

# Most People Don't Know of This Until They Have a Fracture

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## STORY AT-A-GLANCE

- › Every three seconds, someone breaks a bone due to osteoporosis; worldwide, this amounts to more than 8.9 million fractures every year
- › Osteoporosis is often described as a silent disease because it may cause no symptoms until a fracture occurs
- › Bisphosphonate drugs such as Fosamax are commonly prescribed for osteoporosis but may increase your risk of fractures
- › Important nutrients for bone health include vitamin D, vitamins K1 and K2, magnesium, calcium and collagen; proper sleep is also essential
- › Regular exercise, including blood flow restriction training, will help you build and maintain healthy bones

Every three seconds, someone breaks a bone due to osteoporosis, a common bone disease. Worldwide, this amounts to more than 8.9 million fractures every year.<sup>1</sup>

Osteoporosis is often described as a silent disease because it may cause no symptoms until a fracture occurs. "You may not even know you have osteoporosis until after you break a bone," according to the National Osteoporosis Foundation (NOP).<sup>2</sup>

In the U.S., about 10 million adults have osteoporosis, while 44 million have low bone density, known as osteopenia, which raises your risk of fractures and may progress into osteoporosis.<sup>3</sup> "This means that half of all adults age 50 and older are at risk of breaking a bone and should be concerned about bone health," NOP points out.<sup>4</sup>

Among women over 50, 1 in 2 will break a bone due to osteoporosis, as will 1 in 4 men. A fracture can occur from a minor fall or, in some cases, even from sneezing or bumping into a piece of furniture.

## What Are the Causes of Osteoporosis?

Your bone mass grows from birth into adulthood, reaching its peak during puberty. From there, loss of bone mass begins. Your peak bone mass is influenced by genetics, nutrition, gender, physical activity and health status during your growth period.<sup>5</sup>

The greater your peak bone mass, the more protection you have against osteoporosis later in life, such that an increase of peak bone mass of one standard deviation may reduce fracture risk by 50%.<sup>6</sup>

However, your bone tissue is continuously remodeled throughout your life. Tissue is lost by resorption and rebuilt by formation. If resorption outpaces formation, bone loss occurs,<sup>7</sup> which can lead to osteoporosis. According to Penn Medicine:<sup>8</sup>

*“Osteoporosis is a condition that leads to loss of bone mass. From the outside, osteoporotic bone is shaped like normal bone. However, the inside of the bones becomes more porous during the aging process due to the loss of calcium and phosphate.*

*The loss of these minerals makes the bones more prone to fracture even during routine activities, like walking, standing, or bathing. Often, a person will sustain a fracture before becoming aware of the presence of the disease.”*

A number of nonmodifiable factors can influence your risk of osteoporosis, such as age, sex, ethnicity, family history and menopause, but there are also modifiable risk factors over which you have a significant degree of control. Common causes of bone loss include:<sup>9</sup>

Poor diet

Vitamin D deficiency

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Gastric bypass surgery, which can make it difficult for your body to absorb enough nutrients from your food	Aging, including a decrease in estrogen at menopause for women and a decrease in testosterone in men
Increased inflammation in your body	Certain medications, including seizure drugs, hormone treatments for breast and prostate cancers and steroids
Absence of menstrual periods for long periods of time	Excessive intake of alcohol
Low body weight	Smoking
Eating disorders, such as anorexia nervosa	Sedentary lifestyle

Osteoporosis raises the risk of serious bone fractures, including to the spine and hip. Hip fractures, in particular, are notorious for raising an older individual's risk of death, with mortality rates up to 20% to 24% in the year after the fracture.<sup>10</sup>

“Fragility fractures are the fourth leading cause of chronic disease morbidity in Europe, after ischemic heart disease, dementia and lung cancer, however before chronic obstructive pulmonary disease and ischemic stroke,” according to the International Osteoporosis Foundation.<sup>11</sup>

“Evidence suggests that many women who sustain a fragility fracture are not appropriately diagnosed and treated for probable osteoporosis.” However, the commonly recommended treatment – bisphosphonate drugs, such as Fosamax – may cause more harm than good.<sup>12</sup>

## **Bisphosphonate Drugs May Raise Your Fracture Risk**

In the U.S., about 40 million prescriptions for bisphosphonate drugs are written every year.<sup>13</sup> The drugs induce apoptosis of osteoclasts – cells that degrade bone – inhibiting bone resorption.

However, there's a significant downside to the drugs, which may leave your bones frail and increase your risk of fractures. In a study conducted by researchers with the Spanish Agency for Medicines and Medical Devices it's explained:<sup>14</sup>

*"[D]uring the normal process of bone remodeling, the formation of bone produced by osteoblasts [bone-forming cells] is induced by osteoclasts, which implies that on reducing the resorptive activity, there is also an accompanying reduction in bone formation. The greater bone density observed after treatment with bisphosphonates may thus reflect bone weakness and not strength, given the increase of mineral content in the bone.*

*Bisphosphonates also weaken the collagen structure and produce an accumulation of microscopic injuries in the bone structure. Biologically, this makes it plausible that long-term bisphosphonate use would increase the risk of fracture and cause difficulty in repairing fractures."*

Indeed, the team found taking bisphosphonates was associated with an increased risk of subtrochanteric or diaphyseal fractures in women aged 65 and older who had a low fracture risk. The fracture risk increased among long-term bisphosphonate users.<sup>15</sup>

Fosamax has included a warning about atypical femur fractures on its package insert since 2011.<sup>16</sup> A 2017 study, which used a particle accelerator to generate exceptionally detailed images of the internal structure of bone samples from 10 hip fracture patients treated with bisphosphonates (BP), 14 samples from naïve fractures (bone fractures in patients that were not treated with the drugs) and six nonfractured controls, also showed a risk. According to the study:<sup>17</sup>

*"BP bone was 28% lower in strength than untreated hip fracture bone, and 48% lower in strength than non-fractured control bone ... BP-treated bone had 24%*

*more microcracks than naive fractured bone and 51% more than non-fractured control ...*

*BP therapy had no detectable mechanical benefit in the specimens examined. Instead, its use was associated with substantially reduced bone strength. This low strength may be due to the greater accumulation of microcracks and a lack of any discernible improvement in bone volume or microarchitecture. This preliminary study suggests that the clinical impact of BP-induced microcrack accumulation may be significant."*

Another paper published that same year in Scientific Reports suggested that "bisphosphonates may oversuppress remodeling resulting in accumulation of microcracks."<sup>18</sup> Microcrack accumulation, in turn, may lead to a "loss of microstructural integrity and consequently, reduced mechanical strength."<sup>19</sup>

This is why, in my view, these drugs should be avoided, as they do not address the underlying problem. While bisphosphonates make your bone thicker, they simultaneously make it mechanically weaker. Bisphosphonates have also been linked to an increased risk of liver and pancreatic cancers,<sup>20</sup> along with:

Osteonecrosis of the jaw (decay of the jawbone)<sup>21</sup>

Eye inflammation<sup>22</sup>

Liver damage<sup>23</sup>

A twofold increased risk of atrial fibrillation<sup>24</sup>

Kidney toxicity<sup>25</sup>

Hypocalcemia (low blood calcium level)<sup>26</sup>

## **Nutrition for Healthier Bones**

Prevention is key when it comes to osteoporosis, and the food you eat can go a long way toward building and maintaining strong, healthy bones. Important nutrients for bone health include:

1. **Vitamin D** – Vitamin D plays a regulatory role in the absorption of calcium and phosphorous, which are important for healthy bones.<sup>27</sup>
2. **Vitamins K1 and K2** – Vitamin K1, phylloquinone, is found in plants and green vegetables. Aside from playing a crucial role in blood clotting, it's also important for bone health. Osteocalcin is a protein produced by your osteoblasts and is utilized within the bone as an integral part of the bone-forming process.

However, osteocalcin must be "carboxylated" before it can be effective. Vitamin K1 functions as a cofactor for the enzyme that catalyzes the carboxylation of osteocalcin.<sup>28</sup>

Vitamin K2, menaquinone, which is synthesized by intestinal bacteria, works synergistically with calcium, magnesium and vitamin D to build strong, healthy bone. Vitamin K2 directs calcium to your bones and prevents it from being deposited in your soft tissues, organs and joint spaces. Vitamin K2 also activates the protein hormone osteocalcin, produced by osteoblasts, which is needed to bind calcium into the matrix of your bone.

The pooled evidence of seven Japanese trials assessing vitamin K2's (menaquinone-4) ability to prevent fracture rates found "hip fractures reduced by 6%, vertebral fractures reduced by 13%, and all nonvertebral fractures by 9%."<sup>29</sup>

3. **Calcium** – Calcium works synergistically with vitamin K2, magnesium and vitamin D, and needs all three of those to function properly. Vitamin D aids calcium absorption, while vitamin K2 makes sure the calcium ends up in the right place – your bones and not your arteries.
4. **Magnesium** – Magnesium works synergistically with calcium, vitamin K2 and vitamin D, and aids calcium absorption.
5. **Collagen** – Collagen has been shown to strengthen bones<sup>30</sup> and improve osteoporosis.<sup>31</sup>

## Sleep Disturbances Affect Bone Health

Sleep disturbances influence bone turnover and muscle strength,<sup>32</sup> which is why getting proper sleep is so important for bone health. Both short and long sleep duration have been indicated as risk factors for osteoporosis, for instance, and a study of older adults revealed that long sleep (eight hours or more a night) was the best predictor of osteoporosis risk.<sup>33</sup>

In fact, when 10 men had their sleep restricted and their circadian rhythm disrupted for three weeks, it led to an “uncoupling of bone turnover wherein bone formation is decreased but bone resorption is unchanged.”<sup>34</sup> Lack of sleep is also problematic for bones.

A study published in the Journal of Bone and Mineral Research<sup>35</sup> looked at postmenopausal women and found intriguing correlations between sleep duration and bone density. Women who reported sleeping only five hours or less per night had, on average, 0.012 to 0.018 g/cm<sup>2</sup> lower bone mineral density than those who slept seven hours or more.

Bone density was checked in four sites: whole body, hip, femoral neck and spine. Short sleepers had lower bone density in all of these areas and were at increased risk for osteoporosis of the hip and spine.

## Physical Activity – Including BFR – May Help

Along with nutrition and proper sleep, regular physical activity is essential for bone health. **Blood flow restriction (BFR) training** is an ideal form of exercise that's effective yet safe enough that even the elderly and the frail can participate.

It involves performing strength training exercises while restricting venous blood flow return to your heart (but not arterial flow) to the extremity being worked. This is done by wrapping your arms or legs with a cuff that mildly restricts blood flow.

By forcing blood to remain inside your extremity while it is exercising with light weights, you stimulate metabolic changes resulting in greater strength with virtually no risk of injury. While more research is needed on how BFR affects bone health, a systematic review found four studies showed BFR training increases the expression of bone formation markers and decreases bone resorption markers.<sup>36</sup>

Another study published in *Medical Hypotheses* suggested, “We hypothesize that the main mechanism behind the proposed favorable bone responses [of BFR] observed thus far is through increased intramedullary pressure and interstitial fluid flow within the bone caused by venous occlusion.”<sup>37</sup>

By providing your body with the fuel it needs via proper nutrition and engaging in regular exercise and daily movement, you can keep your bones strong and avoid osteoporosis, without the need for drug treatments.

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