

Calcium- Should we get it from natural foods or calcium pills/injections?

Calcium is the mineral which makes all hard tissues of the body – bones, and teeth. Only 1 % of calcium gets distributed in the soft tissues and blood. The blood level of calcium gets maintained in the close range of 9-11mg/100ml of blood. The bones are the biggest reservoir of calcium, which keeps the blood calcium level in the narrow range. The mineral calcium has generated the most interest amongst the public because osteoporosis (bone – thinning) has become an epidemic amongst the sedentary city dwellers. The physicians prescribe calcium supplements commonly to prevent osteoporosis. High doses of calcium are by far the most widely prescribed supplements around the world.

The big question is, “Are calcium supplements doing any good?”

To understand this, one has to know why osteoporosis – bone thinning occurs. If we do not know the exact cause of a disease, we will never know how to prevent or cure it.

Why does osteoporosis (Bone thinning) occur?

The processes of bone formation and bone resorption go on simultaneously in the body. In young, the process of bone formation exceeds the resorption. The reverse is true when the body gets older. That is the reason; older individuals develop osteoporosis. It is a natural process, but an excess of it causes bone thinning, bone pain, and fractures. A variety of factors contribute to osteoporosis:

- Female gender – Postmenopausal women have a higher risk of osteoporosis because of the lack of female hormone estrogen.
- Deficiency of vitamin D – Calcium absorption from the digestive tract requires vitamin D, and its deficiency decreases calcium absorption.
- A slim body frame – People with a lean physical structure are at a higher risk for osteoporosis. Healthy fat mass (not overweight or larger waistline) in females is protective in minimizing osteoporosis because fatty tissue produces the female hormone estrogen. Additionally, strong muscles sustain bones.
- Excess of Cortisol and Thyroid hormone – Excess of these hormones increase protein break-down, that makes bone frame weaker. Level of cortisol hormone rises with stress and lack of sleep. Taking cortisone as medication (rheumatoid arthritis, asthma) causes bone thinning. Thyroid replacement hormone can also lead to bone thinning.
- Excessive salt intake – More the salt intake more the mobilization of the calcium from the bones and a higher risk for osteoporosis. The commercial preprepared foods are rich in salt. The excessive consumption of refined salt is a significant contributor to osteoporosis in modern city dwellers.

- Caffeine, alcohol and carbonated beverage Intake – These acidic drinks increase the risk of osteoporosis by mobilizing the calcium from the bones.
- Sedentary lifestyle – The bones get their nutrition from muscle blood vessels. If the muscles are not moving, the precious cargo of calcium and other nutrients is not reaching the bones. Basically, **“Strong muscles make strong bones.”**
- Excessive intake of Meat and Dairy – A series of studies by the nutritional biochemist T. Campbell and colleagues concluded that excessive protein consumption from the meat and dairy promotes osteoporosis. Dairy consumption has become a significant modern controversy. High protein consumption leads to higher excretion of calcium in the urine. The reason is that the protein breakdown creates an acidic waste in the body. Since the body is alkaline, the acidic waste needs to get balanced by the alkaline calcium carbonate mobilized from the bones.

Misconception about Calcium supplementation

- Reid et al. Review: Should we prescribe calcium supplements for Osteoporosis? Journal Bone Metabolism; 2014.*
- Bolland M J et al. Calcium supplements and cardiovascular risk: 5 years on; Therapeutic advances in drug safety; 2013*
- Anderson JB et al. Calcium intake from Diet and Supplements and the risk of coronary artery calcification, ten-year study. Journal of American Heart Association; 2016.*

Over the past 10-15 years, calcium supplements are being widely prescribed by physicians all over the world, especially for urban populations over 50 years of age. This practice of prescribing calcium supplements followed 2001 recommendations by the “National Institute of Health (NIH), USA.” NIH proposed that adults over the age of 50 years, especially postmenopausal women should receive supplemental calcium in the doses as high as 1200-1500 mg daily. At the root of this promotion was the presumption, that increasing the calcium intake would increase bone formation and prevent osteoporosis. The medical research over the past 15 years, however, has failed to support this presumption.

Interestingly, while the evidence supporting the benefit of calcium supplementation is weak, there are reports which show that calcium supplements in the high doses prescribed per NIH recommendations, produces harmful effects. These adverse effects include:

- Increased risk of heart disease and stroke-Vitamins and mineral supplements are helpful if one has a deficiency. However, too much of these supplements can be harmful. Calcium supplements get prescribed in high doses of 1200-1500 mg, which cause high blood calcium levels lasting for up to 8 hours. More scientific studies are showing that risk of heart attacks and stroke increases with these high doses of calcium, which keep blood

calcium levels high for several hours. The high blood calcium levels cause calcification and thickening of the arteries raising the risk of high blood pressure, heart attacks, and stroke.

- High blood calcium levels from high dose calcium supplements also increase the risk of kidney stones.
- Calcium supplements in high doses, cause constipation and other symptoms of digestive distress and pain.
- High dose calcium supplements can cause generalized symptoms such as bone pain, muscle pain, anxiety, lethargy, and fatigue.

A sensible take on the calcium supplementation

Advocacy for the use of calcium supplements by NIH got based on the presumption, that increasing calcium intake would increase bone formation and improve bone strength. The current research and understanding of the biology of the bone do not support this presumption. There is evidence that calcium supplements prescribed in the recommended high doses of 1000-1500 mg can cause harm as outlined above. The balance of risk and benefit on high dose calcium supplementation is a negative-more risk than the benefit.

“Most health organizations now recommend that individuals should obtain their calcium requirements, primarily from their diet rather than the calcium supplements. Finally, the supplements, if required should be prescribed in much smaller doses of 500mg or less and not the mega doses of 1000-1500 mg which raise the blood levels of calcium abnormally high for eight hours”.

Factors which affect calcium absorption and excretion

(Referenced from the Book on Nutrition Science, Sixth edition by B.Srilakshmi)

It is good to know what will improve the absorption of dietary calcium from the digestive tract. In healthy individuals, up to 30-40% calcium in the diet gets absorbed in the gastrointestinal tract. Calcium absorption is higher in children and during pregnancy because of the hormonal effect. The calcium absorption declines with age, especially in postmenopausal women. Several factors influence the absorption of calcium in the digestive tract:

- **Vitamin D** – This plays a critical role in calcium absorption. A reasonable level of Vitamin D improves calcium absorption by 10-30%.
- **Stomach acidity** – Absorption of calcium is better in the acidic conditions. In elderly calcium absorption decreases significantly because stomach acidity goes down. A similar situation occurs in individuals who take acid reflux medications regularly. Patients with

Acid reflux should correct their problem by food and lifestyle change and not by acid – reflux medications, which lead to significant digestive and health issues.

- ***Commercial protein powders and bone health*** – Meats, natural plant proteins, and dairy have phosphates. Presence of phosphates in the natural proteins helps with bone health as the calcium deposited in the bone is calcium phosphate. Additionally, an increase in the amount of phosphate in the diet protects against the excretion of calcium in the urine. However, synthetic protein powders such as casein protein, whey protein, and pea protein do not contain the protective phosphates. Consuming large amounts of these commercial protein powders (as is done by bodybuilders), therefore, is harmful to bone health.
- ***Emotional stress*** – Emotional anguish, anxiety, depression increases levels of stress hormone cortisol levels in the body. High cortisol levels reduce calcium absorption. Cortisol also leads to bone thinning because of muscle loss.
- ***Lack of physical activity and exercise*** – People who are immobile or sedentary, lose bone mass. Bedridden patients lose their muscle mass fast, followed by the loss of their bone mass. Active exercises such as walking, running, and weight training that make the muscles strong, increase bone strength and density.

“Bone blood flow is dependent on the muscle blood flow; therefore, the strong muscles build strong bones.”

- Caffeine intake – High caffeine intake increases the excretion of calcium in the urine. Cola beverages have a dual negative effect on bone health – these contain phosphoric acid as well as caffeine. The regular consumption of as little as one can of caffeinated soda drink a day can make the bones weak.
- Excess sodium (salt) intake – A diet rich in sodium increases calcium excretion. The commercially packaged and pre-prepared junk foods contain harmful high amounts of salt. Refined white salts have more sodium than unrefined natural salts such as rock salt (desi namak) and Himalayan pink salt.
- Alcohol – Consuming 2-3 alcoholic drinks/day increases the risk of osteoporosis by inhibiting the absorption of calcium as well as vitamin D.

Food Sources of Calcium

The dairy sources – Milk, yogurt (Dahi, Curds), are rich sources of calcium provided the cows are grass-fed and not farm-raised cows which get corn-fed. The calcium in the cow feed comes primarily from green vegetations and not the bulk feed of genetically modified corn. Additionally, the milk from the farm-raised cows is deficient in vitamin D, because these cows do not see the sun and open pastures. The milk from cows raised on the commercial dairy farms, therefore, is deficient in bone health-promoting calcium and vitamin D.

The most adult Asian population is lactose intolerant and are unable to digest milk, which may cause indigestion, gas, bloating, and acidity. The curd/dahi are better options for dairy in Indians. Food sources of calcium:

Product	Calcium in mg
Dahi/Curd/Yogurt1 Cup (6 ounces-225ml)	300
Cheese /Paneer one ounce (28gm)	200
Broccoli225 gm	150
Cooked green vegetables 225 gm	150
Soybean 225gm	175
Lentil/ Legumes 100gn	200
Nuts/Seeds one ounce(28gm)	80
Poppy seeds10gm (2 tsp)	130
Sesame seeds 10gm (2 tsp)	90
Curry leaves 10gm	83
Gingelly seeds (Bhanjira) 10gm	145

Recommended Dietary Intake (RDI) of calcium

- An adult male/ female requirement of calcium is about 600 mg/day.
- The requirement is twice as high during pregnancy and lactation.
- Growing children and young adults require up to 800 mg of calcium/day.
- A healthy level of Vitamin D (preferably from the sunlight) is critical for optimal absorption of calcium from the digestive tract.
- Additionally, several factors outlined above modify the absorption and excretion of calcium from the body and need consideration for normalizing calcium.