

The Impact of Vitamin D Levels on Bone Mineral Density in Postmenopausal Women

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Annotation: This article discusses the effect of vitamin D levels on bone mineral density in menopausal women. In addition, the effects of vitamin D on menopause have been studied. The aim of this review is to summarise the evidence linking vitamin D to bone health outcomes in menopause women. A plethora of scientific evidence globally suggests that large proportions of people have vitamin D deficiency and are not meeting recommended intakes. Older adults are at particular risk of the consequences of vitamin D deficiency owing to a combination of physiological and behavioural factors. Epidemiological studies show that low vitamin D status is associated with a variety of negative skeletal consequences in older adults including osteomalacia, reduced bone mineral density, impaired Ca absorption and secondary hyperparathyroidism. There seems to be inconsistent evidence for a protective role of vitamin D supplementation alone on bone mass. However, it is generally accepted that vitamin D (17.5 µg/d) in combination with Ca (1200 mg/d) reduces bone loss among older white subjects. Evidence for a benefit of vitamin D supplementation alone on reducing fracture risk is varied. According to a recent Agency for Healthcare Research and Quality review in the USA the evidence base shows mixed results for a beneficial effect of vitamin D on decreasing overall fracture risk. Limitations such as poor compliance with treatment, incomplete

assessment of vitamin D status and large drop-out rates however, have been highlighted within some studies. In conclusion, it is generally accepted that vitamin D in combination with Ca reduces the risk of non-vertebral fractures particularly those in institutional care. The lack of data on vitamin D and bone health outcomes in certain population groups such as diverse racial groups warrants attention.

Keywords: Menopause, menopausal period, Vitamin D, Calcium, Bone mineral density, metabolic processes, immunity.

Introduction

Menopause is an inevitable phenomenon of the general aging of the female reproductive system and is defined as the permanent cessation of menstrual periods, which occurs after the loss of ovarian follicle development. While the average age of menopause is around 51 years, it can vary from 40 to 60 years. Additionally, early menopause occurs in 1% of young women before the age of 40. Moreover, the loss of estrogen during menopause leads to accelerated bone mass loss and osteoporosis, resulting in decreased bone mineral density (BMD) and a subsequent increase in osteoporotic fractures.

Bone is defined as a mineralized connective tissue composed of four types of cells: osteoblasts, bone-lining cells, osteocytes, and osteoclasts. Bone is responsible for several important functions in the body, such as movement, support, protection of soft tissues, and storage of calcium and phosphate. Despite its passive appearance, bone is an extremely dynamic organ that is constantly being resorbed by osteoclasts and remodeled by osteoblasts.

Menopause is a process during which women lose fertility and menstrual cycles cease. Although it occurs naturally and is not considered a disease, menopause can lead to various complications if left unchecked. This period is characterized not only by the loss of reproductive function but also by significant hormonal changes, which lead to numerous physical and psychological issues. This state persists for many years. To support the body during these challenging times, it is necessary to take specially designed medicinal complexes for different age groups.

The importance of vitamins during menopause is as follows: Mood swings, headaches, and nervousness are common consequences of stressful situations for women over 45. Over time, taking vitamins can help solve the following tasks:

- Accelerate metabolic processes: A good metabolism positively affects the gastrointestinal tract's function and helps prevent unnecessary weight gain, which often occurs during menopause.

Immune System Support

The body continues to endure significant strain during menopause, which can exacerbate chronic diseases. Maintaining a strong immune system helps prevent these complications and ensures women can preserve a youthful appearance for many years. Treatment during menopause can boost overall performance and alleviate the emotional stress placed on the cardiovascular system.

Types of Menopause

There are two main types of menopause: natural and artificial.

- **Natural Menopause:** This is related to the depletion of ovarian follicle reserves due to aging.
- **Artificial Menopause:** This type occurs when a woman must immediately stop synthesizing sex hormones. It can be caused by the following conditions:
 - ✓ Fibroids
 - ✓ Uterine fibroids
 - ✓ Endometriosis
 - ✓ Uterine bleeding of various origins
 - ✓ Malignant tumors

Induction of Artificial Menopause

Artificial menopause can be induced through the following methods:

- **Surgical Practice:** This involves the removal or incision of the ovaries (ovariectomy). Indications for this operation include breast, uterine, and ovarian tumors.
- **Medication:** A less invasive method involves temporarily halting menstrual cycles through the use of special medications.

Method and Methodology

X-ray imaging of the ovaries is a method used in cases of malignant tumors. For most women, menopause begins between the ages of 47 and 52. The onset of this condition can occur very early or may be delayed for several years. Menopause that starts at the age of 40 is considered early menopause, while late menopause occurs between the ages of 56 and 65. The onset of menopause is influenced by several factors:

- **Genetic:** The number of follicles synthesizing estrogen in the ovaries is genetically programmed. This also applies to the hypothalamus and pituitary gland, which regulate menstrual cycles.
- **Geographical:** Sunlight exposure can influence the early or late cessation of menstrual cycles.
- **Personality:** Menopause tends to begin later in women who maintain an active sex life and fulfill their sexual desires.
- **Socioeconomic:** Women who are free from prolonged stress, have regular menstrual cycles, and do not engage in strenuous physical activity tend to experience later menopause.

Essential Vitamins During Menopause

As menopause approaches, the body faces mineral deficiencies. Complexes designed for older women during this period include all the necessary vitamins and phytoestrogens. These help compensate for the body's reduced hormone production, improve endocrine function, and strengthen the nervous system.

Vitamin D

The primary function of vitamin D is to help the body absorb calcium and phosphorus. It aids in preventing cardiovascular diseases, boosts immunity, and prevents thrombosis. A lack of vitamin D during menopause can lead to fatigue, increased risk of osteoporosis, and a rise in various health issues. Other problems often seen include muscle pain, joint lubrication issues in the pelvic area, difficulty walking, and limping. Women living in cities with low sunlight exposure, high pollution levels, and limited outdoor activity are often in need of vitamin D supplements.

The essential role of vitamin D and its metabolites in the absorption and formation of bone tissue has been recognized for a long time. Vitamin D plays a key role in regulating the proliferation and maturation of bone cells, as well as in bone mineralization and resorption. Additionally, severe vitamin D deficiency has been linked to osteomalacia in adults. Therefore, a deficiency in vitamin D may increase bone turnover and bone mass loss through enhanced bone resorption in postmenopausal women.

Research Results

Some studies have shown that vitamin D receptors (VDRs) are expressed in reproductive systems, including the ovaries, endometrium, and placenta. Additionally, several studies have reported the role of vitamin D + calcium supplements in the maturation of ovarian follicles. The effectiveness of calcium intake along with vitamin D supplementation has also been demonstrated as an important intervention for preventing osteoporosis in postmenopausal women by increasing bone mineral density (BMD).

Despite genetic influences on the age of menopause, it is theoretically believed that lifestyle factors, such as diet and physical activity, play a significant role in ovarian health. Previous studies have confirmed that physical activity, particularly exercise, is effective in reducing the risk of clinical fractures in postmenopausal women. Muir and colleagues published a study in 2013 assessing the impact of physical activity on bone density in postmenopausal women. Their findings show that regular physical exercise was overall effective in increasing bone density in postmenopausal women. Furthermore, several previous studies have shown that physical activity, especially a regular exercise program, is a primary method for maintaining bone mineral content (BMC) and preventing bone mass loss in women.

Vitamin A

Vitamin A performs several biochemical functions: it helps maintain sharp vision, provides antioxidant protection for the body by protecting immune cells from destruction, and supports the health of hair, nails, and teeth. Taking this vitamin can significantly reduce the risk of developing malignant tumors and enhance the production of sex hormones. A deficiency in vitamin A can lead to frequent colds and premature skin aging. While the body stores this vitamin slowly, an overdose can result in limb damage, drowsiness, nausea, and menstrual cycle disruptions.

Vitamin B1 and B6

These vitamins are essential for maintaining the health of the central nervous system, improving energy processes, reducing stress, and aiding in digestive system function. They also help regulate blood sugar levels, which is particularly important during menopause. A deficiency in these vitamins can lead to muscle weakness, reduced endurance during exercise, loss of appetite, rapid skin aging, and hair loss. Excessive intake may lead to digestive issues, muscle cramps, and headaches.

Vitamin C

Vitamin C is a crucial element in any medicinal complex. It not only acts as an antioxidant but also helps with:

- Better absorption of iron
- Protection against infections
- Stimulation of the immune system
- Strengthening blood vessels

Vitamin C also aids in healing injuries, regulates metabolic processes, removes toxins, and improves liver and gallbladder function. Overdosing is almost impossible, but excessive intake may lead to kidney stones, bloating, and abdominal pain.

Vitamin E

Vitamin E is a powerful antioxidant that restores cellular connections and protects them from the damaging effects of free radicals. It helps prevent cancer, promotes blood clotting, strengthens artery walls, and prevents varicose veins. It alleviates unpleasant symptoms of menopause and stimulates ovarian function. Taking vitamin E enhances hair beauty, preserves skin youthfulness by preventing dryness and wrinkles, and strengthens nails.

Micronutrients and Minerals During Menopause

In addition to vitamins, the body needs the following nutrients:

Magnesium: Calms the body, lowers blood pressure and cholesterol levels, prevents diabetes, and combats obesity, fatigue, and heart attacks.

Calcium

Calcium ions are involved in blood clotting and the strengthening of bone tissue. A deficiency in calcium can cause joint stiffness, nervousness, insomnia, limb discomfort, muscle spasms, and cramps. What is Menopause? Menopause marks the end of a woman's reproductive life. Symptoms of menopause include sudden hot flashes, night sweats, mood swings, and a variety of cognitive changes. These symptoms are caused by a decrease in the levels of female hormones in the blood. Hormone therapy, self-management techniques, and home remedies can help manage the effects of menopause.

CONCLUSION

Strength training exercises, combined with vitamin D and calcium, have a positive effect on bone mineral density and bone mineral content. They can help prevent or delay the development of breast cancer and conditions such as osteoporosis in postmenopausal women. However, further research is needed to assess the molecular pathways involved in this process.

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