Effect of Osteopontin and Other Biochemical Markers on Iraqi Women with Osteoporosis

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ABSTRACT

Osteoporosis is a common problem that affects the bones, causing decreasing the mineral density in them (BMD), so the bones become weak and easy to break. Women are more susceptible to osteoporosis than men. The purpose of this current study is to know the effect of decreasing or increasing serum levels of osteopontin (OPN) and some biochemical markers of Iraqi women. In this study, 40 samples are collected from women over the age of forty and have osteoporosis. Different biochemical markers are measured such as vitamin D3, calcium (Ca^{+2}),Phosphorus (PO_4),uric acid (U.A, total cholesterol (TC), triglycerides (TG), alkaline phosphatase (ALP), high-Density Lipoprotein (HDL), the results of measurements are compared with 40 samples of healthy women. After examining the results, it was found that the levels of osteopontin, total cholesterol, triglycerides, and alkaline phosphatase are high compared with the control group with a significant difference (P≤0.001). And the result shows low levels of (high-Density Lipoprotein, vitamin D3, calcium, Phosphorus) of serum comparing the healthy group with a significant difference (P≤0.001). High levels osteopontin in the serum of and low levels of some biochemical markers such as (vitamin D3, calcium,Phosphorus and high-Density Lipoprotein) can be used in the diagnosis of osteoporosis.

Keywords: Osteoporosis, Osteopontin, Biochemical Marker

1. INTRODUCTION

Bones are the living tissues that are broken and replaced continuously as the bones undergo a continuous process called remodeling. In this process the old bone tissue is replaced by osteoclasts and new tissue is formed by osteoblast [1].When there is an imbalance between the two processes and the bone resorption is more than the bone-building, osteoporosis occurs [2],where the bones become brittle and they easily break due to a low mineral density in them (BMD)[2][3].Figure 1 shows the deference between healthy and injured bone. People with osteoporosis who have high levels of lipids are more susceptible to the risk of atherosclerosis, cardiovascular disease, and stroke [4], as well as have high levels of alkaline phosphatase, alkaline phosphate [5].They also have high levels of uric acid, A link between bone fractures and uric acid has recentlybeen discovered [6]. The diagnosis of metabolic bone disease is done through markers of bone turnover The diagnosis of metabolic bone disease is done through markers of bone turnover (BTMs) which are proteins or products derived from them that are measured in plasma or urine and which are either derived from osteoblast or osteoclasts [7]. In order to maintain bone density, the body needs an adequate supply of calcium, Phosphorus. On the other hand, it needs vitamin D3 that is used to absorb calcium,Phosphorus from food. One of the main factors for osteoporosis is a diet low inPhosphorus,calcium[8][9][10]. Vitamin D3 can be obtained through food or through exposure to sunlight [9]. One of the signs of bone resorption and considered a major

component of the non-collagen bone matrix is (OPN) and has a major role in bone resorptionby facilitating the attachment of osteoclasts to the bone matrix [11].In this paper, the levels of OPN and other biochemical markers are examined to show their effects on Iraqi healthy women and women with osteoporosis, where 80 women data will be examined in this study.Section 2 explains patient and work methods. The results of our study will be explained in section 3. Section 4 discusses the results. The final section 5 shows the conclusion of this paper.
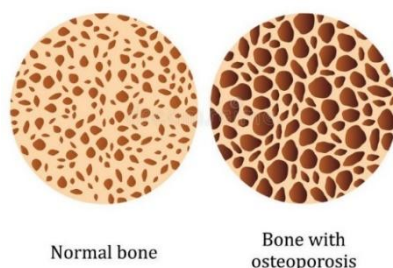
Figure 1: Normal and Bone with osteoporosis

2. PATIENTSAND METHODS

The current work was carried out in Fallujah Teaching Hospital during the period from November 2020 to March 2021. We have selected a group made up of (n = 80) of the women whose age is over forty years, divided into two subgroups (n = 40) of women with osteoporosis and (n = 40) of healthy women were chosen from the general population. Five ml is withdrawn from venous blood and is coagulate for 30 minutes at room temperature, after that, a centrifuge is used for 10 minutes (3500 rpm) to separate the serum. $Ca^{+2}$and PO_4, U.A of the serumis analyzed using a spectrophotometric method by using a kit manufactured by Biolabo/French.(HDL, TC, TG) analyzed using a spectrophotometric by using a kit produced by liner /Spain.D3serum is analyzed using a Minividas device bya kit manufactured from (biomerieux/ French).To search for the markers of bone turnover, OPN serum is analyzed using ELISA technology by usinga kit manufactured by (MyBioSource/USA). The Statistical package for social science (SPSS) program is used for calculating the statistical measurements like T-test, mean, standard division (SD) and correlation. The student's test (T-test) is utilized to test the differences between two groups of samples. Mean ±SD results are compared based on given P≤0.05.

3. RESULT

Todescribe the state of correlation between the groups, a correlation coefficientwas found.Table1 describe the result of comparison, where it was found that there is a significant difference of age between the control group and the osteoporosis group, Where P≤0.02, and there is no significant difference with rate (BMI) with P≥0.09.For the clinical characteristics, it observed increasing levels of (TC, TG,U.A, ALP, and OPN) in the serum in the osteoporosis group compared with the control group, with a significant difference (P≤0.001). While the levels of (D3, Ca,HDL, and PO_4) in the serum decreased with a significant difference (P<0.001).Figure 2 illustrates the levels of groups studied.

Table1:(Mean±SD) Demographic and clinical characteristics of the studied groups

Parameter	Osteoporosis n=(40)	Control n=(40)	P-value
Age (years)	44.75± 4.45	47.15 ±4.605	≤0.02
BMI (kg/m2)	25.54±5.14	24.55±4.42	≥0.09

Ca (mg/dl)	7.49±1.32	4.22±1.63	≤0.001
D3 (ng/mL)	19.29±5.70	8.34±0.96	≤0.001
ALP(IU/l)	61.07±11.28	73.27±13.92	≤0.001
HDL(mg/dl)	50.97±3.455	43.148±6.135	≤0.001
TC (mg/dl)	173.50±22.64	228.70±29.03	≤0.001
TG (mg/dl)	111.95±15.93	181.00±65.54	≤0.001
OPN(ng/mL)	14.512±3.558	24.93±7.044	≤0.001
PO_4 (mg/dL)	2.915±0.3110	1.950±0.4972	≤0.001
U.A	5.427±.07317	6.887±1.216	≤0.001
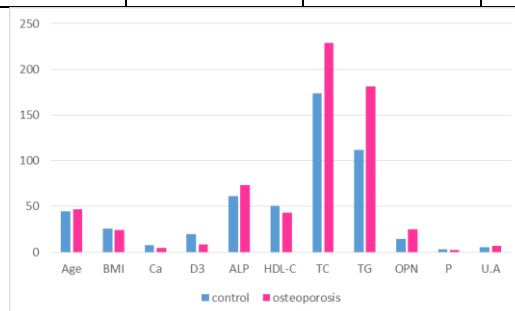
Figure 2: Compare between difference groups

Table 2 explained the correlation between activity (OPN) and other variables in osteoporosis group,it is appeared that there is a weak negative correlation between OPN activity with (Age,PO_4 U.A, Ca, and TG) parameters whileweak positive correlation with (D3,TC, HDL,ALP, and BMI) parameters.

Table2: Correlations between OPN activity and other variables in osteoporosis group

OPN activity	r	P-vlaue
Age (years)	-0.119	0.463
BMI (kg/m2	0.095	0.559
Ca (mg/dl)	-0.102	0.533
D3 (ng/mL)	0.025	0.880
ALP(IU/l)	0.054	0.741
HDL-C (mg/dl)	0.147	0.364
TC (mg/dl)	0.074	0.651
TG (mg/dl)	-0.109	0.502
U.A	-0.287	0.073
PO_4	-0.028	0.865

4. DISCUSSION

Osteoporosis is a common problem in which the bones become weak and easy to break. The metabolic disorders that have effects on the metabolism of the bones are caused by less of $Ca^{+2}$and PO_4that are considered the main components of the bones.Decreasing ofCa^{+2}andPO_4in the food in addition to the conditions that prevent absorptionfrom the intestine leads to a decrease of its percentage in the blood. The body compensates this deficiency by absorbing calcium,phosphorus from the bones, which leads to their weakness. For this reason, the percentage of$Ca^{+2}$and PO_4in the osteoporosis group is less than the control group, the studies in [8][10] [11] [12] approves our results.[12][12][12][12][12][12]The lower levels of calcium,phosphorusis associated with lower levels of D3 in the serum due tothat Vitamin D3 supports the body's ability to absorb$Ca^{+2}$and$PO_4$and has an important role in bone growth and regeneration, and

decreasing their levels lead to weak bones and ease of breaking them,which causes secondary hyperparathyroidism. This is corresponds with studyin [13][14].ForALP, it is found in many human tissues, including the intestine, kidneys, liver, placenta, and bones, and there is a large proportion of it in the bones and liver.So,increasing the percentage of ALP in blood belongs to diseases inthe liver or bone.We found that the osteoporosis group have high levels of ALP and this is approvedin the study of Khan and others [15][14].Increasing uric acidcaused increasing bone resorption due to oxidative stress and inflammatory cytokines, and this is identical to the study in[6]. Older people have a greater risk of fractures and bone loss than younger people[16][17].In a previous study[18], it showed an inverse relationship between osteoporosis and BMI, and this is identical to our current study. It was previously believed that high blood lipids are just associated with heart and arterial disease, but after conducting the study it was found that high fat has a major role in the occurrence of bone fractures[19], as well as low bone mineral density associated with low levels (HDL) [20]and this is what we found in our current study.OPN plays a role in increasing bone resorption and reduces bone building, thus its percentage in the serum increases for the osteoporosis group [21] matches to our study.

5. CONCLUSIONS

In this study that are made of 80 Iraqi women their age than 40 year, itwas found thatlow levels of (HDL, D3,$Ca^{+2} and PO_4$) and High levels of(OPN, TC. TG, U.A, and ALP), in the serum can be used in the diagnosis of osteoporosis.

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