Menopause can be officially declared in the absence of any menstruation for one complete year [1]. However, there were many signs and effects that led up to this point, many of which may extend well beyond it such as irregular menses, vasomotor instability (hot flashes and night sweats), atrophy of genitourinary tissue, increased stress, breast tenderness, vaginal dryness, forgetfulness, mood changes, and in certain cases osteoporosis and/or heart disease [2]. While, estrogens are present in both men and women, they are usually present at significantly higher levels in women of reproductive age and they promote the development of female secondary
sexual characteristics, such as breasts and are also involved in the thickening of the endometrium [3]. Low estradiol levels are a risk factor for osteoporosis and influences the quality of life for older woman [4&5]. Estrogen deficiency can lead to excessive bone re-absorption after menopause[ 6].

Calcium is the major mineral cation of bone, so the body contains a very large calcium pool [7]. Decreased body calcium leads to loss of bone mineral, reducing of bone strength, increased susceptibility to fractures [8]and many increase blood pressure particularly among pregnant women [9]. Estrogen, on the other hand, is believed to decrease serum calcium levels by enhancing calcium deposition in bone and suppressing bone resorption and it regulates intestinal absorption of calcium and decreases expression of parathyroid hormone [10]. Much of these research on the relationship between estrogen and calcium has come from studying post–menopausal women and the effects of estrogen decline during that period. For example PTH was found to increase after menopause [11] and osteoporosis has long been associated with estrogen decline following menopause [12&13]. Thus the plasma and interstitial fluids have a normal calcium ion concentration of about 1.2 mmol/L, level only half the total plasma calcium concentrations [14,15&16]. High – calcium diets could increase the risk of kidney stone in susceptible individual where researches during the last decade have demonstrated that estrogen regulates bone homeostasis through unexpected regulatory effects on the immune system and on oxidative stress and direct effects on bone cells [17&18]. Worldwide, there are nearly 9 million osteoporotic fractures each year, generating massive burden both to individuals and to health services [19&20].

2. Materials & Methods

All of the participating women in this study were living in Baghdad and were all from the out patients of Al-Yarmouk Teaching Hospital / Baghdad / Iraq in the Bio Chemistry and Hormones Department. Beside this, some of the nursing staff of the hospital voluntaries women blood donors. Over a period of one year, 90 women were included in this study, all were evaluated by full clinical history, complete physical examination, none of them had clinical or laboratory evidence of disease that may affect the parameter to be measured and had negative drug history. Among 90 subject 30 women with age range from (20-43) years had no diseases known to affect the parameter to be measured and none was taking any medication that might interfere with calcium metabolism. The remaining subjects 60 women, 30 women ranging from (20-43) years were on contraceptive pills (they taken Yasmin pills) and the other 30 subjects were postmenopausal women ranging from (43-58) years.

The levels of Calcium, Estradiol, HDL, and LDL were analyzed in all subjects. About 5 ml of venous blood was aspirated using disposable needles and syringes. Samples were collected between 9:00 A.M - 1.00 P.M, after 12-14 hours fast. The blood was allowed to clot in plain
tubes for 20 minutes at room temperature, and the serum was recovered by centrifugation at 3000 rpm (Estradiol analysis was performed on day 19, 20, 21 of the menstrual cycle). Serum estradiol was estimated by direct immune enzymatic assay [21]. Similarly, estimation of Calcium was done by colorimetric determination [22] and the estimation of LDL cholesterol was done by enzymatic colorimetric test [23] and direct homogenous test for the determination of HDL-cholesterol enzymatic colorimetric test [24]. The above procedures were adopted for both cases and controls.

3. Results

The values of (ES) in sera of three groups were founded as shown in Table (1) and Figure (1) was equal to (309.36 ±150.44) for A group (282 ± 140.98) for B group and (63.33 ± 29.53) for C group respectively. No significant differences in (ES) levels for group B compared to control, while a significant difference of estrogen levels in sera of group C compared to control.

Table (2) and Figure (2) showed that, a non-significant differences in sera of calcium in group B compared with A group, it was (8.36 ± 0.8) and (8.2 ± 0.7) respectively. While the level of Ca in sera of C group significant decrease compared with control.

The values of HDL in sera of control, B and C in Table (3) and Figure (3) were (1.14±0.44), (1.08 ± 0.40) and (0.89±0.11) respectively. No significant decrease in HDL for B group compared to control, while a significant decrease in HDL of C group compared to control.

As for LDL in the Table (4) and Figure (4) in control B and C were (3.02+0.93), (3.15+0.90) and (3.77 +0.63) respectively. We found no significant increase in LDL for B group compared to C and control groups.

Table (1) Estradiol levels in sera of three studied groups.

<table>
<thead>
<tr>
<th>group</th>
<th>No.</th>
<th>Range of age</th>
<th>Estrogen ( ng/ml) Mean ± SD</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>control women (A)</td>
<td>30</td>
<td>(20-43)y</td>
<td>309.36 ± 130.44</td>
<td>27.42</td>
<td></td>
</tr>
<tr>
<td>women taking oral contraceptive (B)</td>
<td>30</td>
<td>(20-43)y</td>
<td>282.93± 140.98</td>
<td>25.59</td>
<td>P &gt;0.05</td>
</tr>
<tr>
<td>menopausal women (C)</td>
<td>30</td>
<td>(43-58)y</td>
<td>63.33 ± 29.53</td>
<td>4.24</td>
<td>P&quot;&lt; 0.05</td>
</tr>
</tbody>
</table>

Figure (1) Histogram showing the mean serum Estrogen of patients subject for (A) control women, (B) women taking oral contraceptive, (C) menopausal women.

Table (2) Ca statistic calculation levels in sera of three studied group

<table>
<thead>
<tr>
<th>group</th>
<th>NO</th>
<th>Ca (mg/l00ml) Mean±SD</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30</td>
<td>8.36 ± 0.8</td>
<td>0.14</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30</td>
<td>8.2 ± 0.7</td>
<td>0.15</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>7.16±0.58</td>
<td>0.10</td>
<td>P&quot;&lt; 0.05</td>
</tr>
</tbody>
</table>

Figure (2) Histogram showing the mean serum (Ca) of patients subject for (A) control women, (B) women taking oral contraceptive, (C) menopausal women.
Table (3) HDL statistic calculation in sera of three studied groups

<table>
<thead>
<tr>
<th>Group</th>
<th>NO.</th>
<th>HDL (mmol/l) mean±SD</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30</td>
<td>1.14±0.44</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30</td>
<td>1.08±0.40</td>
<td>0.07</td>
<td>P&gt; 0.05</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td>0.89±0.11</td>
<td>0.02</td>
<td>P” &lt;0.05</td>
</tr>
</tbody>
</table>

Figure (3) Histogram showing the mean serum HDL of patients subject for (A) control women, (B) women taking oral contraceptive, (C) menopausal women.

Table (4) LDL statistic calculation in the sera of three studied groups

<table>
<thead>
<tr>
<th>Group</th>
<th>NO.</th>
<th>LDL (mmol/l) Mean±SD</th>
<th>SE</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>30</td>
<td>3.02±0.93</td>
<td>0.17</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>30</td>
<td>3.15±0.90</td>
<td>0.16</td>
<td>P&gt;0.05</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>3.77±0.63</td>
<td>0.11</td>
<td>P” &lt;0.05</td>
</tr>
</tbody>
</table>
Figure (4) Histogram showing the mean serum LDL of patients subject for (A) control women, (B) women taking oral contraceptive, (C) menopausal women.

Correlation relation between Estrogen and HDL.

Figures (5), (6) & (7) showed a high significant positive correlation between Estrogen and HDL with P value equal and less than 0.0001 for (A)(B) and (C) groups with correlation coefficient value (r) (0.597), (0.217) and (0.696) respectively.

Fig (5): Correlation relation between Estrogen and HDL in (A) group
Correlation relation between Estrogen and LDL

Figures (8),( 9) & (10) showed a high significant negative correlation between Estrogen and LDL with P value equal and less than 0.0001 for (A)(B)and(C) groups with correlation coefficient value \( r \) (-0.467), (-0.201)and(-0.739) respectively.
Correlation relation between Estrogen and Calcium

Figures (11), (12) & (13) showed a high significant positive correlation between Estrogen and Calcium with P value equal and less than 0.0001 for (A), (B) and (C) groups with correlation coefficient (r) value (0.773), (0.759), (0.731) respectively.

Fig (10): Correlation relation between Estrogen and LDL in (C) group

Fig (11): Correlation relation between Estrogen and Calcium in (A) group

Fig (12): Correlation relation between Estrogen and Ca in (B) group
4. Discussion

Estrogen deficiency is the most important cause of postmenopausal bone loss in women. Women lose annually in average 3% of their bone mass in years after menopause compared with men who only lose 0.5 – 1% of their bone mass per year during the same period [25]. From my results of estradiol levels in sera of three groups (Table 1) and (Figure 1), I can say that estradiol level hard significantly decreased in menopausal women, when compared to reproductive women, but there is no significant decrease in women taking oral contraceptive pill comparing with control. usually the sudden decline in estradiol levels during the early years of menopause is due to malfunction of ovaries or at the first sign of weakened ovarian function [25].

In menopausal women, many physiological and metabolic conditions are altered due to the decreased estrogen concentration. Estrogen deficiency at menopause increase the rate of bone remodeling which result in high turnover bone loss [26&27]. Estrogen deficiency may induce calcium loss due to decreased intestinal (Ca) absorption decrease renal calcium conservation [11]. On the other hand, estrogen regulates intestinal absorption of Ca and decreased expression of parathyroid hormone. Much of these researches on the relationship between estrogen and Ca has come from studying post-menopausal women and effect of estrogen decline during that period [12].

Our results about changes in (HDL) levels with menopause agree with [27]which they are suggested that total (HDL) levels fall slightly with menopause, the decrease in HDL after menopause can be attributed to age and hormonal changes in the body that leads to elevate levels of lipids, the cause for this is a significant reduction in circulating concentration of estrogen in menopausal women. The prevalence of small, dense (LDL) is low in premenopausal women (10 – 13 %) but increase to (30 - 50 %) in postmenopausal women, that’s can be attributed to age and changes in hormone levels after menopause [27].
However, a number of trends were carried out previously towards using herbs to treat higher total cholesterol, blood sugar and increase normal human bactericidal power of normal serum which might lead in a total in the reduction of some menopausal characteristics [28 & 29].

5. Conclusions

It could be concluded from this study that, there were different changes in biochemical parameters in female body related to changes in the hormones, especially estrogen. These changes clearly noticed in female during menopause period especially in Ca, so calcium titer could be very useful tool in the early diagnosis, treatment and/or reduction of the bone diseases in female during menopause.

6. Recommendations

1- Early measuring for chemical and hormonal variables, especially calcium ion and estrogen hormone consistently among women, for the purpose of early diagnosis of osteoporosis.
2- Adding calcium as food or medical treatment to prevent /or for avoiding osteoporosis within different doses according to age and the needs of women.
3- Follow-up the family medical history and exercising sports for half an hour a day.

References


