

Osteoporosis: Who is on Target?

Atul Samiran

M.Sc. (Gold Medalist), CSIR- NET, Scholar

Post graduate Department of Zoology

Tilkamanjhi, Bhagalpur University, Bhagalpur-812007, Bihar, India

Email: atulsamiran@gmail.com

Abstract: With aging, calcium and vitamin deficiency in the body increases the risk of osteoporosis. This disease makes bones weak and brittle due to which the bones are broken by a minor injury or sprain or light stroke. This is the painful disease. With aging, calcium absorption rate decreases. This causes calcium deficiency in the blood. To overcome this deficiency, it releases calcium from the calcium bank i.e. bone as a result, the bone weakens. With age, the level of gonadal hormone also decreases. Gonadal hormone also helps in mineralization of bone and lacking of these hormones affect bone health. Apart from the elder people, it is also common in people who are suffering from Chronic Kidney disease or suffering from Calcium metabolism or people with hormonal imbalance. Apart from this, the risk of this disease is more than normal in those people who use steroid medicine indiscriminately or people with family history of osteoporosis and smokers.

Key Words: Aging, Bone mass, Bone mineralization, Calcium, Osteoporosis.

1. INTRODUCTION:

Osteoporosis is also called silent killer of bone. Our body rests on the structure of bones. So we can fit only when our bones are strong and fit. The bones present in our body are solid and rigid form of connective tissue. It gives support to our body and various organs. The cells forms bone is called osteoblasts and this process is called osteogenesis. Osteoblasts secrete collagen fibers as well as it secrete ground substances which are responsible for matrix calcification. Bone cells that break down old bone called osteoclasts and such mature osteoblast cell which never participate in bone formation are called osteocytes [1]. It is only responsible for matrix maintenance. Our bones are made up of many minerals. The most important ingredient in all of these is calcium. Apart from calcium, our bones contain zinc, silicon and phosphorus. It is believed that hydrogen and oxygen also play a role in bone formation because hydrogen and oxygen are present in bones as water (H₂O). Our bones are made up of 60 to 70% calcium and phosphate. Apart from this, protein and inorganic salts are also present in bones. It has been proved by scientists that for about 35 to 40 years, the bones absorb the most calcium but with aging and the unhealthy lifestyle affects our body, due to which the bone mineral density is reduced and bones become weak and when ignore, it becomes so weak that it breaks easily on mild injury or sprain. This problem of bone weakening and breaking is called osteoporosis. Osteoblasts continue the process of making new bones in the body and the old bones are finished. If this manufacturing process slows down then the corrosion process is accelerated and the bone weakens. The risk of the disease usually increases after 40 years in women and after 50 years in men. According to the latest data, 200 million people worldwide suffer from this disease while osteoporosis causes 90 million fractures every year. The risk of osteoporosis is highest in women over the age of 50 years.

2. STUDY:

Bones fracture without any reason or fracture due to light strain are not only coincidence rather, it is a sign of bone weakness or osteoporosis. It is usually called the disease of the elderly people and its problem is said to be common in aging but its cases have started appearing in the youth and also in the young people. There can be many reasons such as, disturbance in calcium metabolism, Thyroid problems, inactivity, smoking, alcoholism, consuming steroid medicines, chronic kidney disease (CKD), obesity, etc. Here we will know in detail which types of people are more at risk of osteoporosis. Osteoporosis is the biggest cause of bone fractures in menopausal women and women above 50 years of age.

The risk of osteoporosis is very common in Postmenopausal women (Postmenopausal osteoporosis): The primary osteoporosis:

Normally osteoporosis occurs due to ageing is called primary osteoporosis [2]. Osteoporosis is the major reason of bone fracture in menopausal women or elder women (more than 50year old aged women)[3]. Usually this can happen to any elderly woman or man, but author William pelit, Jr. Caucasian and C. Adamec write that a woman who is a small height (65years age or older) and whose ancestors comes from Western Europe, such women is more vulnerable to this

disease. Also, he writes that Caucasian and Hispanic women in general have a much higher risk of osteoporosis. An average, women loses 30-50% of their bone mass up to at the onset of menopause [4]. Appearance of osteoporosis in postmenopausal women is the result of diminished level of gonadal hormone. After menopause, there is a decrease in the efficiency of ovaries, which results in a decrease in the secretions of estrogen. Whereas in contrast, the FSH secretion increases. Estrogen hormone maintains bone density. However the risk of osteoporosis in women begins at the pre-menopausal stage. Decreasing level of estrogen and increasing level of follicle stimulating hormone (FSH) stimulates the process of bone resorption and increases bone losing process [5]. Decreased level of estrogen and the increased level of FSH is the main cause of osteoporosis in postmenopausal women. Estrogen increases osteoblastic activity of the bone. However, apart from estrogen, there are many factors that increase osteoblastic activity. Normally rate of bone deposition and absorption are equal to each other, so that the total mass of bone remains constant but after menopause decreased estrogen (almost no estrogen is secreted by ovaries) leads to diminished Osteoblastic activity [6]. Amount of bone resorption is greater than the amount of bone deposition by decreasing osteoblastic activity and increasing osteoclastic activity. It causes net loss of bone [7]. In addition to estrogen deficiency, calcium absorption also decreases with aging. After menopause, such woman is highly vulnerable to osteoporosis that has a family history of osteoporosis. Apart from this, women who smokes or obese or suffering from thyroid disease or take low calcium diet or take excess medicine in these, after menopause, the risk of osteoporosis is greatly increased [2].

Elder people and osteoporosis: Senile osteoporosis:

We can put it in primary osteoporosis category. In elder people osteoporosis is more common in women than men. The ratio of the incidence of this disease in women and men is 2: 1. However the risk of osteoporosis in different people is affected by their lifestyle. Many factors stand behind the senile osteoporosis. Very low level of estrogen after menopause is the main cause of osteoporosis in women in the same way, testosterone levels decrease with aging in men. Testosterone maintains bone density. The reduction in this hormone reduces bone mineral density. However gonadal hormone is not the only reason for decrease in bone density in older people. Apart from this, decrease in 1,25 dihydroxy cholecalciferol (1,25 OH₃ D₃) secretions and parathormone imbalance is also a big reason of osteoporosis in Elder People.

1, 25 dihydroxy cholecalciferol is the active form of vitamin D. It is quite essential for absorption of calcium as well as it affects bone absorption and bone deposition. Vitamin D has a major role in increasing bone strength. It synthesizes vitamin K- dependent calcium binding protein (osteocalcium) in the bone which helps in bone mineralization as well as it increases cross linking of collagen fibers in bone. 1,25 dihydroxy cholecalciferol also increases absorption of phosphorus [8]. Concentration of 1,25 dihydroxy cholecalciferol decreases with age and this reduces or stops calcium absorption. In such situation, the parathyroid gland secretes large amount of parathyroid hormone (PTH) to overcome calcium deficiency. This condition is called hyperparathyroidism. It increases bone resorption and bone loss. It is also seen that season also affects this disease. More cases of osteoporosis and bones fracture shown in winter season. It is believed that in winter season gloomy winter sky causes low exposure of sunlight and we know sunlight is the main source of vitamin D. Due to this, there is a growth of PTH in the body along with lack of 1,25 dihydroxy cholecalciferol and thus bone loss occurs rapidly. In osteoporosis there is greater risk of hip bone, vertebral column, leg bone and wrist bone fracture.

People with chronic kidney disease (CKD) and osteoporosis: The secondary osteoporosis:

The function of kidney is to remove toxic and unwanted material from the body. As well as kidney also regulates the mineral metabolism of the body. Such people who suffer from CKD are easily grasped by osteoporosis. Due to CKD abnormalities occur in mineral metabolism of the body. Due to this body struggles shorting of calcium, phosphate, vitamin D, etc. and osteoporosis comes. This is why there is lacking in level of vitamins, minerals and salts reduce the rate of bone formation, result is that the bone density decreasing gradually. It is also seen that, soon after suffering from the CKD, people become affected by mineral bone disease. It is collectively called CKD-MBD. After CKD this type of complication is normal and the term CKD-MBD defines disturbance in mineral metabolism, skeletal problem and soft tissue calcification [9]. Person suffering from CKD is easily grasped by osteoporosis and bone related disease because such patient suffers from various pathophysiological conditions such as secondary hyperparathyroidism, adynamic bone, hemodialysis associated amyloidosis, vitamin D deficiency, hypocalcemia, change in bone architecture, nutritional disturbance, etc. [10]. Maintaining secondary hyperparathyroidism is the main cause of bone weakness or bone loss. Normally there are two reasons of maintaining secondary hyperparathyroidism in CKD. The first one is the low level of calcium due to CKD and the second cause is that the damaged kidney cannot convert the vitamin D in active vitamin D₃ (1,25 dihydroxy cholecalciferol). Result is that the absorption of calcium stops in absence of 1,25 dihydroxy cholecalciferol. These two reasons are main cause of secondary hyperparathyroidism [4]. In the condition of secondary hyperparathyroidism, level of PTH is very high in blood. We know that, PTH uses the bone as calcium bank, whenever low level of calcium occurs in plasma, the PTH withdraws calcium from the bone and maintains the plasma calcium

level[3]. Hyperparathyroidism significantly increases osteoclastic activity. However human body quickly compensates the bone loss caused by mild hyperparathyroidism. But it is not possible or very tuff in elder people or CKD people. It can possible only in under 50 year aged people. In elder people, mild hyperparathyroidism causes a big issue.

Risk of osteoporosis is also high in such people who are in the exposure of a particular type of medicine

Long-term use of certain types of medication also reduces bone mineral density. This causes the bones to weaken and break only when a minor injury or sprain occurs. That is, we can say that taking certain types of medicine for a long time can also cause osteoporosis. These certain types of medicine may be steroid or glucocorticoid, such as; Cortisone, Prednisone, Prednisolone, etc. They normally treat arthritis, inflammatory bowel disease, COPD, etc. Apart from this, steroid medication is also used during organ transplant to reduce graft rejections. As such, these medicines are transported inside the body somehow but steroids taken by pill or injection are the major cause of osteoporosis. As we know the process of bone formation and deterioration is always going on in the body but due to excessive steroid medication causes bone deterioration rapidly and bone formation process become very slow or stop. These medicines cause degradation of bone very rapidly for the first 6 months and continue until we stop taking steroids. However taking calcium and vitamin D pills along with steroids reduces bone loss to an extent; still such drugs should not be used for a long time. Higher amount of glucocorticoid restrict osteogenic cell maturation and also stop its formation as well as it inhibit alkaline phosphatase, collagen and osteocalcin. It also interferes with bone matrix monetization. It also leads to Osteoblastic apoptosis. Excessive secretion of glucocorticoid increases the chances of secondary hyperparathyroidism and inhibits estrogen, testosterone and other adrenal androgen. Higher level of glucocorticoid directly stimulates PTH secretion. It is seen that during steroid therapy Osteoblastic cells and renal tubule cells are sensible for PTH. Initially it increases calcium balance but if, such situation persists long time it causes bone resorption. Excess amount of glucocorticoid interfere with active transmembrane. They also inhibits the expression of genes, dependent on vitamin D3, that is calbindin membrane calcium binding protein and the receptor for vitamin D. Mostly people who goes through the steroid therapy in such people, the power of absorption of calcium from gastrointestinal tract is reduced. It causes negative calcium balance and we know that the negative calcium balance inhibits Osteoblastic activity [11].

Osteoporosis easily catches those people who are struggling from hormone imbalance condition.

Harmonic imbalance is also a very important reason for developing secondary osteoporosis. We know very well, PTH, vitamin D and hormone secreted from thyroid gland, i.e. calcitonin are play major role in calcium regulation. Other than this some other hormones like adrenal corticosteroid, estrogen, testosterone, thyroxin, somatotropin, glucagon, etc. also affect the calcium present in bone. That is why it is also seen that people who are suffering from hyperthyroidism easily grasped by osteoporosis. Osteoblastic activity affected by hyperthyroidism due to which the bone mineral density decreases and bone remodeling process reduced 50%. Increased levels of Interleukin-6 are seen in the blood serum of people with hyperthyroidism. Interlinkin-6 enhances osteoclastic activity by using PTH as mediator [12]. The growth hormone (GH) which is secreted from anterior pituitary is also play very important role in bone formation. Osteoporosis and other bone disease can be appears due to lacking of GH [13] as well as testosterone and estrogen play very important role in bone mineralization. Thus lacking of all these hormones can cause osteoporosis.

3. CONCLUSION:

We can say that, the risk of osteoporosis increases with aging, although it is not inevitable. This can be avoided by taking appropriate amounts of calcium and vitamins and regularizing lifestyle and exercise. It is generally said that it is an old-age disease, but in recent we have seen that it is developing at an early age the reasons for which we have considered. To overcome this disease, we have to remove such reasons. To overcome osteoporosis we have to need comprise calcium, magnesium, vitamin D and other essential substances in our diet. Along with this, we have to avoid more medication and exercise should be included in daily life.

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AUTHOR'S BIOGRAPHY:



Mr. Atul samiran

P.G. Department of zoology

E-mail: atulsamiran@gmail.com

Mr. Atul samiran is M.Sc. in Zoology from Post graduate department of Zoology, which comes under Tilkamanjhi Bhagalpur University, Bhagalpur. He secured first position in the university in M.Sc. for which he was awarded the gold medal. He has recently secured 66th position across India in National eligibility test, conducted by the council of scientific and industrial research. Currently, he is involved in the race for registration in Ph.D. in Tilkamanjhi Bhagalpur University.