STUDY THE VITAMIN D, ESTROGEN AND PTH LEVELS IN PRE AND POST IRAQI WOMEN WITH OSTEOPOROSIS

Elham F. Hamzah¹, Maha F. Smaism², Alaa H. Al-Algawy³
¹²³Collage of Medicine, Babylon University, Iraq

ABSTRACT

Background: Osteoporosis, a multifactorial skeletal disease characterized by reduced bone mineral density (BMD) and increased fracture risk is a growing health problem. This study aimed to evaluate the effect vitamin D (VD), estrogen (ES) and PTH levels in pre and post Iraqi women with osteoporosis (OST).

Subjects and Methods: A total number of 50 women with OST and similar number of women as control were included in this study. VD levels were assessed by HPLC while ES and PTH levels were estimated by ELISA.

Results: Serum VD levels (ng/ml) was significantly decreased (p-value< 0.05) in total OST women compared to other subgroups (total control and control-pre subgroups). Serum ES levels (pg/ml) was significantly decreased (p-value< 0.05) in total OST women compared to other subgroups (total control and control-pre subgroups). Serum PTH levels (pg/ml) was significantly increase (p-value< 0.05) in total OST women compared to other subgroups (total control and control-pre and control-post subgroups).

Conclusion: Lowering VD and ER levels are among the most risk factors to developing OST while PTH levels were increasing as a result of VD and ES elevation levels.

Keywords: Osteoporosis, Vitamin D, Estrogen, PTH, Iraqi Women

I. INTRODUCTION

Osteoporosis (OST) is a systemic skeletal disorder characterized by low bone mass, micro-architectural deterioration of bone tissue leading to bone fragility, and consequent increase in fracture risk. It is the most common reason for a broken bone among the elderly (1). Bones that commonly break include the vertebrae in the spine, the bones of the forearm, and the hip (2). Until a broken bone occurs there are typically no symptoms. Bones may weaken to such a degree that a break may occur with minor stress or spontaneously. After the broken bone heals, the person may have chronic pain and a decreased ability to carry out normal activities (3). The active vitamin D metabolite 1,25(OH)2D opens up calcium channels in the gut, stimulates the formation of calcium binding protein in the intestinal cell, and thereby stimulates the absorption of calcium and phosphate from the gut. In this way, optimal circumstances for bone mineralization are created (4). Mineralization in itself is a passive process, once sufficient calcium and vitamin D are available. In case of vitamin deficiency, the 1,25(OH)2D concentration may drop and less calcium will be available for bone mineralization (5). The parathyroid hormone (PTH) level will increase, stimulating the hydroxylation of 25(OH)Din the kidney to 1,25(OH)2D. The increased serum PTH stimulates bone turnover, leading to bone loss (6). Most patients with osteoporosis are currently treated with bisphosphonates. Calcium and VD are added for several reasons. In a patient with severe VD deficiency, bisphosphonate treatment may induce symptomatic hypocalcaemia. In addition, all randomized clinical trials on bisphosphonates have been performed with calcium and vitamin D as basic treatment. Some investigators have questioned the possible gain in bone mineral density with additional treatment with calcium and VD (7,8). Early studies on ES role in bone metabolism focused on the role of the proinflammatory cytokines IL-1, IL-6, TNF-α, granulocyte macrophage colony-stimulating factor, macrophage colony-stimulating factor (M-CSF), and prostaglandin-E2 (PGE2). These factors increase bone resorption, mainly by increasing the pool size of pre-OST in bone marrow (9), and are down regulated by ES. Other study have found that E up regulates TGF-β, an inhibitor of bone resorption that acts directly on OST to decrease activity and increase apoptosis (10). However, ES regulation of bone resorption must now be re-evaluated in the light of the recent discovery of three new members.
of the TNF ligand and receptor signaling family that serve as the final effectors of OST differentiation and function (11). The aim of this study to evaluate the effect VD, ES and PTH levels in pre and post Iraqi women with OST.

II. MATERIALS AND METHODS

Study design:
Women were involved in this study had an age of 49±5.5 years. The minimum and maximum age were 35 and 55 years respectively, in which about 48% of the women lie in the age ≥45 years of old and 52% lie in the age <45 years of old.

Determination of VD by HPLC:
VD was estimated by high performance liquid chromatography (HPLC). The conditions of HPLC for estimation of VD were:

Stationary phase: C18 column, 5µm, 4.6 ×150mm, mobile phase: water: acetonitrile (30:70)(pH 5.9 ammonium acetate solution), flow Rate: 1.07 ml/min, and detection Type: UV at λ= 267 nm. An auto-sampler injection system were used in this study

Assessment of ES and PTH levels by ELISA
The levels of serum ES and PTH (pg/ml) were measured by Enzyme-linked immune sorbent assay (ELISA) according to manufacture instructions. The concentrations of ES and PTH (pg/ml) in the serum samples was determined by comparing the optical density (OD) of the samples to the constrictions of standards.

Statistical Analysis
To determine the significant differences between the study groups as related with genotype and allele frequencies by using chi-square test in both patients and control groups.

Results

Clinical characteristics of psoriasis group is shown in table 1:

Table 1: Characteristics of psoriasis group

<table>
<thead>
<tr>
<th>Clinic-pathological variables</th>
<th>OST</th>
<th>CONT</th>
<th>chi-square statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of women</td>
<td>50</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Age &lt;45</td>
<td>24</td>
<td>27</td>
<td>0.758</td>
</tr>
<tr>
<td>≥45</td>
<td>26</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>MS Pre</td>
<td>25</td>
<td>23</td>
<td>0.688</td>
</tr>
<tr>
<td>Post</td>
<td>25</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>BMI &lt;25</td>
<td>17</td>
<td>36</td>
<td>0.001</td>
</tr>
<tr>
<td>≥25</td>
<td>33</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>FH Yes</td>
<td>32</td>
<td>12</td>
<td>0.001</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>38</td>
<td></td>
</tr>
</tbody>
</table>

MS: Menopausal status, BMI: body mass index, FH: family history

Serum VD levels (ng/ml) was significantly decreased (p-value< 0.05) in total OST women compared to other subgroups (total control and control-pre subgroups, as shown in figure (1).
**Fig. (1): serum levels of VD (ng/ml) in total OST, total control, OST (pre, post), and control (pre, post)**

Table (2) shown significant difference (p-value < 0.05) of ES (pg/ml) levels between age, MS, and FH groups (95%CI of 0.8-2.9, 1.1-3.6, and 1.03-3.5, respectively) and the results also shows statistical differences in ES levels between BMI subgroups (p-value < 0.05) (95%CI of 0.2-2.98).

**Table (2): ES levels in OST study subgroups.**

<table>
<thead>
<tr>
<th>ES (pg/ml)</th>
<th>N</th>
<th>mean± SD</th>
<th>p-value (95%,CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45</td>
<td>24</td>
<td>20.4± 1.7</td>
<td>0.005 (0.8-2.9)</td>
</tr>
<tr>
<td>≥45</td>
<td>26</td>
<td>18.5± 1.9</td>
<td></td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25</td>
<td>17</td>
<td>18.9± 2.4</td>
<td>0.011 (0.8-2.98)</td>
</tr>
<tr>
<td>≥25</td>
<td>33</td>
<td>20.9± 3.2</td>
<td></td>
</tr>
<tr>
<td><strong>MS</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre</td>
<td>25</td>
<td>19.7± 2.5</td>
<td>0.001** (1.1-3.6)</td>
</tr>
<tr>
<td>Post</td>
<td>25</td>
<td>17.3± 1.9</td>
<td></td>
</tr>
<tr>
<td><strong>FH</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>32</td>
<td>18.9± 2.5</td>
<td>0.008 (1.03-3.5)</td>
</tr>
<tr>
<td>No</td>
<td>18</td>
<td>21.1± 0.2</td>
<td></td>
</tr>
</tbody>
</table>

** Highly significant difference ( P < 0.001) .

Figure (2) showing the negatively correlation between age of OST women with PTH levels while there were also slightly negatively correlation between of them in control group.
III. DISCUSSION

There are certain risk factors (menopause status and positive FH of OST) for the onset of OST whose association can lead to loss of bone mass and increased risk of incidence of OST (14). In terms of family history data, the notices that there is a statistically significant difference between the observed groups. Namely, in the experimental groups, the family history was statistically significantly more frequent (64%) than in the control group (24%). Menopause status occurred in 50% of women in the experimental group compared to women in the control group 46%, which statistically represents a significant difference (p<0.05). Danndan et al (2018) in their research find that among other specified risk factors for osteoporosis, a positive family history represent a significant risk factor for the onset of this disease (15). Also, other scientific studies suggest that previous family or personal history increase the risk of osteoporosis/osteoporotic fractures several times and that in postmenopausal women they represent strong predictors for the first - incident of osteoporosis (16,17). On the other hand, the results of the study by Franccucia et al (2008), as well as other scientific study show that early loss of the menstrual cycle (before 50 years of age) can be an important independent risk factor for the development of osteoporosis and osteoporotic fracture (18,19). The presence of risk factors for the development of osteoporosis may be associated with different lifestyles and habits such smoking, type of diets and the duration of menopause, and more than the year of menopause can significantly affect the development of this disease. The results of this study showing decline levels of VD in post-menopausal women (16±1.2) compare to pre-menopausal women (18.6±1.2), (p-value< 0.05). VD deficiency is common among post-menopausal women and it is important to treat vitamin D deficiency to prevent falls and fractures in patients with osteoporosis and this results were agree with results from other studies (23,24).

Current study examined VD levels to determine the effects of this vitamin deficiency or insufficiency on selected associated factors among pre and post-menopausal women with osteoporosis. The effects of age in developing of OTS through ES levels can be explain by two phases of bone loss in women, the first occurs predominantly in trabecular bone and starting at menopause. It results from ES deficiency, and leads to a disproportionate increase in bone resorption as compared with formation (38). This phase could be defined as menopause related bone loss and after 4–8 years, the second phase exhibits a persistent, slower loss of both trabecular and cortical bone, and is mainly attributed to reduced bone formation. This is age related bone loss, which is the only phase that happens in women and the results of present study is agreement with other studies (39,40). Increase levels of ES in women with obesity (≥ 25 BMI) have a higher circulating levels of estrogen is may be due to enhanced peripheral aromatization in fatty tissues. Napoli et al (2009) were reported that the overweight and obese women were greater concentrations of ES compared to women with normal BMI (41). In the bones, PTH has both catabolic and anabolic effects and the effect on bone can be classified into early effect, which leads to release of calcium in the serum from bones, and late effect, which includes reabsorption and bone remodeling and among the two types of bone cells, osteoblasts seem to interact with PTH hormone (56). Marquina et al (2020) were reported that premenopausal women presented a higher prevalence of parathyroid failure and permanent hypoparathyroidism (57).
Lowering VD and ER levels are among the most risk factors to developing OST while PTH levels were increasing as a result of VD and ES elevation levels.

**Conflict of interest**

No potential conflict of interest relevant to this manuscript was reported.

**REFERENCES**