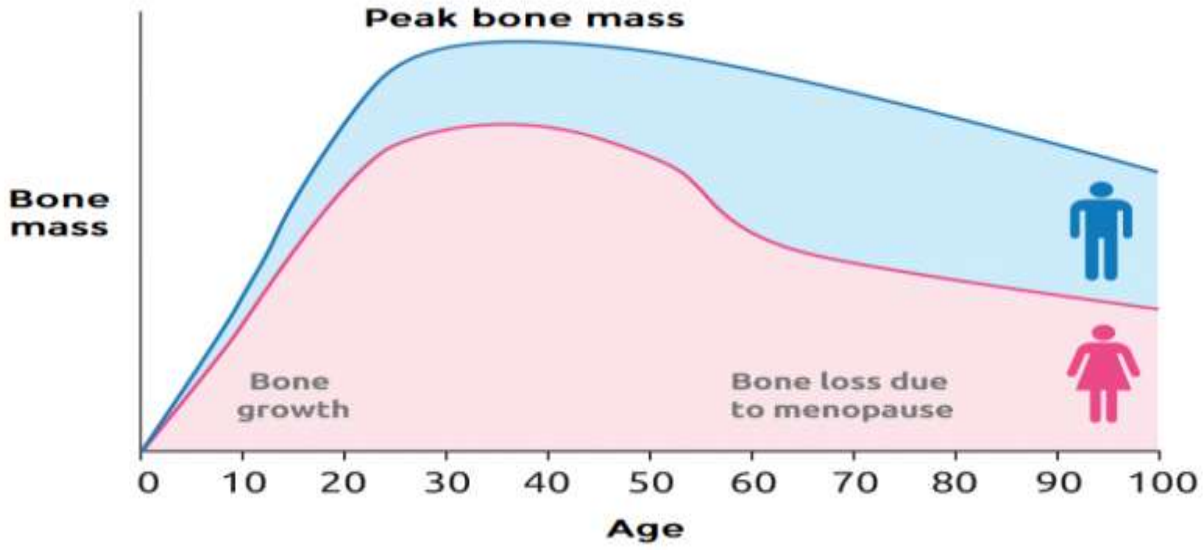
Keep Bones Strong & Prevent Osteoporosis: Natural solutions & when to take calcium, Vitamin D & Drugs?

Table of CONTENTS:

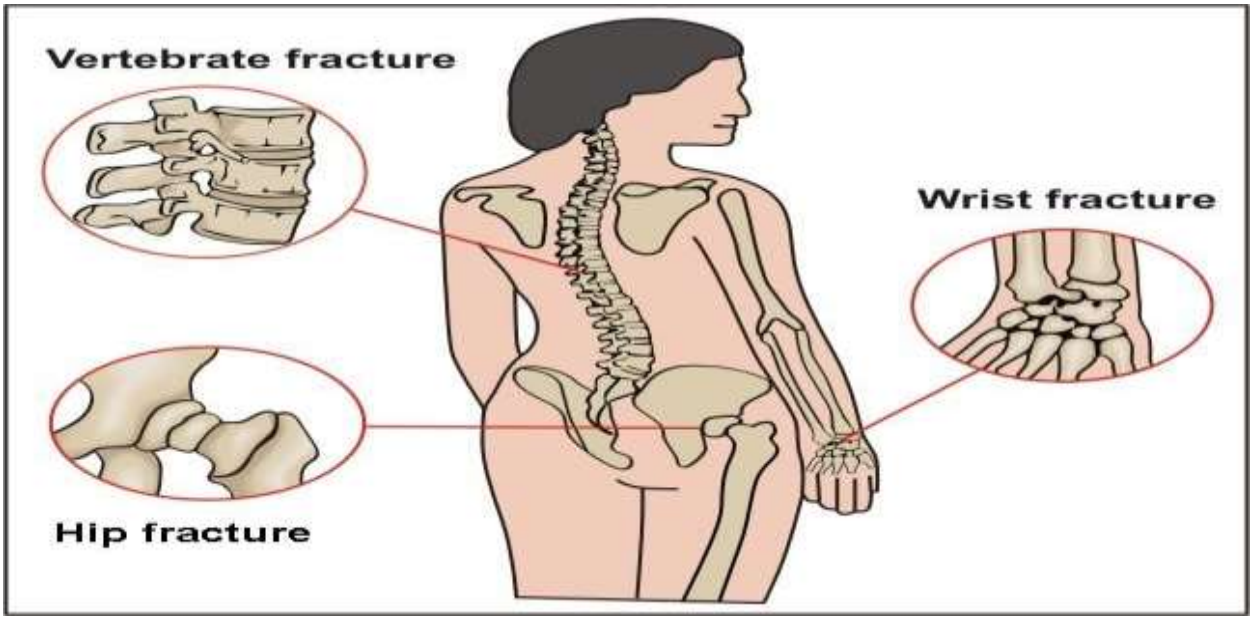
1. Introduction-What is Osteoporosis?

Osteoporosis means weak, porous, and spongy bones that break easily, leading to significant pain, disability, and dependence. It is a silent disease, and most older people do not know they have it until they break a bone with a minor injury. Osteopenia is the milder form, and Osteoporosis is the severe form of the disease that increases the risk of bone fractures. Healthy calcium balance together with Vitamin D is necessary for maintaining bone health as well as muscle health. Weak bones and weak muscles go hand in hand.

Bones grow in strength as the child grows into adulthood, reaching a peak between 20-30 years of age. Strong bones at a young age is a fixed deposit for keeping solid bones in old age.



The bones are renewed throughout life by a constant process of new bone formation and old bone destruction. At a young age, new bone replacement is more than bone loss. As age advances, the process reverses, and at an older age, bone loss is more; the bone becomes spongy and thin and can break easily. That age is greater than 65 years in females and 70 years in males. However, Osteoporosis can occur prematurely at a younger age if the food is deficient in calcium, sun exposure for Vitamin D production is inadequate, or a person is taking certain medications that interfere with calcium absorption or increase bone loss. The three bones that are at the most significant risk of fracture in Osteoporosis are- Spine. Hip and wrist.



There are 9 million fractures worldwide each year because of Osteoporosis, approximately one in every 3 seconds. Norway is the country with the highest incidence of Osteoporosis. That is surprising because the population consumes meat and milk in large amounts. The studies from Norway suggest that excessive dairy (more than one glass a day) is unnecessary. More milk increases the risk of Type 2 diabetes, doubles the risk of heart disease because milk is rich in sugar and saturated fat. The same is valid for milk-dense foods such as cheese/ paneer and milk-based sweets. So moderation in dairy is the key, and more milk does not translate to stronger bones (that is an old myth).

To keep strong bones, one needs to know:

2.Why do Osteopenia and Osteoporosis occur?

3.How to increase the calcium in the bones naturally?

4. How to increase the natural intake of vitamin D?

5. How to know if a deficiency of calcium and vitamin D is present?

6.How do doctors diagnose Osteoporosis?

7.How to prevent Osteoporosis?

8.Do we need medical supplements of calcium and Vitamin D ? when are these required, and what is the safe amount?

9.What are the medical remedies to treat severe Osteoporosis, and when are these prescribed?

2. Why Do Bones Become Weak & Osteoporosis Occurs?

The new bone formation and old bone destruction occur in the body simultaneously, as outlined above. The strong bones at young age ensure strong bones later in life. A variety of factors contribute to excessive and premature bone thinning:

a). **Female Gender-** Female hormones are protective, and postmenopausal women have a higher risk of Osteoporosis. Risk increases after the age of 65 years. Early menopause before 45 years and removal of ovaries increases the risk of Osteoporosis.

b). **Older age**—Osteoporosis is more common in females over the age of 65 years and males over the age of 70 years

c). **Deficiency of Vitamin D**--Calcium absorption from the digestive tract requires vitamin D, and its lack decreases calcium absorption.

d). **A slender body with less muscle mass and fat** –People with weak muscles and less body fat are at a higher risk for Osteoporosis. Healthy fat mass (not overweight and obesity) in females is protective of Osteoporosis because fatty tissue produces female hormone estrogen.

e). **Lack of exercise and insufficient muscle mass-** When muscles contract, muscle blood vessels pump the blood and nutrition to the bones. Active, strong muscles build strong bones. Lack of exercise and activity (sedentary lifestyle) is a major cause of bone thinning among city dwellers.

f). **Excessive salt intake**—When the kidneys get rid of excess salt, calcium accompanies the salt in the urine. So a diet rich in salt causes bone thinning from excess calcium loss.

g). **Coffee, Tea, and soda drinks**—Excess of these drinks increases calcium excretion in the urine. Dark brown cola drinks are specifically bad for the bones because they are highly acidic from the added phosphoric acid. The acidic foods and beverages cause bone thinning (see below).

h). **Excess of acidic foods in the diet**- Meat, dairy, sugar, and refined carbohydrates (milled wheat flour and maida) create an acidic residue in the body. The body composition is alkaline, so it balances itself with alkali when there is more acidic residue. The readily available alkali in the body is calcium carbonate in the bones. More acidic the food, the more the calcium is drawn out from the bones, increasing bone thinning risk.

i). **Acid reflux medications**—Stomach acidity or Acid reflux disease has become an epidemic amongst city dwellers because of factory foods, stale preprepared foods, and eating late. Doctors commonly treat it with drugs that lower stomach acidity. Stomach acidity is essential to calcium absorption. The widely prescribed acid reflux drugs such as Prilosec, Protonix, Nexium, etc., interfere with calcium absorption and weaken the bones.

k). **Excess of Cortisol hormone and Thyroid hormone**- Excess of these hormones causes bone thinning. The level of cortisol hormone rises with lack of sleep and emotional stress. Taking cortisone as medication (in rheumatoid arthritis, asthma) causes bone thinning. Thyroid replacement hormone can also lead to bone thinning.

Amongst all the reasons listed above, the six most significant reasons for the modern epidemic of excessive and premature bone thinning are:

- **Inadequate dietary intake of calcium (natural plant foods are rich in calcium and refined factory foods deficient in calcium)**
- **Inactive lifestyle**
- **Too much salt in the diet**
- **Excessive consumption of acidic foods, coffee,tea, and soda drinks**
- **Use of acid reflux medications**
- **Vitamin D deficiency --From lack of sun exposure (indoor lifestyle)**

3. How To Increase Calcium in the bones Naturally?

To meet calcium needs for strong bones, one requires to know the following:

a). The average daily requirement of calcium

b). How to increase the absorption of calcium from the digestive tract?

c). How to prevent calcium loss from the body?

d). How to prevent calcium loss from the bones?

e). How to increase the calcium supply to the bones?

f). Knowledge of good dietary sources of calcium

a). Average daily calcium requirement -In an adult male or female, the daily dietary calcium requirement is 600-800 mg. Pregnant and lactating women, growing children, and young adults require twice as much calcium in their daily diet. The need for calcium is also higher in older adults over the age of 65 because they have lower stomach acidity and absorb calcium poorly. The human body is very competent in recycling and conserving calcium. So in most cases, there is no need to take medical supplements of calcium, especially in doses higher than 500mg daily. That is provided the dietary intake is good.

b). How to increase absorption of calcium from the digestive tract – *To* maximize calcium absorption in the digestive tract, one requires to:

- **Normalize Vitamin D level**—Calcium absorption from the digestive tract is dependent on normal Vitamin D levels in the body. The deficiency of Vitamin D is a major cause of inadequate calcium absorption. The easiest and most reliable way to get vitamin D is sun exposure for 30-60 minutes in the morning. Sun exposure can provide 80% of the vitamin D needed by the body (see the details of sunbathing for maximizing vitamin D intake below).
- Eat foods rich in calcium (see below)
- Minimize or avoid smoking and alcohol
- Eliminate the use of acid- reflux medications- To eliminate acid reflux disease, eat early before 8 PM, three to four hours before bedtime, and eat more alkaline foods (see picture below)

c). *How to prevent calcium loss from the body*?– The calcium loss from the body via urine increases if the diet is rich in salt, as indicated above. Excess consumption of salt in packaged foods is a significant cause of bone thinning in modern city dwellers.

d). ***How to prevent calcium loss from the bones?—*** The foods which make the body acidic remove calcium carbonate from the bones making bones weak and thin. The body is alkaline, and when there is more acid residue in the body from the food, more calcium gets removed from the bones to balance the alkaline state of the body. Minimize acidic foods in the diet (see picture above acidic vs. alkaline foods). Meat eaters lose more calcium in the urine.

e). ***How to Increase calcium and Vitamin D supply to the bones?*** -- The bones get their nutrition from muscle blood vessels. If the muscles are not moving, the precious cargo of calcium and vitamin D can not reach the bone to do the work of building strong bones. Lack of exercise and physical activity is another big reason for bone-thinning amongst the city dwellers.

So always remember, "Strong muscles build strong bones."

f). *Good dietary sources of calcium*--The good dietary sources of calcium are**:**

- Dairy (milk, curds-dahi, buttermilk)- Cow milk is a good source of calcium and vitamin D provided the cows are grazing grass under the Sunlight in open pastures. Unfortunately, most milk sold in cities worldwide is from Farm-raised cows. These cows get fed unnatural cornmeal, are locked up indoors, and given antibiotics and hormones to produce ten times the average amount of milk produced by the cows raised naturally (40 to 50 liters versus 4-5 liters) a day. Therefore, the milk from farm cows is deficient in both calcium and Vitamin D. Another problem with milk is that most adult Asian populations do not have lactase enzymes in the digestive tract to digest the milk. Therefore milk causes bloating, indigestion, and acidity. The fermented milk products such as curds and thin buttermilk (chaach), on the other hand, carry lactase enzymes and are better digested by Asians.
- Green Vegetables and soybeans
- Lentils and legumes
- Seeds and nuts

Food Products Versus Calcium Content

Food Product	Calcium in mg
Dahi/ Curd one cup (225 ml)	300
Cooked Spinach & Dark green vegetables (225gm)	150
Soybean (225gm)	175
Lentils & Legumes (100gm)	200
Nuts & Seeds (28gm-one fistful)	80
Poppy Seeds/ Chia seeds (two teaspoons-10gm	130
Sesame seeds (two teaspoons-10gm)	90
Curry Leaves (10gm)	80
Black raisins or Munacca (7-8 pieces)	60
Gingelly seeds (bhanjira-10gm)	145
NOTE: Recommended dietary intake (RDI) of calcium is: 600 mg in an adult, 800 mg over 65, and 1000 mg in growing children and pregnant/ lactating mothers.	

4. How To Increase Vitamin D intake naturally?

Among all the vitamins, vitamin D- the bone vitamin, is an exception that the body can make from natural Sunlight. In addition to bone health, Vitamin D also boosts immunity and protects against infections. The viral infections of the respiratory system are more common in the winter months than the summer months because the Sunlight is sparse and weak.

To improve Vitamin D levels naturally, one needs to be familiar with:

a). Natural sources of Vitamin D

b). Beneficial effects of vitamin D and sunlight

c). Recommended blood levels of Vitamin D

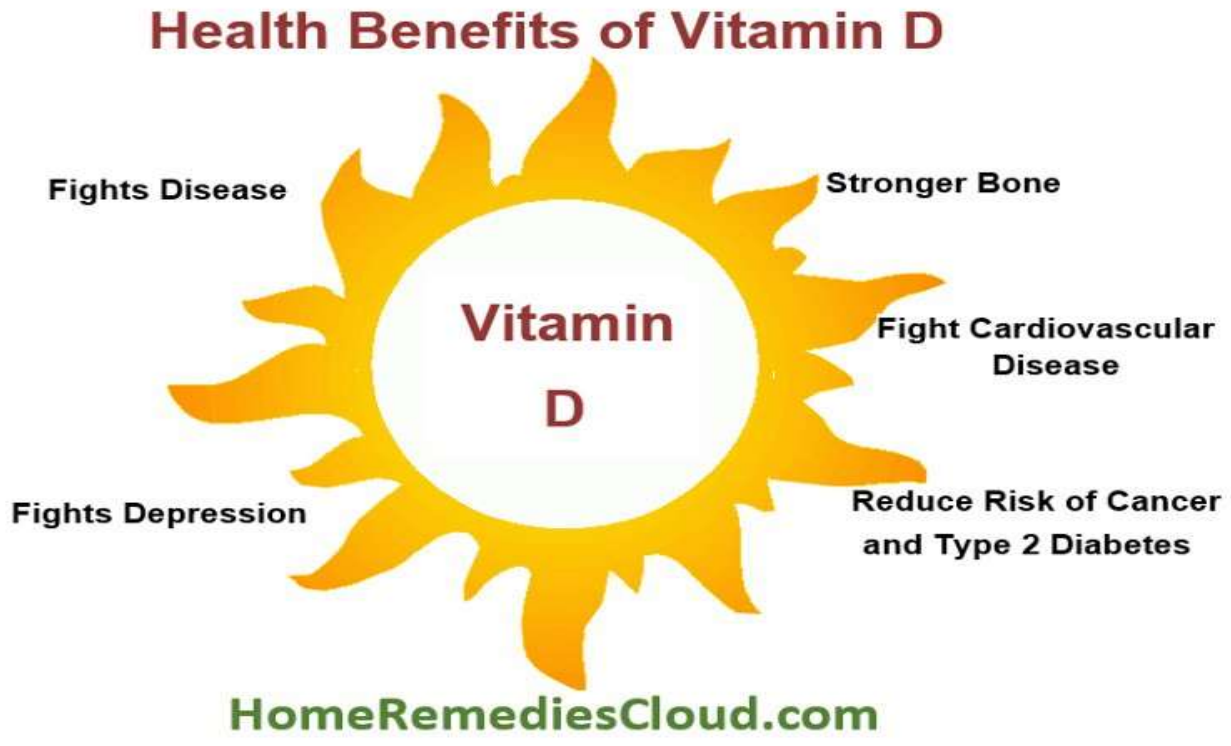
d) Taking Sunlight safely to maximize the production of Vitamin D

a). Natural Sources of Vitamin D **--**There are two natural sources of vitamin D, diet and Sunlight.

- **Dietary Sources-** Most plant and animal foods such as milk, vegetables, eggs, and meat are poor sources of vitamin D. The only food product rich in Vitamin D is Cod liver oil.
- **Sunlight exposure-** The ideal and most abundant source of vitamin D is the UV-B rays of the morning and evening sun. Sunlight exposure can never overdose a person with vitamin D; in contrast, medical Vitamin D supplements can overdose and cause side effects. Therefore vitamin D supplements, especially in high doses, should be avoided or taken with great caution under close medical supervision. Proper exposure to Sunlight can provide an individual up to 80% of the body's Vitamin D requirements. Sunlight is abundant in India, but the city population in India and worldwide suffers from vitamin D deficiency because of a preference for an indoor lifestyle. Geographic areas of the world where there is no sunlight for many months of the year suffer from low vitamin D levels.

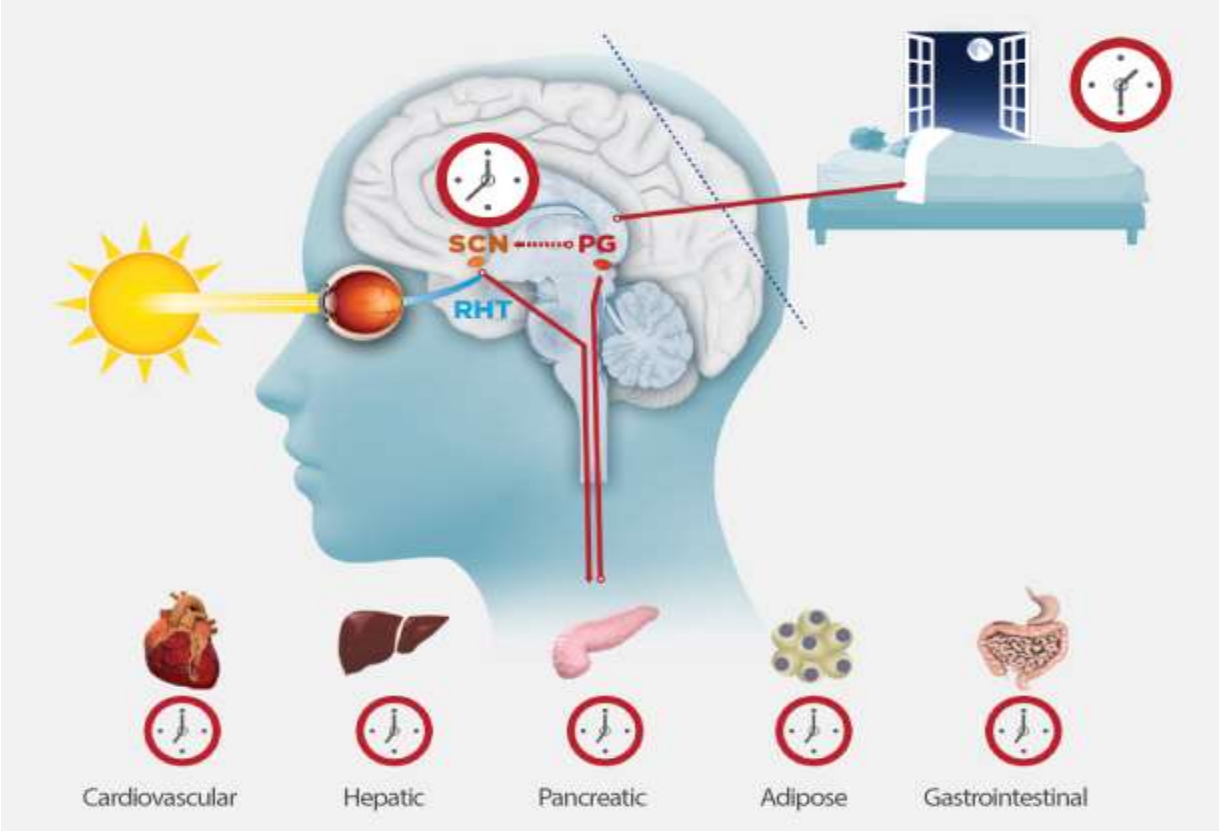
b). Beneficial effects of Vitamin D and Sunlight- Natural Vitamin D in conjunction with Sunlight has so many benefits that it will be fair to say:

"There are all kinds of light for sight, but for health, there is only one light, and that is Sunlight. "



- ***Bone health***—Vitamin D plays a vital role in maintaining blood levels of calcium and phosphorus for bone mineralization. Vitamin D produces this effect by promoting the absorption of these elements from the digestive tract.
- ***Hormonal balance***—The eyes perform the unique function of connecting the brain to Sunlight. Vitamin D receptors have a universal presence in the body, including the brain. The nerves from the eyes carrying the signals stimulate the brain's hypothalamus area, the master controller of all many hormones such as Growth hormone, Thyroid-stimulating hormone, Cortisol stimulating hormone, etc. The hormones are vital chemical messengers in the body.
- ***Sleep and Mood***—Deep rejuvenating sleep hormone Melatonin and mood-elevating hormone Serotonin are synthesized in the brain in the morning on exposure to Sunlight or the bright morning light. Both Melatonin and Serotonin are interrelated to each other, so insomnia leads to depression and depression to insomnia. The people in the geographic areas of the world where there is no sunlight many days at a stretch have a higher incidence of depression and suicides.
- ***Immunity***- Sunlight exposure and Vitamin D increases the number of immune cells which defend the body against bacterial and viral infections. Respiratory diseases such as the Common cold, Influenza, and Pneumonia are more common during the winter months. Sunlight and optimal Vitamin D levels boost immunity and are protective against infections and cancers. The incidence of autoimmune diseases such as Rheumatoid arthritis, Type1 Diabetes, Hashimoto Thyroiditis, and Multiple sclerosis (weakness and paralysis of muscles) is increasing worldwide. That could be related to a preference for indoor style with reduced exposure to Sunlight leading to deficiency of Vitamin D..
- ***Skin health*** –Vitamin D deficiency and lack of healthy exposure to Sunlight can lead to skin conditions such as Psoriasis and Eczema. Human skin is the site of vitamin D synthesis, and it influences many functions such as skin cell growth, turnover of dead cells, and protection against infections. Several clinical studies have shown beneficial effects of vitamin D in Psoriasis and Eczema.
- ***Brain function and memory***—Exposure to sunlight increases cell growth in the brain called the Hippocampus, which is the seat for forming new

memories. Diminution in the Hippocampus's size occurs with aging and correlates with reduced memory and cognitive function (reasoning and use of gathered information).



c). ***Recommended Blood Levels of Vitamin D***- The International Osteoporosis Foundation estimates that 80% of the Indian city population suffer from vitamin D deficiency. That is unfortunate, considering India is near the equator and has abundant Sunlight for making natural Vitamin D.

- Vitamin D levels of 30 ng/ml or higher are optimal for bone health.
- Levels below 12 ng/ml indicate severe vitamin D deficiency.
- The levels above 50ng/ml are considered high and an indication to stop vitamin D supplementation
- The levels above 100 ng/ml are considered high. These high levels can occur when doctors prescribe very high doses of vitamin D weekly or monthly (Sunrise Vitamin D 60,000 units).

Testing for vitamin D levels has become widely popular worldwide in the past 5 -10 years. That has led to routine supplementation with high doses of vitamin D, which

can be harmful. The current medical research does not favor regular testing and supplementation of Vitamin D in doses larger than 1000 units a day. Supplementation with high doses of vitamin D also is unnecessary and harmful. Vitamin D can be safely obtained from natural sunlight exposure at no expense without any overdose risks. Vitamin D testing and replacement are required when the patient has symptoms and signs of vitamin D or calcium deficiency (see below).

Taking Sunlight Safely to Maximize Production of Vitamin D

Medical science has exaggerated the harmful effects of Sunlight on the skin, specifically skin cancer (that risk is only in the white population) and early cataracts. Proper protection of the skin and eyes eliminates any chance of sunlight damage. Healthy tips for sunbathing to get the maximum benefit of UV-B rays of the sun for vitamin D synthesis are:

- Indian continent located near the equator allows for the maximum benefit of the Sunlight. Unfortunately, environmental pollution in the big cities blocks UV-B rays of the Sunlight necessary for Vitamin D synthesis in the skin. The stay healthy, the population must campaign for clean air.
- Winter Sun is less effective in generating UV-B rays for vitamin D synthesis in the skin, so sun exposure needs to be later in the morning and longer.
- The ideal time to sunbathe is one hour after the sunrise and one hour before the sunset. Morning time one hour after sunrise is preferable as there is less environmental pollution in big cities in the mornings than in the evenings. Morning Sun also provides the additional benefit of promoting hormone secretions in the brain, as outlined above.
- An easy way to check if Sunlight is safe for sunbathing is to check your own shadow. If the shadow is longer than your height, then it is safe to sunbathe. If the shadow is the same size or shorter than your height, the sun is too strong to sunbathe.
- In older age individuals, vitamin D production in the skin is lower. So older individuals must sunbathe for a more extended period.
- Avoid heavy clothing and sunscreen lotions during sunbathing as both block the sun's UV-B rays. Sunbathing is done in the morning hours when the sun is not intense, so there is no sunburn or suntan risk.

- Darker the skin, the longer the time required to get the appropriate benefit of the Sunlight. The safe duration of sunbathing based on the color of the skin is as follows:

  Individuals with fair and light-colored skin –15 to 30 minutes
  Individuals with brown skin—30 to 60 minutes
  Individuals with very dark skin—1 to 2 hours
  Elderly individuals—1-2 hours

- For maximum benefit, up to 40% of the body requires exposure to Sunlight, including hands, arms, feet, and legs. The best UV-B absorption of rays occurs from the lighter area of arms and hands.
- Multiple 2-3 short 10-15 minute exposures are more useful for Vitamin D synthesis than one long 60-minute exposure.
- The heating and redness of the skin suggest that sun rays are too intense for sunbathing, and further exposure to Sunlight must stop.
- Sunbathing, as described above, done 3-4 times per week, will do the needful in light-colored individuals. Darker skin color individuals require longer exposure time, so daily sunbathing may be more appropriate.

5. How To Know If There is Deficiency of Calcium and Vitamin D?

Vitamin D is vital for calcium absorption. Calcium deficiency can occur silently with no or minimal symptoms. The fracture with minor injury over the age of 50 years raises the alarm that Osteoporosis from vitamin D and calcium deficiency may be present. Calcium and Vitamin D deficiency is suspected if there are following signs and symptoms:

- Muscle aches, bone pain, specifically in the neck and back
- Weakness and tiredness, dizziness, and brain fog
- Inadequate calcium in the body can cause high blood pressure. In pregnant women, and an increased risk of preeclampsia.
- Vitamin D and calcium deficiency leads to poor skin health-dry, scaly skin, psoriasis, eczema, and brittle nails which break easily
- Coarse hair and hair that are falling out in patches.
- Slight 1-2 inches height loss, more than one inch in a year

- Unexpected bone fractures with minor injury- wrist, ankle, spine, and hip fracture.
- Stooped posture is a sign of advanced Osteoporosis because of thinning and narrowing of vertebral bones.
- Deficiency of Vitamin D can cause an increased risk of infections and low energy levels.

The risk of calcium deficiency increases during pregnancy, lactation (breastfeeding) in growing children because of increased demand for calcium. In elderly over the age of 65, calcium deficiency occurs because of decreased absorption from the digestive tract.

Vitamin D deficiency can be confirmed by doing blood levels of Vitamin D as outlined above. However, it is impossible to diagnose calcium deficiency by blood testing because only a tiny fraction of 1% calcium is in blood, and the rest remains stored in the bones.

Doctors typically order bone density (DEXA) scans instead of calcium blood levels to check if bone thinning is present.

6. How Do Doctors Diagnose Osteoporosis?

The test used to diagnose bone thinning is DEXA (Dual-energy X-ray absorptiometry) scan which measures the bone density. The test is expensive and ordered when the doctor suspects an increased risk for Osteoporosis:

- Women who are older than 65 years
- Men older than 70 years with a history of frequent falls (more than 3/ year).
- Younger men and women may require a DEXA scan if they have an account of:
  -Breaking a bone, especially a wrist or hip with a minor injury
  -Rheumatoid arthritis
  -Smoking and drinking heavily.
  -Lean, less than average body weight -Body mass index less than 20
  -Taking steroid medications for more than three months
  -Significant backache, bone, and muscle ache

DEXA scan done once does not need to be repeated for several years. If someone has severe Osteoporosis, then a DEXA scan may have to be repeated in 1-2 years to see the treatment effect. DEXA scan score called T score helps in the assessment of the severity of bone thinning.

Dexascan T score versus severity of Osteoporosis

T score	Diagnosis
+ 1 to – 1	**Normal bone density**
-1 o -2.5	**Low bone density or Osteopenia**
-2.5 to more negative	**Osteoporosis (severe thinning)**
Lower than -2.5	**Severe Osteoporosis**

If there is severe Osteoporosis, calcium and Vitamin D may not take care of the problem. Medications that reduce further bone loss and build bone strength will be required.

7. How to Prevent Osteoporosis?

One can prevent Osteoporosis by eating and living a bone-healthy lifestyle starting from childhood. Healthy bone mass at the age of 20-30 years minimizes the risk of Osteoporosis at a later age. One has to do the following for bone-healthy food and lifestyle:

- Eat a diet rich in calcium (see above)and mostly alkaline plant-based proteins. Consume milk products in moderation; avoid dense milk products like cheese, Paneer, and milk-based sweets. Minimize refined sugar and refined flour, which are acidic foods. Minimize salt intake.
- Get natural vitamin D via sun exposure, as outlined above.
- Maintain healthy body weight – BMI of 21-23. Obese people with BMI greater than 30 and very lean people with a BMI less than 20 are at a greater risk for Osteoporosis.
- Exercise regularly, keep moving the entire day. Remember, strong muscles build strong bones.
- Avoid smoking and heavy drinking

- Take precautions to prevent falls at an older age- ensure bathroom safety, eliminate slippery floors, wear appropriate shoes, etc.
- Get a DEXA scan when medically necessary – risk factors present (as outlined above).

8. Medical supplements of calcium and vitamin D, when to take and how much?

Medical supplements of calcium and vitamin D should be given judiciously in safe amounts after careful consideration in light of the following reported medical observations:

- There is a high incidence of Osteoporosis in the USA and Northern Europe, where Vitamin D levels are lower for several months of the year due to lack of Sunlight. Food intake of calcium in these countries is twice as high as in South Asia (India). That sends a powerful public health message that high-dose calcium supplements without vitamin D do not help.
- High-dose calcium supplements, especially carbonate preparations of 1000 to 15000 mg/ day are irritating to the stomach and cause constipation. Digestive problems are a big reason why most people cannot take these calcium carbonate supplements long-term and quit in few weeks. Calcium supplements in high doses also increase the risk of heart attack by causing calcium deposits in the heart blood vessels. Additionally, these high-dose supplements can increase the risk of kidney stones.
- Vitamin D3 supplements in a dose of greater than 1000 units/ day are unnecessary and can lead to Vitamin D toxicity. Vitamin D blood levels greater than 70-100ng/ml can present as:

  Nausea/ Vomiting, Dizziness
  Confusion, Lethargy
  Increased thirst and urination

- Extensive medical research suggests that calcium and vitamin D supplements increase bone density but may not prevent fractures. When

given in high doses, these supplements carry the risk of side effects as outlined above.

- Vitamin D has several beneficial effects on the body, and normal vitamin D levels improve vitality, boost immunity, protect against many chronic diseases by maintaining cellular health. In this respect, Vitamin D is considered a hormone and not merely a vitamin.

Calcium and vitamin D supplements should be prescribed in reasonable amounts while enhancing natural intake, as suggested in the following guidelines.

The guidelines for the safe Calcium and Vitamin supplementation

Whether the diagnosis is Osteopenia or Osteoporosis, the first step is patient education to enhance the natural intake of calcium, and Vitamin D. Adopt calcium-rich natural foods and sun exposure at least 3-4 times per week for 30-60 mins based on the color of the skin as outlined above.

Vitamin D supplements—First and foremost, Vitamin D testing for the blood levels is required only when medically indicated, such as:

- History of muscle weakness and bone pains
- Indoor lifestyle with no exposure to Sunlight
- Patients with digestive disorders
- Patients with kidney disease (kidney disease can lead to low vitamin D)
- Older age with Obesity, Type 2 Diabetes

Vitamin D blood levels lower than 12ng/ml require medical supplements. Daily supplementation with 800-1000 units of Vitamin D3 is a safe option compared to intermittent high-dose therapy. Hig- 10,000 units weekly or 60,000 units monthly. The higher doses of Vitamin D3 (4-5000 units/day) should be given only for few weeks under close medical supervision with Vitamin D blood level monitoring. Aim for blood levels within 30-50 ng/ml. Levels higher than 70 ng/ ml should alert the physician to discontinue high-dose supplements.

Giving very high amounts of 60,000 units intermittently every month increases the risks of falls in the elderly. The falls are more likely during the high peaks in blood levels of Vitamin D. High-dose vitamin D therapy can also increase calcium levels in the body, with an increased risk for kidney stones.

The Vitamin D supplements available in the market are D2 plant-based- vegan) or D3 (animal-based or plant-based). Between the two preparations, D3 is preferable as it is more effective in raising the blood level of Vitamin D.

Good sources of Vitamin D supplements:

Plant Source of Vitamin D2 supplements- Mushrooms and Yeast

Animal Source of Vitamin D3 Supplements – Lamb lanolin from lamb wool

Plant source of Vitamin D3- Algae and lichen extracted Vitamin D3 suspended in olive oil or extra virgin coconut oil. The oil as a suspension vehicle is ideal because Vitamin D is a fat-soluble vitamin and oil fat promotes the absorption improving its bioavailability.

Calcium Supplements- Advocacy for high dose calcium supplements of 1000-1500 mg was started almost a decade ago by the National Institute of Health (NIH), USA. The current research does not support such high-dose calcium supplements for the reasons outlined above. Recommendations are that individuals get their calcium primarily from their diet rather than calcium supplements. The calcium supplements should be given to patients with insufficient dietary intake, particularly if they have Osteoporosis. When required, calcium supplements should be prescribed in much smaller doses of 500 mg/day in conjunction with 800-1000 units of vitamin D3 to optimize bone health. The smaller amounts of calcium and vitamin D3 are safe and better tolerated.

The calcium preparation in the supplement does matter significantly. Intestinal absorption of calcium citrate is 25% better than calcium carbonate. Calcium citrate has the additional benefit that it can be taken on an empty stomach. On the other hand, calcium carbonate is dependent on stomach acidity for its absorption, so it has to be taken with food. Additionally, calcium carbonate takes a longer time to clear the stomach.

Keep in mind that acid reflux medications such as Nexium, Prilosec, etc., will interfere with the absorption of calcium by altering the acidity in the stomach.

9. What are The Medical Remedies (Drugs)To Treat severe Osteoporosis & When Are These Prescribed?

Osteoporosis is considered to be severe if :

a). DEXA Scan T score is lower than -2.5

b). There is a history of fracture with a minor injury

c). There is severe backache due to spinal fractures.

Calcium and Vitamin D supplements alone will not suffice in severe Osteoporosis. These patients require drugs that slow down bone loss or build bone mass. The guidelines for managing severe Osteoporosis are:

- Modify Food and Lifestyle to enhance the natural intake of calcium and Vitamin D
- Calcium and vitamin D supplements in safe doses as outlined above.
- First-line drugs—The first-line drugs are the drugs that slow down bone resorption. These drugs, called Bisphosphonates, include the following medicines:

  Alendronate (Fosamax)- once a week tablet
  Risedronate (Actonel)-once a week or once a month tablet
  Ibandronate (Boniva)- Once a month tablet

Side effects of the Bisphosphonate drugs—Damage to the jaw bone and Thigh Bone. Stomach upset. These drugs need to be stopped if patients develop burning in the chest (esophagitis).

How long to take Bisphosphonates – These medicines are given for 3-5 years. Then patients can continue on food and lifestyle solutions and calcium and Vitamin D supplements in safe daily doses.

- **Second-line drugs—**These drugs also slow down the process of bone resorption like bisphosphonates. For the patients who have kidney dysfunction and cannot tolerate bisphosphonates, these second-line drugs are:
  Denosumab (Prolia)- Given as a shot in the skin every six months. Once the patient gets started on Denosumab, he/she will have to take it for the rest of his/her life.
  Raloxifene (Evista)- It is a hormone therapy that works like estrogen. It provides the beneficial effects of estrogen on the bones without the side effects of estrogen, such as the risk of breast and uterine cancer.

- **Third line drugs-** These drugs are bone-building medication that is like the natural bone-building hormone parathormone. These are given in severe Osteoporosis when the above medicines fail to help. These drugs are given as an injection for 1-2 years, and then the patient is switched back to the other medications. Medicines in this group are:

  Teriparatide (Forteo)-Given as daily injection under the skin
  Abaloparatide (Tymlos)- Given as daily injection under the skin
  Romosozumab (Evenity)-Given as injection once a month

These drugs have multiple side effects and can not be given for more than 1-2 years. Side effects include nausea, dizziness, headache, vertigo.

10. Conclusion

Osteoporosis is a disease of older age (women greater than 65 years and men more than 70 years of age) where there are weak and spongy bones that break easily. Osteoporosis can occur at a younger age if:

- **Dietary intake of calcium is low-** Lack of natural plant foods and more factory-made foods.
- **Inadequate exposure to Sunlight**- A preference for an indoor lifestyle
- **Inactive lifestyle**- Strong muscles build strong bones.
- **Too much salt in the diet**-- leads to excessive loss of calcium in the urine
- **Use of Acid- Reflux medications** -Protonix, Prilosec, Nexium, which interfere with calcium absorption in the stomach
- **Excess of acidic foods** such as meat, dairy, refined sugar, coffee, Tea, and Cola drinks

Blood levels of vitamin D give an insight into deficiency, but calcium does not because most calcium resides in the bones. A DEXA scan assesses the calcium in the bones. The ideal way to manage Osteoporosis is to prevent it by food and lifestyle change. The strong bones at a younger age is a fixed deposit towards solid bones in old age. So to improve bone health, the first essential step is the natural solution.

- Eat foods rich in calcium-Green leafy vegetables, Lentils, Legumes, Seeds, and Nuts. Consume dairy in moderation and minimize dense dairy foods (cheese, paneer, and milk-based sweets)
- Get natural Vitamin D via sunlight exposure (can provide 80% of the body requirements)
- Exercise regularly
- Avoid acid reflux medications, use natural solutions- see YouTube video on Acid Reflux disease; – www.foodlifestylebalance.com

Calcium and Vitamin D Supplements--Take Calcium and Vitamin D supplements judiciously in smaller amounts rather than large doses. Large doses of calcium and Vitamin D can cause significant side effects- digestive upset, dizziness and falls, kidney stones, and a slight risk for heart attack. The doses considered significant are:

Calcium Supplements- 1000 to 1500 mg tablets

Vitamin D Supplements- Greater than 1000 units/ day—Amounts like 10,000 Units/ week and 60,000 units/ month . Large doses can cause toxic blood levels of vitamin D.

Safe Doses of Calcium and Vitamin D Supplement are:

- *Calcium citrate 500mg/ day*
- *Vitamin D3 up to 1000 units/ day.*

The ideal calcium supplement is calcium citrate because it is absorbed 25% better and one can take it on an empty stomach.

The ideal Vitamin D supplement is Vitamin D3, as it produces higher blood levels than Vitamin D2. Plant based Vitamin D3 preparations from Algae that are suspended in virgin coconut oil are ideal for absorption because Vitamin D is a fat soluble vitamin and fat in the oil improves its absorption.

Medical remedies to stop bone loss are required only when someone has severe Osteoporosis (DEXA Scan score lower than -2.5 with history of spinal fractures, kyphosis (bone bending), loss of height of greater than one inch over a year, etc. Several medications are available for preventing bone loss or for rebuilding bone mass. Unfortunately, most drugs have significant side effects and require administration under close medical supervision.

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