



# ORIGINAL RESEARCH PAPER

Ayurveda

## OSTEOPOROSIS –AN AYURVEDIC PERSPECTIVE

**KEY WORDS:** Osteoporosis, Asthikshaya, Tiktaksheeravasti

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### ABSTRACT

Osteoporosis is a generalized skeletal disorder of low bone mass and deterioration in its architecture causing susceptibility to fracture. The disease is the result of multiple physical, hormonal, nutritional and life style factors acting alone or in concert. Drugs used in modern medicine cause adverse effects on prolonged use and bone density falls gradually on stoppage of these medicines. So need arises for drugs which are effective and safer for prolonged use. In Ayurveda we can correlate osteoporosis as Asthisoushrya. Vata kopa and asthikshaya can result in Asthisoushrya. Managements including internal and external snehana with vasti, calcium supplementation and hormonal regulation with single and compound drugs effectively manage Osteoporosis.

### INTRODUCTION

Osteoporosis is characterised by lowered bone mass and microarchitectural deterioration of bone tissue leading to enhanced bone fragility and consequent increase in fracture risk. Women are four times likely to develop Osteoporosis than men. It is prevalent in post-menopausal women but also occurs in men and women with underlying conditions or major risk factors associated with bone demineralisation.

Osteoporosis is a global public health problem currently affecting more than 200 million people worldwide. According to World Health Organization (WHO) and International Osteoporosis Foundation (IOF), it is second only to Cardiovascular disease as a global healthcare problem. Mostly it is a silent disease that may go undetected till the harmful consequences like fragility fractures, bone pains and spine fractures present themselves. One in 3 women and one in 5 men over the age of 50 will suffer a fracture due to Osteoporosis. Worldwide, Osteoporosis causes more than 8.9 million fractures annually, resulting in an osteoporotic fracture every 3 seconds. Approximately 1.6 million hip fractures occur every year worldwide. This incidence will increase to 6.3 million by the year 2050. The annual incidence rate of osteoporotic fractures in women is greater than the combined incidence rate of heart attack, stroke and breast cancer. As Osteoporosis affects elderly population which is growing, it will put a great burden to healthcare system as treatment is expensive. Although in most western countries, the peak incidence of Osteoporosis occurs at 70-80 years of age, Indians are afflicted with the same at the age of 50-60. In India the prevalent Osteoporotic population is expected to climb from 55 million in 2012 to hit 73.8 million a decade later, at an Average growth rate of 3.4 %.

### RISK FACTORS FOR OSTEOPOROSIS

#### Modifiable risk factors

- Low BMI: BMI less than 20 kg/m<sup>2</sup> associated with greater bone loss and increased risk of fractures.
- Poor nutrition: Insufficient calcium from dietary sources produce more PTH which boosts bone remodelling.
- Vitamin D deficiency
- Alcohol: People with excessive alcohol consumption have a 40% increased risk of sustaining Osteoporotic fracture.
- Eating disorders like anorexia nervosa and bulimia can cause Osteoporosis
- Oestrogen deficiency.
- Insufficient exercise: People with a more sedentary lifestyle are more likely to have hip fractures than those who are more active.
- Frequent falls: Visual impairment, loss of balance, neuromuscular dysfunction, immobilisation and use of

sleeping pills increase the risk of fractures.

- Smoking: People with a past history of cigarette smoking and people who smoke are at increased risk of any fracture compared to non-smokers.

#### Non-Modifiable risk factors

These fixed risk factors determine whether an individual is at high risk of Osteoporosis. These are the factors which we can't change but people need to be aware of these risks so that they can take steps to reduce bone mineral loss as early as possible.

- Age: The majority of hip fractures (90%) occur in people aged 50 and older.
- Female gender: Women, particularly post-menopausal women are more susceptible to bone loss than men because their bodies produce less oestrogen. Women are more likely to sustain an Osteoporotic fracture than men. Lifetime risk of any fracture ranges between 40-50% in women compared to 13-22% in men.
- Family history: A parental history of osteoporotic fracture is associated with an increased risk of fracture that is independent of bone mineral density.
- Previous history of fracture: A previous fracture increases the risk of any fracture by 86%, compared to people without a prior fracture. There is a two times more risk in both sexes.
- Ethnicity: Studies have found that Osteoporosis is more common in Caucasian and Asian populations and the incidence of Osteoporosis and fractures of the hip and spine is lower in black than in White people.
- Menopause or Hysterectomy: Hysterectomy if accompanied by the removal of ovaries may also increase the risk of Osteoporosis because of oestrogen loss.
- Long term glucocorticoid therapy: Long term corticosteroid use is a very common cause of secondary Osteoporosis.
- Rheumatoid arthritis: Rheumatoid arthritis and diseases of the endocrine system can take a heavy toll on bones. Hyperparathyroidism for eg results in elevated levels of PTH which signals bone cells to release calcium from bone into the blood.
- Primary or secondary hypogonadism in men: Androgen deficiency in men increase the risk of fracture. At any age acute hypogonadism such as that resulting from orchidectomy for prostate cancer accelerates bone loss to a similar rate as seen in menopausal women.

#### Secondary risk factors

These risk factors include other diseases that directly or indirectly affect bone remodelling and conditions that affect mobility and balance which can contribute to the increased risk of falling and sustaining a fracture.

Disorders that affect the skeleton

- Asthma
- Nutritional or gastrointestinal problems
- Rheumatoid arthritis
- Haematological disorders or malignancy
- Some inherited disorders
- Hypogonadal states
- Endocrine disorders
- Immobility

Medical treatments affecting bone health Chronic intake of certain medications can affect bone health. These include:

- Glucocorticosteroids
- Thyroid hormone treatment
- Certain anticonvulsants
- Certain antipsychotics
- Antacids

## **PATHOPHYSIOLOGY**

Bone maintenance is a delicate business. In adults the daily removal of small amounts of bone mineral, a process called resorption must be balanced by an equal deposition of new mineral if bone strength is to be preserved. When this balance tips toward extreme resorption, bones weaken (Osteopenia) and overtime can become brittle and prone to fracture (Osteoporosis). The balance between bone resorption and bone deposition is determined by the activities of two principle cell types; osteoblasts and osteoclasts. The balance between the activities of these two cell types govern whether bone is made, maintained or lost.

According to Ayurvedic classics, the microarchitecture of bone is derived from Akashamahabhuta and prithvi mahabhuta. Bone matrix is originated from Prithvi bhuta and hollow canaliculi is derived from akasha bhuta. The resorption and remodelling of bone is controlled by vata dosha. When vata dosha aggravates there is excessive bone resorption and when vatadosha is performing its normal function bone formation is favoured. This is evident by the classical reference "Asthimarutayornaivam prayo vridhdhirhi tarpanat". Hence Vata has a definite role in the pathogenesis of Osteoporosis.

As aging occurs there will be decrease in the production of oestrogen and testosterone in both females and males. Of these oestrogen has a more protective role against Osteoporosis. This can be attributed to the Dhatuposhtaka property of oestrogen which is mainly a derivative of Kapha dosha and snigdhabhava. When there is estrogen deficiency there will be vata kopa which further aggravates bone resorption.

Asthi dhatwagni has also an important role in maintaining the nourishment and functioning of Asthi dhatu. There is always a balance between the activity of Osteoblasts and Osteoclasts. Due to an idiopathic etiology this balancing mechanism is lost and a derangement in asthidahtuwagni results in excessive activity of Osteoclasts which further accelerates the pathology.

Osteoporosis is more common among patients with history of Diabetes Mellitus and Obesity. In that clinical condition Avaranajanya samprapthi has to be considered leading to undernourishment of Asthi dhatu due to srotorodha. Premeha hara chikitsa and Sthoulyharachikitsa has to be adopted here along with asthikshayachikitsa.

## **CLINICAL FEATURES**

Asthigatavaata and sandhigata vata are the clinical entities that should be taken into consideration while explaining Osteoporosis.<sup>3</sup> According to Susruta, Asthisoola is the symptom of asthigatavaata. "In Asthigata vaata Asthisosha, Asthibheda, and Asthisoola are the clinical features. Asthitoda, Asthisosha and asthisoushirya when

persists for a long time results in asthivakrata and bhagna which manifests as skeletal deformities like kyphosis and fracture. Dorsal kyphosis is a severe manifestation of long standing spinal Osteoporosis. Vertebra become biconcave and is referred to as Cod fish vertebra.

Osteoporosis, as per the literal meaning refers to the porosity developed in bones. Porosity develops due to the depletion of the solid filling material inside the bone and in such a context, it is asthisoushirya generated due to majjadhatu kshaya.<sup>6</sup> In another context, the kopa of vata which resides in asthi ie asthigatavata gives a symptomatically similar picture of Osteoporosis. Even though all the stages of asthigatavata need not end in Osteoporosis, a chronic pathology which causes asthisaraheenatha can lead to asthisoushirya-Osteoporosis. The general nidanas for vata kopa and vatadushti can cause a vitiation in the normalcy of asthigatavata. Since asthi and vata has asrayasrayee bandha the manifestations are clear in the residing dhatu. Prior to the recognition of the disorder a prolonged sub clinical phase occurs in many patients and so this is called a silent disease. The most common complaint is back pain of acute onset and with great intensity. It is sharp in character and aggravated by movement and weight bearing. This often reflects an underlying compression fracture of a vertebral body. Most often affected vertebrae are twelfth thoracic and first lumbar vertebrae.

## **SAMPRAPTHI**

Asthigatavatha is responsible for asthikshaya and its symptoms and therefore the samprapthi of vathavyadhi paving way to the samprapthi of asthigatavata. Vatadushti especially can result in asthivridhi and kshaya.<sup>6</sup> The lakshanas mentioned in asthikshaya are similar to those of Osteoporosis. Srotodushti can also be a cause for the depletion and degeneration of asthidhatu. Due to the nidanas, the prakopa of vata which is also located in asthi as per the asrayasrayeebandha explained by Vagbhata changed from its normal quality in which it is supposed to be and thus ruksha, laghu nature of the vata in asthidhatu increases. Thus the bhoutikaghatana of prithvi added on by the rookshata of vata gets hampered. The ruksha and laghugunas increase, reducing the matter inside and the bone becomes porous and light. The symptoms of majjakshaya ie asthisoushirya is also a cardinal feature in Osteoporosis. Thus all these nidanas lead to vata kopa either by dhatukshaya or avarana.<sup>7</sup> In dhatukshaya, vata gets vitiated and circulates through the empty channels in the body (riktasrotas) fills them and again produces further dhatukshaya. According to Chakrapani, riktata is emptiness caused by reduced snigdhatva. In margavarodhajanyavata kopa the channels or srotas are obstructed by doshas, dhatus or malas and its prakopa occurs. In the samprapthi of asthigatavata, first vitiation of vata takes place by vatavridhikaranidananas. In Ayurveda both vridhi and kshaya are mentioned as pathological states of a dhatu. Osteoporosis can be placed under the spectrum of asthikshaya. In this, the primary stage in the samprapthi is vata kopa by slowly progressing events due to vatavridhikaranidananas or asthivahasrotodushtinidananas. Beejadosha can also be related to the pathogenesis of the disease as evident from the modern science. Vata dominant prakritis have more susceptibility to develop Osteoporosis. On analysing the nidanas, it is observed that vatalaahas and virudhaahas represent low nutrient diets which aggravate the bone resorption rate. Virudhaahas impair the metabolic processes hampering the normal functioning of the dhatwagnis. Thus, the sthira and kharaguna of asthi is reduced by the rukshajanihavata kopa and results in Osteoporosis.

1. Swantantra (Dhatukshayajanya)
2. Parantantra (Margavarodhajanya)

## **CHIKITSA SUTRA**

The treatment of Asthigatavata and Asthikshaya can be adopted in the management of Osteoporosis. The treatment of

Asthigataavaata includes Bahya and Abhyantara snehapaana. Abhyantara snehapaana is especially important in improving Antaraagni and thereby enhancing Dhatuposhana. Sneha dravya are capable of traversing sookshma srotas and permits dhatuposhana immediately. Ghrita and Ksheera medicated with tikta rasa dravya is indicated in Asthi kshaya chikitsa. Thiktsa rasa impart Kharaguna to the asthidhatu and as it titrated with Ksheera or ghrita it will not aggravate vaata. <sup>8</sup>Tiktha Ksheera vasthi is an important methodology explained by Acharya in the management of Asthi kshaya. Administering Vasthi is not only helpful in reducing vatavrudhi but also improves asthi sara.

Acharya Charaka has explained vasthi in the management of stiff joints, bony deformity, in pangu and also Khanja. It is also helpful in the treatment of Dislocation and fracture. As the number of Vasthi administered increases its penetrating power also increases which is evident from the reference eighteen vastis targeted to reach up to the final dhatu ie Ashtadasavasti.

### IMPORTANCE OF SHAMANA CHIKITSA

Asthikshaya is a condition which has the predominance of vata. So rather than shodhana chikitsa, shamana chikitsa can prove to be more effective. Moreover, this is a condition which mostly occurs in old age and most people will be exhausted due to various diseases. In such cases, shamana finds use. Majority of the geriatric diseases are of vata-pitta predominance so is of Osteoporosis and for vata pitta predominant cases shamana is the best treatment of choice.

### COMMON YOGAS USED IN OSTEOPOROSIS

Kashayas including Dhanwantaram kashaya, vidaryadi kashaya and guggulutiktakam kashaya processed in ksheera can be given. Gandha taila, ksheerabala taila and rasa taila can also be used as anupana or as such in the management. Guggulutiktaka ghrita is also commonly used. Guggulu preparations used in bhagna chikitsa are also useful.

### RESEARCH WORKS DONE

1. Effect Of Laksha madhuka choorna in Osteoporosis- Significant improvement was observed in most of the parameters including pain during joint mobility and tenderness BT & AT, AT & BT. Significant improvement was noted in BMD ( $p < 0.001$ )
2. Effect of Lakshaarjuna guggulu in Osteoporosis- There was significant improvement in the parameters including BMD with  $p < 0.001$ .
3. Effect of Tiktaghrita ksheeravasti in Osteoporosis- Significant improvements in study parameters. BMD improved with  $p < 0.001$ .
4. Effect of Krishnatila rasayana in Osteoporosis.

### SINGLE DRUG REMEDIES

1. Kukkudaanda twak bhasma-contains 95% calcium carbonate & 5% calcium phosphate. Correct calcium deficiencies & treat osteoporosis.
2. Praval bhasma is efficient in the prevention of calcium and estrogen deficient bone loss. It has significant calcium content.
3. Shankha bhasma has the ability to easily absorb and compensate the calcium required by the body.
4. Asthisrinkhala- An effective osteogenic agent which aids in bone healing. It stimulates the metabolism and increased uptake of calcium, sulphur, strontium minerals by osteoblasts in fracture healing.
5. Aswagandha choorna- The active constituent Withaferin prevents the loss of bone mineral density after menopause. Promotes bone healing after injury and in osteoporotic bones.
6. Krishna tila rasayana- The best vatahara drug. Stimulates osteoblast differentiation.

### CONCLUSION

Osteoporosis is a metabolic bone disorder characterized by lowered bone mass and microarchitectural deterioration of bone tissue with consequent increase in fragility and susceptibility to fractures. Asthigataavaata is a dhatugatavyadhi where the vitiated vata gets lodged in asthi finally leading to depletion of asthidhatu. (asthi kshaya). Nidana and samprapti is not mentioned separately for asthigataavaata in ayurvedic classics. So Vata vyadhi nidana and samprapti is considered. In Charaka samhita and Susruta samhita <sup>9</sup>, Vata vyadhi is considered as one among the mahagadas. Since it is deep seated its difficult to cure it. Asthigata vata, since it affects the deeper dhatus, it is krichrasadhya. According to Charaka vata vyadhi is either not curable due to sthaanagambheerata or curable with effort in case they are of recent origin in strong patients without any complications. According to Yogaratnakara, all vata vyadhis are asadhya by nature and cure is dependent on god's grace <sup>10</sup>. However, some of the Osteoporosis patients get better relief depending on their prakriti, vayas, bala as well as severity of nidana, dosha, doosha etc of the disease. Thus early identification of the sub clinical features of asthikshaya to ensure prompt management and to ensure a considerable cure. Internal snehana as snehapana and external snehana including brimhana vasti & ksheera vasti along with various single drugs supplementing calcium prove to be useful in Osteoporosis.

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