Physiological Disturbances in Postmenopausal Women

Dakhel Ghani Omran Al-Watify
University of Babylon, College of science for women, Department of Biology

Abstract
The pathophysiology of menopause is attributed to decreased levels of estrogen hormone. Estrogen is known to have multiple functions within the body of women and its deficiency after menopause predispose the females to several physiological disturbances. The present study was designed to investigate changes occurring in postmenopausal women.

Thirteen healthy women involved in this study: 15 premenopausal women (24-27 years) and postmenopausal women (55-57 years). It was found that the levels of follicle stimulating hormone (FSH) pointed out a significant increase (P<0.01) associated with a significant decrease (P<0.01) in the levels of estrogen (estradiol) hormone in postmenopausal women in a comparison with premenopausal women. Levels of super-oxide dismutase activity (SOD), concentration of vitamin-C, and serum copper pointed out a significant decrease (P<0.05) in postmenopausal women when compared with premenopausal women. It had been found that the levels of serum blood glucose, serum zinc, and serum calcium showed a significant increase (P<0.05) in post-menopausal women in a comparison with pre-menopausal women. Changes summarized above might be attributed to estrogen hormone deficiency in postmenopausal women.

Physiological Disturbances in Postmenopausal Women

Dakhel Ghani Omran Al-Watify
University of Babylon, College of science for women, Department of Biology

Abstract
The pathophysiology of menopause is attributed to decreased levels of estrogen hormone. Estrogen is known to have multiple functions within the body of women and its deficiency after menopause predispose the females to several physiological disturbances. The present study was designed to investigate changes occurring in postmenopausal women.

Thirteen healthy women involved in this study: 15 premenopausal women (24-27 years) and postmenopausal women (55-57 years). It was found that the levels of follicle stimulating hormone (FSH) pointed out a significant increase (P<0.01) associated with a significant decrease (P<0.01) in the levels of estrogen (estradiol) hormone in postmenopausal women in a comparison with premenopausal women. Levels of super-oxide dismutase activity (SOD), concentration of vitamin-C, and serum copper pointed out a significant decrease (P<0.05) in postmenopausal women when compared with premenopausal women. It had been found that the levels of serum blood glucose, serum zinc, and serum calcium showed a significant increase (P<0.05) in post-menopausal women in a comparison with pre-menopausal women. Changes summarized above might be attributed to estrogen hormone deficiency in postmenopausal women.
Introduction

Menopause marks the time in a woman's life when her menstruation stops and she is no longer fertile due to depletion of ovarian follicles and gradual decrease in ovarian production of estrogen and other hormones (Attipoe et al., 2008).

During menopause women face various physiological, psychological, and sociological alterations that impair quality of life or may be life threatening. The adverse effects of menopause are attributed to decrease in estrogen level which leads to alteration in lipid profile, body mass index, insulin level, and also to increased risk of hypertension. It has also been observed that there is increased production of free radicals after menopause which is due to a sudden alterations in hormonal status (Miquel et al., 2006).

The decrease in sex steroid hormones during menopause in women causes a number of disturbances in the metabolism of different organs. In this period of life, the risk of osteoporosis, cardiovascular disease, impairment of glucose metabolism, and breast cancer are increased (Moream et al., 2005).

The detailed mechanisms of this effect are still being investigated. The impact of estrogen deficiency after menopause on trace elements has not yet been widely studied, but the expected menopause related alterations in trace mineral status may have an important on the above pathologies (Vannoord et al., 1993; Tubeks, 2007).

Several trace elements, particularly Ca, Mg, Cu, Mn, and Zn are essential in bone metabolism (Saltman and Srause, 1993).

Some trace minerals are cofactors of antioxidative enzymes. Selenium (Se) is a cofactor of glutathione peroxidase, one of the most important enzymes of the free-radical defense enzyme. Zn and Cu molecules are integrated elements of superoxide dismutase (Cu/Zn SOD). Manganese super oxid-dismutase (Mn SOD) is a major enzyme responsible for detoxification of ROS in the mitochondria (Bednarek et al., 2006). Reactive oxygen species (ROS) and lipid peroxide, which are produced by a free radical chain reaction, have been implicated in the pathogenesis of a variety of condition, including menopause (Yagi, 1999).

Estrogen deficient in post menopausal women may associated with postprandial hyperlipidemia, and could limit peripheral glucose uptake (Baron et al., 1990).

Methods

-Subjects of the study

Thirteen healthy women were studies: 15 post-menopausal women (55-57 years) and 15 Premenopausal women (24-27 years). All Postmenopausal women had been without menses at a least 3 years ago and not taking any hormonal replacement therapy, nonsmokers, and without any chronic diseases such as diabetes, asthma, and hypertension. The premenopausal women of this study were non pregnant and they were not using any kind of contraceptive drugs. The blood samples of premenopausal women were taken at follicular phase of menstrual cycle. This study was carried out over a period from September 2011 to January 2012 in Marjan teaching hospital and public health center in Hilla city.

-Hormonal estimation

The levels of follicle stimulating hormone (FSH) and estrogen (E2) hormone were estimated by using enzyme immunoassay (EIA) method, (according by kits from Biocheck, Inc).
Estimation of superoxide dismutase (SOD) activity

The erythrocytes samples were washed with isotonic solution three times. The erythrocytes then were lysed with hypotonic solution phosphate buffer (pH 7.5). The hemolysate was separated by centrifugation at 2500 rpm for 15 minutes. SOD activity was measured by the method of Marklund and Marklund (1974).

Measurement of Vitamin-C vitamin-E

The concentration of vitamin-C estimated according to method of Natelson (1997). Vitamin-E was estimated according to method of Baker and Frank (1968).

Measurement of fasting blood glucose and serum (Zinc, Copper, and Calcium).

Estimation of these parameters was carried out according to kits protocols which supplied by (Biomerixue company).

Statistical analysis

All data were expressed as mean ±SD of number of experiments. The statistical significance was evaluated by student's T-test by using SPSS version 10.D (Daniel, 1999).

Results

Results which are showed in the following (table-1) pointed out a significant decrease (P<0.01) in the levels of estrogen (estradiol) hormone, and a significant increase (P<0.01) in the levels of follicle stimulating hormone (FSH) in postmenopausal women in a comparison with permenopausal women.

Results of superoxide dismutase (SOD), Vitamin-C, and Serum Copper showed a significant decrease (P<0.05) in postmenopausal women. Whereas levels of fasting blood glucose, serum zinc, and serum calcium showed significant increase (P<0.05) in postmenopausal women when compared with premenopausal women.
Table 1: Shows the values of body mass index (BMI), estradiol hormone (E$_2$), follicle stimulating hormone (FSH), superoxide dismutase enzyme (SOD), Vitamin-E, Vitamin-C, and fasting blood glucose, serum (Zinc, Copper, and Calcium) in Pre and Post menopausal women.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Premenopausal women</th>
<th>Postmenopausal women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>25±1</td>
<td>56±1 *</td>
</tr>
<tr>
<td>BMI (Kg/m$^2$)</td>
<td>22±1.2</td>
<td>25±0.1 *</td>
</tr>
<tr>
<td>Estradiol (Pg/ml)</td>
<td>73±7</td>
<td>40±5 **</td>
</tr>
<tr>
<td>FSH (mIU/ml)</td>
<td>7.5±3.21</td>
<td>79.2±14.5 **</td>
</tr>
<tr>
<td>SOD (U/gHb)</td>
<td>6.42±0.51</td>
<td>2.1±0.12 **</td>
</tr>
<tr>
<td>Vitamin-E (mg/dl)</td>
<td>1.95 ±0.16</td>
<td>1.6±0.21</td>
</tr>
<tr>
<td>Vitamin-C (mg/dl)</td>
<td>2.5±0.47</td>
<td>0.5±0.19 *</td>
</tr>
<tr>
<td>Fasting blood glucose (mmol/L)</td>
<td>4.7±0.3</td>
<td>6.3±0.61 *</td>
</tr>
<tr>
<td>Serum zinc (mg/ml)</td>
<td>110.4±20.5</td>
<td>120.4±14.6 *</td>
</tr>
<tr>
<td>Serum copper (mg/m)</td>
<td>115.9±16.5</td>
<td>105 ±11.8 *</td>
</tr>
<tr>
<td>Serum calcium (mg/dl)</td>
<td>8.61±2.1</td>
<td>12.8±1.2 *</td>
</tr>
</tbody>
</table>

- values are means ± standard deviation.
- values with two strikes are significantly at (P<0.01)
- values with one a strike are significantly at (P<0.05)

Discussion

The present study showed a significant decrease (P<0.01) in the levels of estradiol hormone and these results were associated with a significant increase (P<0.01) in the levels of follicle stimulating hormone (FSH). On the basis of physiological point view, estrogen hormone is regulated through negative feed back mechanism through hypothalamic-pituitary-ovary axis and as a result of estrogen deficiency at menopausal time, the negative feed back mechanism become less active and lead to elevate the levels of FSH (Guyton and Hall, 2006).

The present study pointed out significant decrease (P<0.01) in the levels of superoxide dismutase (SOD) in postmenopausal females in a comparison with premenopausal females and this study is consistent with previous study of Marija (2001) that showed a decreased antioxidant enzyme (SOD) activities in postmenopausal women. The pathophysiology of menopause is attributed to decrease of estrogen. Estrogen is known to has antioxidant properties and its deficiency after menopause predispose the body to increased free radicals (Schwenke, 1998).

Also, estrogen acts as an antioxidant by preventing oxidation of low density lipoproteins (Bednarek, 2002). Antioxidants like SOD, glutathione peroxidase are present in red blood cells and acts to prevent lipid peroxidation (Marija, 2001).

The antioxidants enzyme SOD, is the most important enzyme present virtually in all aerobic organism, catalyzes the dismutation of super oxide (O$_2^-$) into oxygen and hydrogen peroxide (H$_2$O$_2$). The catalase, the other antioxidant enzyme, catalyzes conversion of H$_2$O$_2$ into H$_2$O and O$_2$ (Seven et al., 1996). This study, showed a significant decrease in the level of vitamin-C associated with non-significant decrease in the level of vitamin-E in postmenopausal women when compared with premenopausal women.
Signorelli et al., (2006) reported that oxidative stress is increased after menopause, and suggested that the decrease in sex hormones occurring at the time of menopause could predispose women to higher levels of reactive oxygen species. Also, Vural et al., (2005) showed that menopause is associated with increase in oxidative stress and a decrease in some antioxidants such as ascorbic acid (Vitamin-C), Vitamine-E and erythrocyte glutathione. The results of this study were agree with previous study of Traber and Atkinson (2007).

The present study showed a significant increase (P<0.05) in the level of fasting blood glucose in postmenopausal women in a comparsion with premenopausal women. These results were consistent with previous study (Baron et al., 1990) which reported increased prevalence of glucose intolerance and hyperinsulinemia in middle aged and older adult. This study suggest that with age, there is a decrease in skeletal mass of the body associated with decrease physical activity might be cause glucose intolerance. The present study showed that trace elements (Zn, Cu) status in postmenopausal women is different from that of premenopausal women of similar age. Previous studies reported that postmenopausal women have higher levels of serum zinc than premenopausal women (Benes et al., 2005). The present study is consistent with study of Burean et al., (2002) which indicated that there is a higher urinary zinc excretion in postmenopausal women. This study suggests that high zinc in postmenopausal women may be affect of increased bone resorption because of estrogen deficiency.

Results of serum copper (Cu) in postmenopausal women pointed out in significant decrease when compared with premenopausal women. These results were agree with previous studies which are pointed out a decrease of Cu concentration with advanced age (Benes et al., 2005). Also,other authors showed that administration of estrogen replacement therapy is connected with increase in serum copper concentration (Berg et al., 1998).

Concerning the results of calcium, noted there is a significant increase in postmenopausal women. Estrogen prevents bone loss through multiple effects on bone marrow and bone cells, which result in decreased osteoclast formation (Pacifici, 1996). Since, T-cells are low recognized as estrogen-regulated cells capable of producing essential osteoclastogenic factors. These cells found to increased oststeoclastogensis and the bone loss induced by estrogen deficiency (Kong, 1999). Previous studies showed higher calcium and magnesium serum concentrations in postmenopausal women which were associated with higher urinary excretion of these ions (Bednarek et al., 2007). This study suggests that estrogen deficiency lead to increase bone osteoperosis and released of calcium into blood circulation.

The result which are obtained from this study may be attributed to estrogen deficiency in postmenopausal women which in turn lead to multiple physiological disturbance on different of body organs.
References


