The Relation between some Vitamins and Homocysteine Levels with Pre and Postmenopausal osteoporosis Women

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Abstract
Osteoporosis is a chronic condition with several stages. Low bone mass and microstructural degeneration of bone tissue are two characteristics of this chronic, progressive condition, which raises the risk of fracture. The study, which lasted from December 2021 to April 2022 and included participants aged 18 to 76, was carried out at the Dijla Hospital for Medical Rehabilitation in Tikrit. 80 people made up thes total number of subjects: 25 pre- and postmenopausal women with osteoporosis, and 30 pre- and postmenopausal healthy women (15 for each group). Our study found that pre- and postmenopausal osteoporotic women had higher homocysteine levels while having lower amounts of folic acid and vitamin B12 compared to the control group. The study found a negative link between vitamins and osteoporosis but a positive correlation with homocysteine, which is thought to be a diagnostic marker for the osteoporosis condition.
Keywords: Osteoporosis, homocysteine, folic acid, vitamin B12.

1. Introduction

Osteoporosis, which is defined as "POROUS BONES," is characterized by a gradual loss of bone mass that can result in fragility fractures. It is an age-related health issue that endangers senior people's mobility and raises mortality rates. This bone condition affects both males and women (1). It is evident that aging has a deleterious effect on bone metabolism since osteoporosis-related fractures are becoming more common in both men and women beyond age 65 in both genders. The remodeling balance is impacted by aging in a sex-specific way. It is connected to greater bone reabsorption in women and lower bone production and turnover in men (2,3).

When the essential amino acid methionine loses a methyl group, the creation of the sulfur-containing amino acid homocysteine (Hcy) takes place. An enzyme in the liver known as methionine synthetase catalyzes the methionine remethylation route. Methionine synthetase needs vitamin B9 as a donor of the methyl-tetrahydrofolate (MTHF) group, which is the active and circulating form of folic acid. Methionine synthetase also needs vitamin B12 as a cofactor in order to function properly (4). Hcy is involved in a wide array of biological processes that are necessary for survival. In the process of converting S-adenosylhomocysteine into Hcy and adenosine, which are the products of hydrolysis, it is produced as an intermediary in the methionine cycle (5). The therapeutic significance of Hcy, and in particular that of its development, is frequently contested in normal clinical practice (6).

It is possible that hyperhomocysteinemia (HCY) can modulate bone remodeling. It does this primarily by increasing osteoclast activity and differentiation, inducing bone marrow apoptosis of the mesenchymal stem cells, osteocytes, and osteoblasts, and, to a lesser extent, inhibiting osteoblast differentiation. [Citation needed] About half a century ago, researchers noticed that people who had homocystinuria had a significantly higher risk of developing osteoporosis. This hypothesis is based on those findings (8). In addition, hyperhomocysteinemia has been connected to problems with bone irrigation, which have been shown to have a direct impact on the extracellular matrix. In addition, hyperhomocysteinemia causes collagen cross-linking to become disordered, which has a negative impact on bone strength, and it attaches to the extracellular matrix (9, 10).

The biological production of macronutrients, red blood cells, and DNA all require the important micronutrient vitamin B12 (also known as cobalamin or B12) (11). Cobalamins, a cobalt-containing molecule with the property of having the biological action of a vitamin, are referred to as Vitamin B12 in general. Because vitamin B12 is plentiful in animal tissues, it can only be found in foods originating from animals. Meat and meat products, dairy products, fish, shellfish, and fortified ready-to-eat cereals are the main dietary sources of vitamin B12 (12). Hematologic and neuropsychiatric symptoms of vitamin B12 insufficiency can happen simultaneously or separately (13, 14). The hematologic symptoms of megaloblastic anemia from folate deficit and other sources are similar to those of vitamin B12

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deficiency, but it lacks the neurologic characteristics (15).

2. Materials and Methods

Blood was collected from the veins of premenopausal and postmenopausal women with osteoporosis, as well as control volunteers, and left to coagulate in a simple tube. The volume of blood drawn ranged from 5–10 milliliters. After centrifuging the serum for thirty minutes at a speed of four thousand revolutions per minute, it was then divided into aliquots, placed in plastic tubes, and kept at a temperature of minus twenty degrees Celsius until the time of the estimation. Research was conducted in the Dijla Hospital for Medical Rehabilitation in Tikrit for the purposes of this study. The participants in the study ranged in age from 18 to 76, and the trial didn't start until December 2021 and didn't end until April 2022. The overall number of subjects in this study was 80 people: 25 premenopausal and postmenopausal women who had osteoporosis, and 30 premenopausal and postmenopausal women who were healthy (15 for each group). BMD was measured through the lumbar spine (L2-L4) with the help of dual-energy X-ray absorptiometry, and the results were as follows: the right and left femurs to identify this group (DXA). Exclusion criteria for the trial included those with diabetes, thyroid disorders, rheumatoid arthritis, hepatic or renal insufficiency, any tumors or precancerous conditions, and high blood pressure. Homocysteine, folic acid, and vitamin B12 levels were calculated using sandwich-style ELISA kits from the Mybiosource Company (16).

With the aid of SPSS 21, statistical analysis was carried out, and a t-test was used to compare distinct groups. Calculated at (P0.05), the statistical significance level.

3. Results

In this present study, the mean±SD of the serum Homocysteine levels of premenopausal osteoporosis women were (28.53±11.62) µmol/L and the control group (9.09±1.64) µmol/L respectively while the postmenopausal osteoporosis women were (25.99±5.76) µmol/L and the control group (8.04±0.80) µmol/L respectively with highly significant (P≤0.01) in the osteoporotic groups when compared with the control groups.

The mean±SD of the serum folic acid levels of premenopausal osteoporosis women were (22.20±13.76) nmol/L and the control group (49.51±20.14) nmol/L respectively while the postmenopausal osteoporosis women were (13.56±7.44) nmol/L and the control group (53.06±4.99) nmol/L respectively with highly significant (P≤0.01) in the osteoporotic groups when compared with the control groups.

Premenopausal osteoporosis women's mean and standard deviation (SD) serum Vitamin B12 levels were (5.231.01) pg/ml and the control group's levels were (5.871.43) pg /ml, respectively, with no statistically significant difference (P>0.05) when compared to the control group, while postmenopausal osteoporosis women's values were (4.750.69) pg/ml and the control The table displayed each result (1).

Table (1):- Levels of Homocysteine, Folic acid and Vitamin B12 in Pre and Postmenopausal Osteoporosis Women with control groups

parameters	Mean±S.D Premenopause patients	Mean±S.D Premenopause Control	P- value	Mean±S.D Postmenopause patients	Mean±S.D Postmenopause Control	P- value
Homocysteine (µmol/L)	(28.50±3.63)	(9.09±1.64)	(P≤0.01)	(25.99±5.76)	(8.05±0.80)	(P≤0.01)
folic acid (nmol/L)	(22.20±13.76)	(49.51±20.14)	(P≤0.01)	(13.56±7.44)	(53.06±4.99)	(P≤0.01)
Vitamin B12 (pg/mL)	(5.23±1.01)	(5.87±1.43)	(P >0.05)	(4.75±0.69)	(5.18±0.67)	(P≤0.05)

4. Discussion

The levels of homocysteine were found to be significantly higher in both premenopausal and postmenopausal women who had osteoporosis when compared to the levels seen in control groups. This could be due to the fact that homocysteine has negative effects on bone, such as reducing the amount of blood flow in bone tissue and increasing the amount of mineraloproteins, both of which damage the bone extracellular matrix (17). Therefore, an increase in the Hcy level in the blood is considered to be a risk factor for osteoporosis. Hcy is also responsible for the promotion of inflammatory processes, which in turn result in bone demineralization through the activation of bone resorption and the cessation of the production of new bone, which has a negative impact on bone strength (18).

Folic acid and vitamin B12 levels were lower in premenopausal and postmenopausal women with osteoporosis than in control groups. This may be because folic acid and vitamin B12 are involved in homocysteine metabolism and bone turnover and have direct and indirect effects on bone (19). In fact, these nutrients do more than just control homocysteine metabolism. They also change the way bone cells work. In particular, they stimulate osteoblasts, while a lack of them increases osteoclast activity (20). Levels of vitamin B12 in the serum can fluctuate, which can have an effect on growth, bone mineral density, and the risk of bone fractures (21). There are a number of factors that determine how a lack of vitamin B12 or taking vitamin B12 supplements will affect one's bones. These factors include one's age, gender, and the length of time they have been lacking the vitamin or taking the supplement. It has been demonstrated that a lack of vitamin B12 will result in a decrease or maintain the same level of bone mineral density (BMD) (22.23.24). Vitamin B12 deficiency was found to have a

significant impact on osteoblast numbers and bone production, but it had no influence on the parameters of bone resorption, as determined by bone tissue analysis and histometry. (21.25).

5. Conclusion

The study concluded that there was a negative correlation between vitamins with osteoporosis but a positive correlation with homocysteine considered as diagnostic markers to diagnosis the osteoporosis disease therefore Folic acid and vitamin B12 should be supplemented to osteoporosis patients.

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