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# Conceptual study on the etiopathogenesis of *Asthi Kshaya* w.s.r. to Postmenopausal Osteoporosis

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## ABSTRACT

World Health Organization defines osteoporosis as a "Progressive systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture" Osteoporosis is considered a serious public health concern. Based on 2001 census approximately 163 million Indians are above the age of 50. This number is expected to increase to 230 million by 2015. Even conservative estimated suggest that of these, 20% of women and about 10-15% of men would be osteoporotic. The total effected population would, therefore, be around 25million, the figure can increase to 50 million. According to the classics, *Asthi Kshaya* is having the *Lakshanas* like *Asthi Shoolam*, *Kesha*, *Loma*, *Nakha*, *Dwija Prapatanam*, *Sandhi Shaitilya*. As some of the *Lakshana* of *Asthi Kshaya* resembles with the signs and symptoms of Osteoporosis, to certain extent it can be compared to Osteoporosis.

**Key words:** *Asthi Kshaya*, *Vata Dosha*, *Postmenopausal Osteoporosis*.

## INTRODUCTION

*Ayurveda* is an ancient science of life deals with the preventive as well as curative aspect. It explains human body as a 'congenial homeostasis' of *Doṣha*, *Dhatu* and *Mala*. The function of *Dhatu* is *Dharana* of the *Sharira*.<sup>[1]</sup>

Osteoporosis is one of the major signs that has increasingly been perceived as serious disabling disease in women aged above 40 years reaching *Rajonivritti*. It is not mentioned as disease in classical

texts of *Ayurveda*. Yet, according to *Acharya Sushruta* it can be considered under *Swabhavabala Pravritta Vyadhi*.<sup>[2]</sup> *Rajonivritti* occurs at *Sandhikala* of *Praudhawastha* and *Jarawastha*, where *Vata* starts overpowering *Pitta Dosha* and leads to *Kshaya* of all *Dhatu*s.<sup>[3]</sup>

According to the principles of *Ashrayaashrayi Bhava* by *Acharya Vagbhata*,<sup>[4]</sup> *Asthi Dhatu* is the seat of *Vata Dosha*<sup>[5]</sup> and is inversely related to each other i.e., if there is *Vata Vruddhi* there is *Asthi Kshaya*.

*Asthi Kshaya* occurs due to two main mechanisms, the first is deficiency of nutrients suitable for nourishing the bone because of malnutrition or the catabolic activity of *Vata Dosha* and the second is *Srotoavarodha* which obstructs supply of nutrition to the *Asthi vahasrotas* as a result of imbalanced *Agni* i.e., with *Jatharagnimandhaya* and *Dhatwagnimandhaya* that leads to formation of *Ama*. It can also occur due to a combination of both.

World Health Organization defines Osteoporosis as "Progressive systemic skeletal disease characterized by low bone mass and micro architectural deterioration of

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bone tissue, with a consequent increase in bone fragility and susceptibility to fracture".<sup>[6]</sup> Low levels of Estrogen cause imbalance in bone reabsorption and remodeling which leads to accelerated bone loss.<sup>[7]</sup>

Though most of the Samhita explained about *Asthi Dhatu*, its structure, function and its various diseases, Detail description about *Nidana Panchakas* of *Asthikshaya* is not available in our classics.

Considering the above factors in this present study, an effort is made to understand the *Nidana Panchaka* of *Asthikshaya* with special reference to Postmenopausal Osteoporosis.

### **Nidana**

#### **Samanya Dhatukshaya Nidana<sup>[8]</sup>**

- *Ativyayama* (excessive exercise)
- *Anashana* (fasting)
- *Ati Chinta* (worry)
- *Rukshashana* (intake of dry food)
- *Alpaashana* (intake of less food)
- *Vataatapa Sevana* (exposure to dust and sunlight)
- *Bhaya, Shoka* (excess of worry, grief, fear,)
- *Rukshapana* (intake of dry liquid like Ruksha Madya)
- *Prajagara* (waking at nights)
- *Ativartana* (*Atyadhika Pravrutti*) of *Kapha, Rakta, Shukra, Mala,*
- *Kala* (time factor (*Adana Kala* and *Vridhavasta*))
- *Bhutopaghata* (invasion of *Bhuta, Preta* etc.)

#### **Asthivaha Srotodushti Nidana**

- *Vyayama* (excessive exercise)
- *Ati Sankshobha* (excessive irritation)
- *Asthi Vighattana* (repeated trauma)
- *Vatala Ahara Sevana* (excessive consumption of *Vata* aggravating food)

#### **Majjavahasrotodushti Nidana<sup>[9]</sup>**

- *Utpeshana* (being crushed)

- *Ati Abhishyandana* (being filled with wet components of *Kapha*)
- *Abhighata* (trauma)
- *Prapedana* (compressed)
- *Virudha Ahara Sevana* (consumption of incompatible and unwholesome food)

#### **Purishava Srotodushti Nidana<sup>[10]</sup>**

- *Sandharana* (withholding urge of defecation)
- *Ati Ashana* (excessive eating)
- *Ajeerna* (indigestion)
- *Adhyashana* (repeated eating)
- *Durbalagni* (weak digestion)
- *Krusha* (in emaciated persons)

#### **Medovaha Srotodushti Nidana**

- *Avyayama* (lack of exercise)
- *Diva Swapna* (sleeping during day time)
- *Medhyanam Ati Sevanat* (excessive intake of fatty, fried and caloric foods)
- *Varuni* (an alcoholic product).

#### **Vishishta Nidana**

##### **Sahaja Nidana:**

- *Beeja*,<sup>[11]</sup> *Beejabhaga, Beejabhagavayava*
- *Pitrija Bhava*<sup>[12]</sup>
- *Kulaja* (Caucasians)
- *Prakriti* (*Vata* dominant *Prakriti*)

##### **Jataja Nidana<sup>[13]</sup>: Vatakara Ahara, Vihara**

##### **Swabhavaja Nidana<sup>[14][15]</sup>: more in women and old age**

##### **Samprapti**

*Acharayas* have mentioned about the *Ashrayaashrayi Bhava* which beautifully explains the relationship of various *Doshas* with the *Dhatu*s. As per this theory *Vata* is the *Ashrayi of Asthi Dhatu* and only these two share a reciprocally proportional relationship. Owing to this peculiar relationship, all *Vata Nidana* becomes the *Nidana* for *Asthi Kshaya*. Keeping in mind all the

*Nidanas* explained under *Vata Vyadhi* an attempt has been made here to formulate and explain the *Samprapti* of *Asthi Kshaya*. In order to have a proper interpretation of the *Samprapti* of *Asthi Kshaya*, apart from the normal *Vata Prakopa Nidana*, the main factors for the materialization of the disease, *Srotopradusaka Nidanas* of *Medovaha*, *Asthivaha*, *Majjavaha* and *Purishavaha Srotas* should not be neglected, as they also play a definite role, either directly or indirectly in the pathogenesis of *Asthi Kshaya*. The proper functioning of *Jataragni*, *Bhutagni*, *Dhatwagni* is essential for the “*Samyak Dhatu Posana Prakriya*”<sup>[16]</sup> in order to maintain the qualitative and quantitative normalcy of the *Dhatu*s while explaining concept of *Dhatu Utpatti*.

Functional deformity in any of these *Agnis* especially the *Dhatwagni* leads to the *Vikruti* in the transformation of *Posaka Dhatu* (*Dhatu* specific nutrients) into *Posya or Sthayi Dhatu*, resulting in *Dhatuvikruti*. Hence, adaptation of the principles of *Dhatu Posana Krama* is also carried out in this regard to explain the *Samprapti* of *Asthi Kshaya*.

*Manasika* factors also play a vital role in the pathogenesis of *Asthi Kshaya*. The role of *manas* in the causation of a disease is very well explained in our classics. Thus, these factors are also considered to frame up and explain the *Samprapti* of *Asthi Kshaya* effectively. Considering the above said factors it is learnt that the Pathogenic mechanism of *Asthi Kshaya* is not single mechanism whereas it is a complex mechanism.

#### **Samprapti Ghataka of Asthikshaya**

**Dosha:** *Vata Pradhana* (*Vyana, Udana, Samana*), *Pitta* (*Pachaka*), *Kapha* (*Kledaka, Shleshaka*) *Vata* is the leading *Dosha*, as this is a disease related to *Jara* and *Asthi Dhatu*. Also, as *vata* gets provoked *Kapha Kshaya* takes place. *Vata Prakopa* and *Kapha Kshaya* manifests symptoms such as *Shoola, Rukshata, Ruja, Shrama* etc.

**Dushya:** *Asthi* is main *Dushya* in this disease with its *Mala, Nakha* and *Kesha*. But *Kshaya* of all *Dhatu*s also occurs in later stage, hence all *Dhatu* including their *Upadhatu*s can be considered under *Dusya*.

**Agni:** In old age, *Jatharagni Vaishmya* leads to poor *Dhatu* formation, by affecting *Dhatvagni* and *Bhutagni*.

**Ama:** *Jatharagnijanya Ama* and *Dhatvagnijanya Ama*

**Srotas:** *Medavaha, Asthivaha, Majjavaha, Purishavaha Srotas*.

**Sroto Dushti Laxshana:** *Sanga*.

**Udbhava Sthana:** *Ama Pakwashaya*.

**Sanchara Sthana:** *Rasayani*.

**Vyakta Sthana:** *Asthi Dhatu*, its *Upadhatu Danta* and *Mala Kesha, Nakha, Roma* and *Sandhi*.

**Adhisthana:** *Asthi* and *Sandhi*.

**Roga Marga:** *Madhyama Roga Marga*.

**Roga Prakriti:** *Chirakari*.

#### **Purvarupa**

As we go through the classics, we cannot find about the *Poorvarupa* of *Asthi Kshaya*. *Vatavardhaka Nidana* along with the other *Nidana* itself forms the *Nidana* for the *Asthi Kshaya* due to the *Ashraya Ashrayi Bhava* of the *Vata* and *Asthi*. So *Vridhdhavata* causes the disease *Asthi Kshaya*. As we all know that the *Poorvarooopa* in *Vatavyadhi* is *Avyakta*. *Chakrapani* in his commentary has clarified that *Avyakta* can be taken as *Alpavyaktata* or as *Asampoornalakshana* or as mild *Lakshana*. So, the *Lakshana* in their mild form can be taken as the *Poorvarooopa* of *Asthi Kshaya* in the initial stage of the disease. *Manda Vedana* (dull aching type of pain) in the *Asthi, Sandhi*, and *Mildness* of other *Lakshana* such as *Kesha, Roma, Nakha, Danta Vikara* (*Shadana* and *Bhanga*) may be taken as the *Purvarupa* of the disease *Asthi Kshaya*.

#### **Rupa**

SN	Lakshanas	Ch	Su	A.S	A.H	H.S
1.	<i>Asthibheda</i>	+	-	+	-	-
2.	<i>Asthitoda</i>	-	+	+	+	-
3.	<i>Ruja</i>	-	-	-	-	+
4.	<i>Asthi Shula</i>	+	+	-	-	-

5.	Kesha Vikara and Patana	+	-	+	+	-
6.	Loma/Roma Vikara and Patana	+	-	+	+	-
7.	Nakha Vikara and Patana	+	+	+	+	-
8.	Smashru Vikara and Patana	+	-	-	-	-
9.	Danta Vikara and Patana	+	+	+	+	-
10.	Shrama	+	-	-	-	-
11.	Sandhi shaitilya	+	-	+	-	-
12.	Ruksha	-	+	+	-	-
13.	Parushya	-	-	+	-	-
14.	Asthibadda	-	-	+	-	-
15.	Mamsabhilasha	-	-	+	-	-
16.	Anga Bhanga	-	-	-	-	+
17.	Ati Manda Chesta	-	-	-	-	+
18.	Bala Kshaya	-	+	+	+	-
19.	Medo Kshaya	+	-	-	-	+
20.	Viryasya Mandya (Utsaha Hani)	-	-	-	-	+
21.	Vikampana	-	-	-	-	+
22.	Vamana	-	-	-	-	+
23.	Visangnata	-	-	-	-	+
24.	Shosha	-	-	-	-	+
25.	Kathorata	-	-	-	-	+
26.	Shophita	-	-	-	-	+

**Upashaya**

1. Madhura Rasa Pradhana Dravya like Shali, Rakta Shali, Masha etc.
2. Amla and Lavana Rasa Pradhana Dravya.

3. Dugdha, Dadhi, Takra and Ghrta.
4. Mamsa, Mamsa Rasa etc.
5. Niyamita Vyayama.
6. Abhyanga and Swedana.
7. Vata Nashaka and Vedana Shamaka Oushadhi.

**Anupashaya**

1. Shushka Shaka, Mamsa, Mudga, Masura, Adhaki, Kalaya etc.
2. Madya.
3. Ati Vyayama, Sahasa etc.

**Sadhyasadhya**

Asthi is Gambhira Dhatu i.e., deeply situated. The disease of Gambhira Dhatu are said to be Yapyra or Kashta Sadhya.<sup>[17]</sup> The disease Asthikshaya is Asadhya because of its occurrence in Jarawastha. Also, when the disease Asthikshaya is manifested, in condition of bhedawastha i.e., last stage of Kriya Kala. Where as long as the disease is treated, it is Yapyra and if not treated, the disease becomes Asadhya.<sup>[18]</sup>

**Upadrava**

if the disease is not treated properly it can lead to Kshaya of other Dhatu such as Majja Kshaya, Shukra Kshaya and other Dhatu Kshaya leading to Bala and Oja Kshaya. Due to the Kshaya of Asthi Dhathu, it loses its normal texture, strength and density leading to Asthi Bhagna (fractures) which are the commonest Upadrava of Asthi Kshaya. Modern science also agrees that the fractures are the major risk factors of Osteoporosis.

**Pathya-Apathya**

SN	Varga	Pathya	Apathya
1.	Rasa	Madhura-Amla-Lavana	Katu-Tikta-Kashaya
2.	Shukadhanya	Nava Godhuma, Nava Shali, Rakta Shali, Shashtika Shali	Rajamasha, Nishpava, Mudga, Kalaya

3.	<i>Shimbi Varga</i>	<i>Nava tila, Masha, Kulattha</i>	<i>Truna, Koradusha</i>
4.	<i>Shaka Varga</i>	<i>Patola, Shigru, Vartaka, Lashuna</i>	<i>Jambu, Udambara, Kramuka, Tinduka</i>
5.	<i>Mamsa Varga</i>	<i>Ushtra, Go, Varaha, Mahisha, Mayura, Bheka, Nakula</i>	<i>Shushka Mamsa, Kapota, Paravata</i>
6.	<i>Jala Varga</i>	<i>Ushnajala, Shritasheetajala</i>	<i>Sheetajala</i>
7.	<i>Dugdha Varga</i>	<i>Go, Aja, Dadhi (Svadu Dadhi and Amla Dadhi, curd prepared from buffalo milk), Ghrita, Kilata</i>	-
8.	<i>Mutra Varga</i>	<i>Gomutra</i>	-
9.	<i>Madhya Varga</i>	<i>Dhanyamla, Sura</i>	-
10.	<i>Sneha Varga</i>	<i>Tilaja, Ghrita, Vasa, Majja</i>	-
11.	<b>Vihara</b>	<i>Veshtana, Trasana, Mardana, Snana</i>	<i>Ratri Jagarana, Ativyayama, Adhika Shrama, Ativyavaya, Ati Chankramana, Vegadharana</i>
12.	<b>Manasika</b>	<i>Sukha</i>	<i>Atichinta, Atibhaya, Atishoka</i>

## OSTEOPOROSIS

### Etymology

Osteoporosis is derived from Latin.

Osteon - bone; Porosis – porous Hence it means porous bones.

### Definition

World Health Organisation defines osteoporosis as a “progressive systemic skeletal disease characterized by low bone mass and micro architectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture”.

## Classification of Osteoporosis

### Primary Osteoporosis

1. Post menopausal: type I
2. Age related: type II

### Secondary Osteoporosis

#### 1. Endocrine

Cushing’s syndrome

- Thyrotoxicosis
- Hypogonadism
- Pituitary insufficiency
- Athletic amenorrhoea

#### 2. Drugs

- Corticosteroids
- Long term heparin use
- Anticonvulsant drugs
- Cytotoxic drugs

#### 3. Inherited

- Turner’s syndrome
- Osteogenesis imperfecta
- Homocystinuria

#### 4. Nutritional

- Anorexia nervosa
- Alcoholism
- Malabsorption syndrome

#### 5. Immobility

- General (lack of weight bearing exercises)
- Local (e.g. rheumatoid arthritis, hemiplegia, fracture)

#### 6. Other (rare)

- Chronic hepatic disease
- Juvenile
- Pregnancy
- Masto cytosis

## Postmenopausal Osteoporosis

### Mechanism of Estrogen Effects on Bone

An influence of estrogens on bone mass prior to the menopause was suggested by number of observations in reproductive state. Some studies have shown positive association between bone mass and parity in premenopausal women.<sup>[19]</sup> Also, oral contraceptive use has been associated with higher bone mass in some women, but not in all studies. A number of hypo-estrogenic states in premenopausal women are associated with reduced bone mass. Amenorrhoea in female athletes and ballet dancers is associated with low bone mass and fracture risk. The mechanism of action of estrogen on bone turnover still remains unknown. Yet, a number of hypotheses have been suggested. Estrogen induced effects on skeleton may be exerted via either genomic or non-genomic actions.

**Calcitonin theory:** This theory proposes that estrogen deficiency is associated with reduced calcitonin production, leading to increased bone resorption, increased serum calcium levels, reduced parathyroid hormone secretion and hence reduced production of 1,25 dihydroxy vitamin D<sub>3</sub>; this chain of events would result in reduced intestinal calcium absorption and reduced serum calcium levels.<sup>[20]</sup>

Other theory proposes indirect effect of estrogen on bone resorption including reduced production of end organ resistance to 1,25-dihydroxyvitamin D<sub>3</sub>, resulting in decreased calcium absorption from intestine, increased parathyroid hormone secretion and increased bone turnover.<sup>[21]</sup>

**Estrogen receptors theory:** There are two main subtypes of estrogen receptor ER- namely ER $\alpha$  and ER $\beta$ . Both receptor subtypes have been reported in human bone. Recent evidence suggests that ER $\alpha$  is predominant in cortical bone whereas ER $\beta$  is the main form in cancellous bone. Estrogen receptors have been described on all the main cell types of bone, namely, osteoclasts, osteoblasts and osteocytes. Estrogen has effects on the production of a number of cytokines and growth factors, which are involved in the regulation of bone remodelling. The bone preserving effect of estrogen is mediated largely through its effect on

osteoclast number and activity. In postmenopausal women, estrogen deficiency is associated with increased production of interleukin 1 (IL-1), tumour necrosis factor  $\alpha$  (TNF $\alpha$ ) and granulocyte macrophage colony stimulating factor (GM-CSF), cytokines that increase osteoclast genesis and IL-1 and TNF $\alpha$  also increase osteoclastic activity. Estrogen also inhibits the production of interleukin -6 (IL-6), and more recently, has been shown to stimulate the production of osteoprotegerin in osteoblastic cells. Osteoprotegerin functions as a soluble decoy receptor for the cytokine RANKL (receptor activator of NF $\kappa$ B ligand), which is essential for osteoclast genesis. Effects of estrogen on osteoclast activity are also mediated via stimulation of apoptosis. IL-1, IL-6 and M-CSF have all shown to inhibit apoptosis in osteoclasts, whereas transforming growth factor  $\beta$  (TGF  $\beta$ ) production is decreased in estrogen deficient states, stimulates apoptosis. Thus, the loss of estrogen at the menopause results in accelerated bone loss and is a major pathogenic factor in postmenopausal osteoporosis.

### Signs and Symptoms

Osteoporosis is a silent disease, until a fracture is sustained.

### Clinical Findings

- In early stages, following acute thoracic compression fracture, patients exhibit marked discomfort on sitting and standing.
- Gait is normal but slow. Spinal movements considerably reduced, with more restriction in flexion than in extension.
- Dowager's hump (thoracic kyphosis) may be present as a result of previous anterior compression fractures.
- Involvement of lumbar spine is noted by progressive loss in lumbar lordosis.
- Axial height may be decreased.
- Paravertebral muscle spasms are palpable and often visible. Spine and paravertebral muscles are tender on palpation and percussion over the level of fracture.

- Bony point tenderness is usually absent as the fracture is in the anterior vertebral body of spine which are not palpable.
- Most patients are totally pain free during the intervals between compression fractures; whereas some may complain of chronic, dull, aching postural pain in mild thoracic and upper lumbar region. This responds symptomatically to frequent, intermittent horizontal rest.
- Loss of height may be up to 2 to 4 cm with each episode of segmental vertebral collapse and progressive kyphosis.
- There is no significant loss of height when the lower ribs come to rest on iliac crest due to collapsed spine., yet loss of bone mass continues.
- This results in decrease in size of thoracic and abdominal cavities, which are responsible for clinically disturbing side effects – exercise tolerance is reduced.
- Abdominal distention, protrusion is a common manifestation secondary to severe lumbar vertebral collapse.
- Circumferential pachydermal skin folds develop at the rib and pelvic margins as the disease progresses.

#### Measurement of Bone Mass or Bone Mineral Density (BMD)

Clinical application of bone densitometry has been one of the advances in Osteoporosis that has directed to the increased patient awareness of this increasingly prevalent disease. With bone densitometry it is possible for clinician to diagnose Osteoporosis before the first fracture has occurred; predict risk for fracture in postmenopausal women; men and in patients receiving gluco-corticoids. Three reasons clinicians do bone mineral density measurements are

1. Diagnosis using the WHO criteria for Osteoporosis.
2. Fracture risk prediction, and
3. Monitoring the natural progression of diseases that affect BMD or monitoring the therapeutic response to Osteoporosis specific treatments.

- T scores between -1 and -2.5 represents osteopenia, clinical significance of which is not completely understood.
- T score below -2.5 represents osteoporosis and a high risk of fracture.
- T score below -2.5 plus one or more fragility fractures is indicative of established osteoporosis.

Bone densitometry measures bone density, not bone turnover or bone stability.

#### Treatment of Osteoporosis

“Prevention Is Better Than Cure” is accepted as the crucial step in managing osteoporosis according to the contemporary science. Only when the disease is manifested and starts increasing the risk of complications, thereby becoming a threat to the patients’ life, medical intervention is needed.

#### Prevention

According to R Handa in his textbook of Orthopaedics Routine physical activity, proper intake of nutritious food containing dietary calcium, magnesium, phosphorus and other minerals, Vitamin-D (dietary & auto-synthesis by exposure to sun), avoiding smoking, tobacco intake and alcohol consumption, avoiding the prolonged use of certain drugs such as cortico-steroids, anticonvulsants, heparin etc. and maintaining a disease free healthy body and mind are the golden tips for the prevention of Osteoporosis.

#### DISCUSSION

##### Nidana

In classics there is no direct mentioning about the *Asthikshaya Nidana* or the factors that cause *Asthikshaya*. But the relationship between *Asthi Dhatu* and *Vatadosha* is beautifully explained through *Ashrayaashrayi Bhava* mentioned in our classics. According to this rationale, when *Vata* increases, *Asthikshaya* occurs and vice versa.

Keeping this particular concept in mind we can say that the *Nidana* responsible for the increase of *Vata Dosh*a is responsible for the *Asthi Kshaya*. Various symptoms of *Jarawastha* are more likely observed in

*Rajonivrittijanya Avastha* also. So, it can be stated that *Rajonivritti* is one of the parts of the process of aging, specific to female. *Akalaja Jara (Rajonivritti)*, *Ruksha Ahara Sevana* for lifetime, sedentary life style, and low intake of *Asthi Posaka Amsa* in diet serves as *Nidana* of *Asthi Kshaya*.

Apart from this, factors like *Manasika Nidana*, *Sroto Dushti Nidana* of *Medovaha*, *Asthivaha*, *Majja Vaha* and *Purisha Vaha Srotas* and also the factors that affects *Jatharagni*, *Bhutagnis*, especially *Parthivagni*, *Vayuvyagni* and *Tejasagni* and both *Upachayakaraka* and *Apachayakaraka Asthi Dhatwagnis* are also responsible for *Asthi Kshaya*.

Functional deformity in any of these *Agnis* especially the *Dhatwagni* leads to the *Vikrti* in the transformation of *Posaka Dhatu* into *Poshya* or *Sthayi Dhatu*, resulting in *Dhatuvikrti*. Hence adaptation of the principles of *Dhatu Posana Krama* is also carried out in this regard to explain the *Samprapti* of *Asthikshaya*.

#### Discussion on Samprapti

*Samprapti* of *Asthikshaya* is not a single pathogenic mechanism, whereas it is a complex mechanism. Hence the *Samprapti* of *Asthi Kshaya* is explained under two different headings *Samanya Samprapti* and *Vishesha Samprapti*.

According to *Acharya Charaka*, *Avruta Marga* of *Vata* causes it to become *Prakupita* and causes *Rasadi Dhatu Shoshana*. Obstruction of normal *Gati* of *Vata (Vyana Vata)* occurs due to the *Margavarana*. By this the *ahara rasa viksepa (rasa samvahana)*, *dhatu vyuhana* and *agni samirana* functions of *vyana Vata* are affected. As a result of this, the *Ahara Rasa* containing the *posakamsas* to the *Dhatu*s will not be able to reach and nourish the *Sthayi Dhatu*s, *Dhatu Vyuhana* i.e., specific arrangement and permeability of the *posakamsas* inside the *Sthayi Dhatu*s will not be possible and the functions of the *Dhatwagnis* are also affected. This signifies the importance of *Medodhatvagni*. Vitamin D, which is derived from sterols, is essential for absorption of calcium in the body. Hence the *Moola* of *Asthi Vaha Srotas* is rightly considered as *Meda*. Imbalance in *Asthi Dhatvagni* leads to improper formation of *Sthayi Asthi Dhatu* from

*Poshaka Asthi Dhatu*. Parathyroid hormone, calcitonin, estrogen etc. play significant role in metabolism of bone. These all can be classified under types of *Agni* acting at different levels. The *Ashrayashraayi* relationship of *Vata Dosha* and *Asthi Dhatu* forms a fundamental base to understand any pathological condition related to *Asthi Dhatu*.

As a combined effect of these factors *Dhatu Kshaya* occurs. According to the principles of *Ashrayaashrayibhava* explained by *Acharya Vagbhata*, *Asthi Dhatu* among the *Saptha Dhatu* is most fictile to be affected since *Vata* and *Asthi* are inversely proportional. So, to sum up briefly, it can be said that *Asthikshaya* is caused due to the *Dhatu Kshaya Karaka* and *Maragavarana Karaka*, *Nidana Sevana* causing the *Prakupita Vata* to fill the *Riktatata* in *Astivaha Srotases* which are barren of *Snehadi Gunas* and cause *Asthikshaya*.

#### Poorva Roopa

As we all know that the *Poorva Roopa* in *Vata Vyadhi* is *Avyakta*. *Chakrapani* in his commentary has clarified that *Avyakta* can be taken as *Alpa Vyaktata* or as *Asampoorna Lakshanas* or as mild *Lakshanas*. Like *Asthishula*, *Toda*, *Bheda*, *Shrama*, *Sandhishaitilya*, *Danta Shadana*, *Nakha Shadana*, *Danta* and *Nakha Bhanga* manifested in mild form.

#### Rupa

*Acharya Caraka* has mentioned it along with the *Laxanas* of *Asthadasa* (18 types) *Kshaya*.

In *Harita Samhita* the *Laxanas* of *Asthikshaya* are described along with the *Laxanas* of *Kshaya (Rajayakshma)*. *Pravrudha Vata Dosha* is the main factor for the cause of *Asthi Kshaya* owing to the *Asrayasrayi Bhava*. So, the *Laxanas* are due to the *Vata Vruddhi*, hence various types of *Vedanas* are seen in the *Asthis* and *Sandhis*. Since the *Dhatu* metabolism involves two *Pakas* viz. *Prasada Paka* and *Kitta Paka*, the *Dhatu*s when affected simultaneously affects the *Upadhathu* and *Malas*, as a common rule. When there is defect in *Dhatu* metabolism due to improper supply of nutrients, naturally the *Prasada Paka* and the *Kitta Paka* are affected leading to the *Vikaras* of *Dhatu*, *Upadhathu* and *Mala* also.

**CONCLUSION**

*Asthikshaya* is a disabling disease which renders women a bedridden life. The prevalence of postmenopausal *Asthi Kshaya* is more in people aged above 40 years. Peak bone mass is attained by the age of 30 years. *Asthikshaya* is one of the *Swabhavabala Pravrutta Vyadhi* as in this *Vaya (Vridhdhavastha)* plays major role along with *Vata* as *Pradhana Dosha* and *Asthi* as *Pradhana Dhatu*. Analysis of textual references regarding aetiology of *Asthikshaya* discloses fact that *Vatakara Nidana* plays a significant role in manifestation of *Asthikshaya*. It is concluded that any abnormalities in *Vyana Vata*, *Udana Vata*, *Samana Vata Pachaka Pitta*, *Shleshmaka Kapha*, *Kledaka Kapha* and *Aharaja*, *Viharaja Nidana* result in *Asthikshaya*. There is no textual reference regarding the *Purvarupa* of *Asthikshaya*, so *Laxanas* of *Asthikshaya* when expressed in mild nature are considered as *Purvarupa* of *Asthikshaya*. *Laxanas* of *Asthikshaya* are *Asthishula/Toda/Bheda*, *Sandhi Shaitilya*, *Shrama*, *Danta Kesha Nakha Prapatana*, *Danta Bhanga*, *Nakha Bhanga*. These *Lakshanas* have close resemblance with symptoms of postmenopausal osteoporosis in modern science which include pain in the back, deformity of spine, risk of developing fractures. *Madhura Rasa Pradhana Dravya* like *Shali*, *Rakta Shali*, *Masha* etc, *Amla* and *Lavana Rasa Pradhana Dravya*, *Dugdha*, *Dadhi*, *Takra* and *Ghrta*, *Mamsa*, *Mamsa Rasa*, *Niyamita Vyayama*, *Abhyanga* and *Swedana*, *Vata Nashaka* and *Vedana Shamaka Oushadhi* are said to be the *Upashayas* of the *Asthikshaya*. *Majja Kshaya*, *Shukra Kshaya*, *Oja Kshaya* and Fractures - *Anga Bhanga* should be considered as complication of *Asthi Kshaya*.

**REFERENCES**

1. Sushruta Samhita. Chaukhambha publications, translated by Prof. K.R.Srikantha Murthy Vol 3 Uttara sthana chapter 54, verse No.7, Choukhambha Orientaalia Varanasi, 2016;355.
2. Sushruta Samhita of Maharshi Susruta, Edited with Susrutavimarsini by Dr. Anant Ram Sharma, volume-I, Chaukhambha Surbharati Prakashan, Varanasi, reprinted edition 2017, Sutrasthana, Chapter 1<sup>st</sup> Verse 33, page no-16.
3. Bhavaprakasha of Bhavamisra Translated by Prof.K.R.Srikantha Murthy, 1<sup>st</sup> Volume Purvakhanda, Chaukhambha Krishnadas Academy, Varanasi, reprinted edition 2008, Chapter 2<sup>nd</sup> Verse 196, page no-45.
4. Astanga Hridaya of Vagbhata, by Kaviraja Atrideva Gupta, edited by Vaidya Yadunandana Upadhyaya, Chaukhambha Prakashan, Varnasi. reprinted edition 2017, Sutrasthana, Chapter 12<sup>th</sup> Verse 1, page no-120.
5. Astanga Hridaya of Vagbhata, by Kaviraja Atrideva Gupta, edited by Vaidya Yadunandana Upadhyaya, Chaukhambha Prakashan, Varnasi. reprinted edition 2017, Sutrasthana, Chapter 11<sup>th</sup> Verse19, page no-116.
6. World Health Organisation. Assessment of fracture risk and its application to screening for Postmenopausal Osteoporosis. Geneva, WHO, 1994. (Technical report series 843).
7. Khosla S, Riggs BL. Pathophysiology of age-related bone loss and Osteoporosis. Endocrinology and Metabolism Clinics of North America 2005;34(4):1015–30.
8. API Text book of medicine by Siddharth N Shah, The Association of Physicians of India, Mumbai, 8<sup>th</sup> edition 2008, 1<sup>st</sup> volume, page no-226.
9. Pandey K.Chaturvedi G Vidyotini Tika Acharya Cand Dhruhabala, Caukhambha Bharati Academy, Varanasi, Edition 2003, Vol 1, Sutrasthana 17/76,77,352P.
10. Shastri.K.Sushruta Samhita Acharya Sushrut, Ayurveda tattva sandipika tika, Chaukhamba Sanskrit sansthan Varanasi, edition 2007; vol 1, Sutrasthana 15/13, 58P.
11. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 1st volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Sharirasthana 3rd chapter Verse 17, page no-784.
12. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 1st volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Sharirasthana 3rd chapter Verse 7, page no-770.
13. Astanga Hridaya of Vagbhata, by Kaviraja Atrideva Gupta, edited by Vaidya Yadunandana Upadhyaya, Chaukhambha Prakashan Varnasi, reprinted edition 2017, Sutrasthana, Chapter 11th Verse27.

14. Astanga Sangraha, Kaviraj Atrideva Gupta, Chowkhmba Krishnadas Academy Varanasi, 1st Volume, Sharirasthana, 2nd Chapter, verse 14.
15. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 1st volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Sharirasthana 4th chapter Verse 14, page no-794.
16. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 1st volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Sutrasasthana 28th chapter Verse 4, page no-467.
17. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 2nd volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Chikitsasthana 15th chapter Verse 16, page no-383.
18. Charaka samhita of Agnivesha, By Vaidya H.C.Kushwaha Edited with 'Ayurveda Deepika' Hindi Commentary, 1st volume, Chaukhamba Orientalia, Varanasi. Reprinted edition 2012, Chikitsasthana 28th chapter Verse 73-74, page no-744.
19. Alderman BW et al. Reproductive history and postmenopausal risk of hip and forearm fracture. Am J Epidemiol; 124: 162-267, 1986.
20. Stevenson et al. Calcitonin and the calcium regulating hormones in postmenopausal osteoporosis: effect of estrogens. Lancet; 8 :693-695, 1981.
21. Eastell R et al. Interrelationship among Vitamin D metabolism, true calcium absorption, parathyroid hormone function and age in women: evidence of an age related intestinal resistance to 1,25-dihydroxyvitamin D action. J Bone Miner Res; 6: 125-132, 1991.

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