



Review Article

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## REVIEW OF *ASTHI KSHAYA* IN RELATION TO *ASTHI DHATU*, *VATA DOSHA* AND BONE HEALTH

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### ABSTRACT

**Background:** *Asthi Kshaya* is an important pathological condition described in *Ayurveda*, mainly related to depletion of *Asthi Dhatu* and aggravation of *Vata Dosha*. In classical view, *Asthi Dhatu* provides structural support, strength, stability and protection to the body. When *Asthi Dhatu* becomes depleted due to improper nutrition, disturbed *Agni*, excessive *Vata Vardhaka Ahara Vihara*, aging, excessive exercise, trauma or chronic disease, symptoms like bone pain, joint pain, weakness of teeth, hair and nails, dryness, cracking sensation and reduced body strength may appear. In modern view, similar conditions may be correlated with reduced bone mineral density, osteopenia, osteoporosis and poor skeletal health **Material and Methods:** This review was prepared by studying classical Ayurvedic concepts related to *Asthi Dhatu*, *Dhatu Kshaya*, *Vata Dosha*, *Dhatvagni*, *Srotas* and *Samprapti*. Modern literature related to bone remodeling, osteoporosis, osteopenia, bone mineral density, calcium, vitamin D and hormonal influence was also reviewed. The collected material was analyzed conceptually and presented in a structured review format. **Discussion:** The relation between *Asthi Dhatu* and *Vata Dosha* is very important because *Vata* is mainly located in *Asthi*. Due to *Ashraya Ashrayi Bhava*, aggravation of *Vata* may disturb *Asthi Dhatu*, leading to structural weakness, pain and degeneration. **Conclusion:** *Asthi Kshaya* can be understood as a condition of reduced bone strength and impaired skeletal nourishment. Early correction of diet, lifestyle, *Agni*, *Vata Dosha* and bone-supportive measures may help in maintaining better bone health.

**Keywords:** *Asthi Kshaya*, *Asthi Dhatu*, *Vata Dosha*, Bone Health, Osteoporosis, Bone Mineral Density

## INTRODUCTION

*Asthi Dhatu* is one of the seven important *Dhatu* described in *Ayurveda*. It gives firmness, shape, support and protection to the body. Bones, teeth, nails and related hard tissues are considered under the functional area of *Asthi Dhatu*. Healthy *Asthi Dhatu* helps in proper body posture, movement, strength and stability.<sup>1</sup> When the formation and nourishment of *Asthi Dhatu* are disturbed, the body gradually loses skeletal strength and becomes prone to pain, degeneration and deformity.<sup>2</sup>

In *Ayurveda*, *Asthi Kshaya* means depletion or reduction of *Asthi Dhatu*. It is commonly linked with aggravated *Vata Dosha*, because *Vata* has qualities like *Ruksha*, *Laghu*, *Khara*, *Chala* and *Sukshma*. These qualities are responsible for dryness, roughness, lightness, instability and degeneration. When these qualities increase in the body, they affect *Asthi Dhatu* and produce symptoms such as pain in bones and joints, cracking sound, weakness of teeth, falling of hair, dryness and reduced physical strength.<sup>3</sup>

The relation between *Asthi Dhatu* and *Vata Dosha* is very specific. Classical *Ayurveda* explains that *Vata* resides in *Asthi*. Therefore, any aggravation of *Vata* directly affects *Asthi Dhatu*. Similarly, when *Asthi Dhatu* becomes weak, *Vata Dosha* gets more space to aggravate. This creates a vicious cycle of degeneration, pain and weakness.<sup>4</sup> This concept is very useful in understanding age-related bone disorders, chronic joint pain, degenerative changes and low bone density.<sup>5</sup>

Modern medical science describes bone as a dynamic living tissue that continuously undergoes remodeling. Bone remodeling depends on balance between bone-forming cells called osteoblasts and bone-resorbing cells called osteoclasts. Osteocytes also help regulate this process. When bone resorption exceeds bone formation, bone mass decreases and conditions such as osteopenia and osteoporosis may develop. Bone mineral density is commonly assessed by DXA scan, and a T-score of -2.5 or lower is suggestive of osteoporosis.<sup>6</sup>

## MATERIAL AND METHODS

The present review article was prepared through a conceptual and literary study of *Ayurvedic* and modern medical literature. Classical *Ayurvedic* concepts related to *Asthi Dhatu*, *Asthi Kshaya*, *Vata Dosha*, *Dhatvagni*, *Dhatu Poshana Nyaya*, *Srotas*, *Kshaya Lakshana* and *Samprapti* were reviewed. Modern medical information related to bone structure, bone remodeling, bone mineral density, osteoporosis, osteopenia, calcium, vitamin D, hormonal factors and lifestyle-related bone health was also studied. The collected information was analyzed and arranged under *Ayurvedic* review, modern review, pathogenesis, findings, discussion and conclusion.

## CONCEPTUAL STUDY

### *Asthi Dhatu*

*Asthi Dhatu* is the fifth *Dhatu* among the seven *Dhatu*. It is formed after the nourishment of *Meda Dhatu* through the action of *Asthi Dhatvagni*. The main function of *Asthi Dhatu* is *Dharana*, which means support and holding of the body. It gives a strong framework to the body and protects vital organs. It also helps in locomotion by providing attachment to muscles, ligaments and joints. *Asthi Dhatu* can be understood as the structural foundation of the body. Just as pillars support a building, *Asthi Dhatu* supports the human body. If this *Dhatu* is healthy, the body remains strong, stable and capable of movement. If it becomes weak, the person may experience pain, instability, deformity and reduced working capacity.<sup>7</sup>

### Formation

According to *Dhatu Poshana Siddhanta*, each *Dhatu* nourishes the next *Dhatu*. *Rasa Dhatu* nourishes *Rakta Dhatu*, *Rakta Dhatu* nourishes *Mamsa Dhatu*, *Mamsa Dhatu* nourishes *Meda Dhatu*, and *Meda Dhatu* nourishes *Asthi Dhatu*. This process depends on proper *Agni*, especially *Dhatvagni*. If *Meda Dhatvagni* and *Asthi Dhatvagni* are functioning properly, healthy *Asthi Dhatu* is formed. When *Agni* is weak or disturbed, the nutrition of *Dhatu* becomes improper.

Poor digestion, improper metabolism and defective tissue transformation lead to weak *Dhatu Poshana*. In this condition, *Asthi Dhatu* does not receive proper nourishment, resulting in *Asthi Kshaya*.<sup>8</sup>

### Functions

*Asthi Dhatu* performs many important functions in the body. It supports the body, maintains shape, protects internal organs and helps in movement. It gives firmness to the body and supports muscle attachment.<sup>9</sup> The teeth and nails are also related to *Asthi Dhatu*, so their weakness may indicate disturbed *Asthi Dhatu*. The proper condition of *Asthi Dhatu* can be observed through strong bones, firm teeth, healthy nails, proper posture and good physical strength. When *Asthi Dhatu* becomes weak, the person may develop bone pain, dental weakness, nail brittleness, hair fall and joint-related complaints.

### Concept of *Asthi Kshaya*

*Asthi Kshaya* means depletion or reduction of *Asthi Dhatu*. It may occur due to poor nourishment, excessive *Vata Dosha*, old age, improper diet, chronic illness, excessive fasting, excessive exercise, mental stress, trauma and disturbed *Agni*. It is not only a condition of bone loss but also a systemic condition where the body's structural strength becomes reduced. In *Asthi Kshaya*, the hard and stable qualities of *Asthi Dhatu* are reduced. At the same time, the dry, light and mobile qualities of *Vata Dosha* increase. This produces symptoms like pain, cracking, weakness and degeneration. Therefore, *Asthi Kshaya* should be understood as a combined disorder of *Dhatu Kshaya* and *Vata Prakopa*.

### Role of *Vata Dosha* in *Asthi Kshaya*

*Vata Dosha* has a very close relation with *Asthi Dhatu*. The main qualities of *Vata* are *Ruksha*, *Laghu*, *Sheeta*, *Khara*, *Sukshma* and *Chala*. These qualities are opposite to strength, stability and compactness of bone tissue. When *Vata Dosha* increases, it causes dryness, roughness and degeneration in the body. Because *Vata* is located in *Asthi*, increased *Vata* directly affects bone tissue. This may lead to joint pain, bone pain, cracking sound, stiffness, dryness and reduced strength. In old age, *Vata Dosha* naturally increases, which is why age-related bone weakness and degenerative disorders are commonly seen.<sup>10</sup>

### Relation Between *Asthi Dhatu* and *Vata Dosha*

The relationship between *Asthi Dhatu* and *Vata Dosha* is explained through *Ashraya Ashrayi Bhava*. *Asthi* is considered as *Ashraya* and *Vata* is considered as *Ashrayi*. This means *Vata Dosha* resides in *Asthi Dhatu*. Due to this relation, any abnormal increase of *Vata* can disturb *Asthi Dhatu*. Normally, when a *Dosha* increases, its related *Dhatu* may also show changes. But the relationship between *Vata* and *Asthi* is special. Increased *Vata* causes reduction and degeneration of *Asthi Dhatu*. This is why *Vata Shamaka* and *Asthi Poshaka* measures are important in the management of *Asthi Kshaya*.<sup>11</sup>

### Causes of *Asthi Kshaya*

The causes of *Asthi Kshaya* may be understood under dietary, lifestyle, psychological, age-related and disease-related factors.

#### Dietary Causes

- Excessive intake of dry, light, cold and rough food.
- Low intake of nourishing food.
- Excessive fasting.

- Irregular food habits.
- Poor intake of calcium-rich and bone-supportive foods.
- Improper digestion due to *Mandagni*.
- Excessive intake of *Vata Vardhaka Ahara*.

#### **Lifestyle Causes**

- Excessive physical exercise.
- Excessive walking or overwork.
- Lack of proper sleep.
- Sedentary lifestyle.
- Repeated trauma.
- Excessive travel.
- Suppression of natural urges.
- Long-term stress and exhaustion.

**Age-Related Causes** Old age is naturally dominated by *Vata Dosha*. During this period, tissue nourishment becomes weak, *Agni* becomes irregular and degeneration increases. Therefore, old age is an important factor in *Asthi Kshaya*.

#### **Disease-Related Causes**

Chronic diseases, malabsorption, long-term inflammatory conditions, hormonal imbalance, nutritional deficiency and prolonged illness may reduce tissue nourishment and lead to depletion of *Asthi Dhatu*.

#### **Clinical Features of *Asthi Kshaya***

The clinical features of *Asthi Kshaya* can be understood as symptoms of reduced skeletal strength and aggravated *Vata Dosha*.

- Pain in bones.
- Pain in joints.
- Cracking sound in joints.
- Weakness of teeth.
- Falling of hair.
- Brittle nails.
- Dryness in body.
- General weakness.
- Reduced stamina.
- Difficulty in movement.

- Deformity in advanced conditions.
- Increased risk of fracture in severe bone weakness.

### Importance of *Agni* in *Asthi Kshaya*

*Agni* is the main factor responsible for digestion, metabolism and tissue nourishment. If *Jatharagni* is weak, food is not properly digested. If *Dhatvagni* is weak, tissue formation becomes defective. In *Asthi Kshaya*, the role of *Asthi Dhatvagni* is very important because improper function of this metabolic factor leads to poor formation of *Asthi Dhatu*. Therefore, correction of *Agni* is essential in prevention and management of *Asthi Kshaya*. Without proper *Agni*, even nutritious food cannot be properly converted into healthy *Dhatu*.<sup>12</sup>

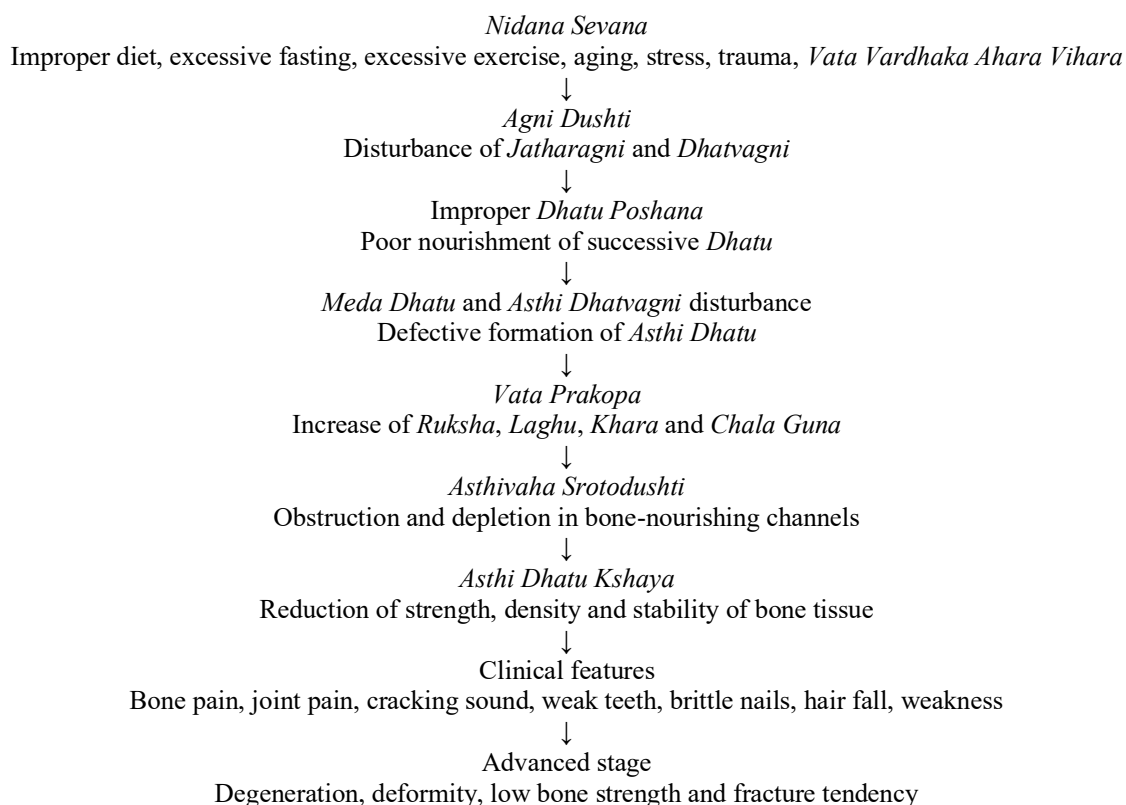
### Role of *Srotas* in *Asthi Kshaya*

*Srotas* are channels responsible for transportation and nourishment in the body. *Asthivaha Srotas* are related to the nourishment and maintenance of *Asthi Dhatu*. If these channels are obstructed or depleted, proper nutrition does not reach *Asthi Dhatu*. This results in gradual weakness and depletion of bone tissue. *Srotodushti* may occur due to improper diet, disturbed metabolism, accumulation of *Ama*, chronic disease and aggravated *Vata Dosha*. In *Asthi Kshaya*, both *Sanga* and *Kshaya* type of pathology may be considered.

### Preventive Ayurvedic View

Prevention of *Asthi Kshaya* should focus on maintaining proper *Agni*, nourishing *Asthi Dhatu* and controlling *Vata Dosha*. The person should avoid excessive fasting, dry food, excessive exertion, mental stress and irregular lifestyle. Use of nourishing diet, proper sleep, moderate exercise and *Vata Shamaka* routine is helpful. Measures like *Snehana*, *Abhyanga*, *Basti*, nutritious food, milk, ghee, sesame, green leafy vegetables and proper sunlight exposure may support bone health when selected according to the individual's condition.<sup>13</sup>

### SAMPRAPTI OF *ASTHI KSHAYA* IN FLOW CHART



## **MODERN REVIEW**

### **Concept of Bone Health**

Bone is a living and dynamic tissue. It is not a dead structure. It continuously undergoes formation, repair and remodeling throughout life. Bone provides support, protects organs, helps in movement, stores minerals like calcium and phosphorus and participates in blood cell formation through bone marrow. Good bone health depends on bone mineral density, bone quality, bone microarchitecture, hormonal balance, nutrition, physical activity and absence of chronic disease. Reduced bone health may lead to osteopenia, osteoporosis, fragility fracture and poor quality of life.<sup>14</sup>

### **Bone Remodeling**

Bone remodeling is a continuous process in which old or damaged bone is removed and new bone is formed. This process mainly involves osteoclasts, osteoblasts and osteocytes. Osteoclasts resorb old bone, osteoblasts form new bone and osteocytes act as mature bone cells that regulate the remodeling process. When bone formation and bone resorption remain balanced, bone strength is maintained. When bone resorption becomes more than bone formation, bone mass decreases. This is one of the main mechanisms behind osteoporosis and age-related bone loss.

### **Osteopenia and Osteoporosis**

Osteopenia means low bone mass, but it is not as severe as osteoporosis. Osteoporosis is a condition in which bones become weak, porous and more prone to fracture. It is often called a silent disease because the person may not have symptoms until a fracture occurs. Bone mineral density is commonly assessed by DXA scan. A T-score of -1 or higher is generally considered normal. A T-score between -1 and -2.5 indicates osteopenia. A T-score of -2.5 or lower indicates osteoporosis.<sup>15</sup>

### **Risk Factors for Poor Bone Health**

Many factors can reduce bone health. Important risk factors include aging, menopause, low calcium intake, vitamin D deficiency, sedentary lifestyle, smoking, alcohol intake, chronic inflammatory diseases, endocrine disorders, long-term steroid use, malabsorption and family history of osteoporosis. In postmenopausal women, estrogen deficiency plays an important role in increasing bone resorption. Estrogen helps regulate bone turnover, and its deficiency disturbs the balance between bone formation and bone breakdown.

### **Role of Calcium and Vitamin D**

Calcium is the main mineral required for bone strength. Vitamin D helps in calcium absorption and mineralization of bone. Deficiency of vitamin D may lead to poor mineralization and bone weakness. In adults, severe vitamin D deficiency may cause osteomalacia, which presents with bone pain and weakness. Adequate calcium, vitamin D, weight-bearing exercise and avoidance of smoking and excessive alcohol are commonly advised for maintaining bone health.<sup>16</sup>

### **Hormonal Influence on Bone**

Hormones play a major role in bone metabolism. Estrogen, testosterone, parathyroid hormone, thyroid hormone, growth hormone and cortisol all affect bone remodeling. Estrogen deficiency after menopause is one of the common causes of accelerated bone loss. Excess thyroid hormone, high parathyroid hormone or long-term steroid exposure may also weaken bone. This modern hormonal concept can be correlated with the Ayurvedic idea that proper systemic balance is necessary for *Dhatu Poshana*. When the internal regulatory system is disturbed, tissue formation and maintenance become weak.

### **Lifestyle and Bone Health**

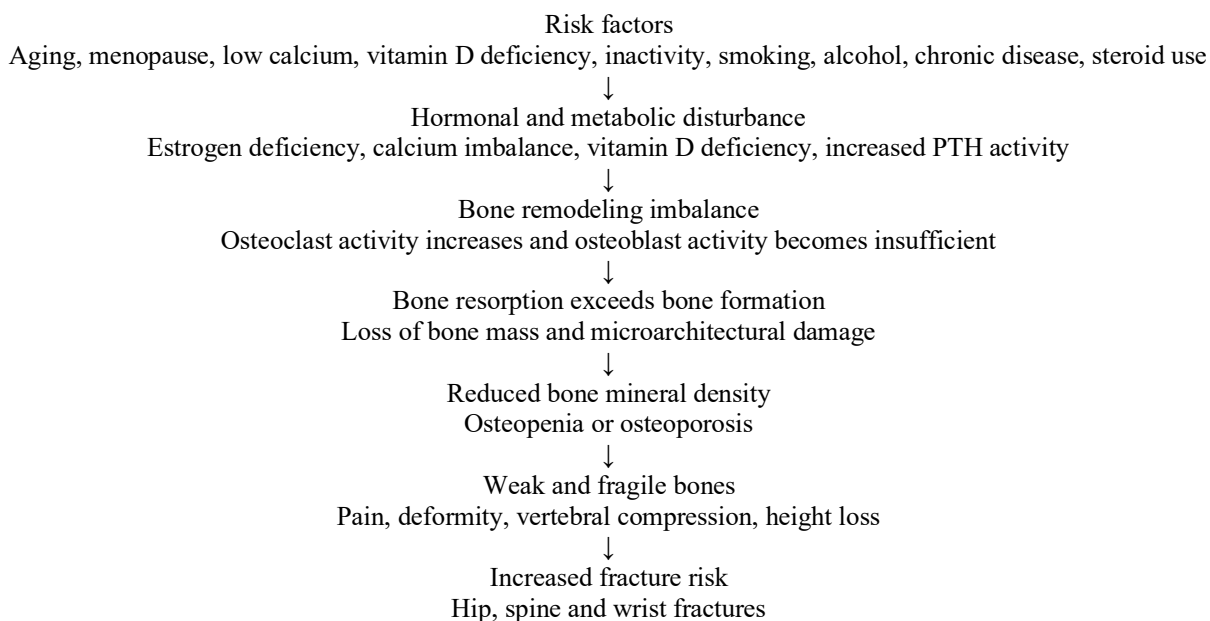
Physical activity is very important for bone strength. Weight-bearing exercises and resistance training stimulate bone formation and improve muscle strength. Sedentary lifestyle reduces bone loading and may increase risk of bone loss. Proper sleep, balanced diet and avoidance of harmful habits are also important.

From an Ayurvedic view, regular activity in moderation supports *Agni*, circulation and tissue nourishment. But excessive activity increases *Vata Dosha*, which may worsen degeneration and *Asthi Kshaya*. Therefore, balanced activity is important.

### Correlation Between *Asthi Kshaya* and Osteoporosis

*Asthi Kshaya* and osteoporosis are not exactly the same, but they show conceptual similarity. *Asthi Kshaya* explains depletion of bone tissue and bone strength due to disturbed *Asthi Dhatu* and aggravated *Vata Dosha*. Osteoporosis explains reduced bone mineral density and increased fracture risk due to excessive bone resorption or reduced bone formation. Both conditions involve weakness of skeletal tissue, pain, degeneration and risk of fracture. Ayurveda gives a broader functional view, while modern science gives measurable parameters like bone mineral density and T-score.<sup>17</sup>

### MODERN PATHOGENESIS IN FLOW CHART



### RESULT AND FINDINGS

- *Asthi Kshaya* is mainly a condition of depletion of *Asthi Dhatu*.
- *Vata Dosha* plays a major role in the development of *Asthi Kshaya*.
- The qualities of aggravated *Vata*, such as *Ruksha*, *Laghu*, *Khara* and *Chala*, are responsible for dryness, roughness, pain and degeneration.
- *Asthi Dhatu* and *Vata Dosha* have a close relationship through *Ashraya Ashrayi Bhava*.
- Weak *Agni* and disturbed *Dhatvagni* lead to improper nourishment of *Asthi Dhatu*.
- *Asthivaha Srotodushti* may contribute to defective nutrition and depletion of bone tissue.
- Clinical features of *Asthi Kshaya* are bone pain, joint pain, cracking sound, weak teeth, brittle nails, hair fall and generalized weakness.
- Modern bone loss is mainly due to imbalance between osteoblast-mediated bone formation and osteoclast-mediated bone resorption.
- Osteopenia and osteoporosis are important modern conditions related to low bone mineral density.
- DXA scan and T-score are important modern tools for assessment of bone mineral density.
- A T-score of -2.5 or lower is suggestive of osteoporosis.

- Calcium, vitamin D, hormones, exercise and lifestyle play important roles in bone health.
- The Ayurvedic concept of *Asthi Kshaya* has practical relevance in understanding degenerative bone disorders and age-related skeletal weakness.

## DISCUSSION

*Asthi Kshaya* is a significant Ayurvedic concept that explains the depletion of skeletal strength and structural stability. The condition is not limited only to bones but also includes related tissues like teeth, nails and hair. The classical symptoms of *Asthi Kshaya* clearly indicate reduced strength and nourishment of hard tissues. The role of *Agni* and *Dhatvagni* is very important because defective metabolism leads to poor tissue formation.<sup>18</sup> Therefore, *Asthi Kshaya* should be understood as a systemic metabolic and degenerative condition.

The involvement of *Vata Dosha* is central in the pathogenesis of *Asthi Kshaya*. Since *Vata* resides in *Asthi*, aggravated *Vata* directly affects bone tissue. In old age, *Vata* naturally increases, and this explains why degenerative bone and joint problems are common in elderly people. The dry, light and rough qualities of *Vata* reduce the stability and compactness of *Asthi Dhātu*. This produces pain, cracking, weakness and degeneration. Hence, *Vata Shamaka* and *Asthi Poshaka* approaches are essential in prevention and supportive management.<sup>19</sup>

Modern science also supports the concept that bone health depends on continuous nourishment and remodeling. Osteoporosis occurs when bone resorption exceeds bone formation, leading to reduced bone mineral density and increased fracture risk. Calcium, vitamin D, hormonal balance and physical activity are important for maintaining bone strength. The Ayurvedic view adds a broader understanding by including diet, lifestyle, digestion, tissue metabolism, aging and *Dosha* balance. Thus, both Ayurvedic and modern perspectives together provide a complete understanding of bone health.<sup>20</sup>

## CONCLUSION

*Asthi Kshaya* is an important condition described in *Ayurveda*, mainly related to depletion of *Asthi Dhātu* and aggravation of *Vata Dosha*. It may be clinically understood through symptoms like bone pain, joint pain, cracking sound, weak teeth, brittle nails, hair fall and reduced physical strength. Modern concepts like osteopenia, osteoporosis and low bone mineral density show close similarity with the idea of reduced bone strength. The pathogenesis involves poor tissue nourishment, disturbed *Agni*, *Asthivaha Srotodushti* and *Vata Prakopa*. Maintenance of proper diet, lifestyle, digestion, exercise, calcium, vitamin D and *Vata Shamaka* measures may help in preserving bone health. A combined Ayurvedic and modern understanding of *Asthi Kshaya* can be useful for prevention, early identification and better supportive care of bone-related disorders.

**CONFLICT OF INTEREST** -Nil.

**SOURCE OF SUPPORT**- None.

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