



Review Article

UNDERSTANDING OSTEOPOROSIS AND ITS AYURVEDIC MANAGEMENT - A REVIEW

R Sreelekshmi

Assistant Professor, Department of Kayachikitsa, Amrita School of Ayurveda, Kollam, Kerala, India.

Article info
Article History:
Received: 24-10-2022
Revised: 15-11-2022
Accepted: 01-12-2022

KEYWORDS:
Asthigatavata,
Osteoporosis,
Asthikshaya,
Bhagna Cikitsa.

ABSTRACT
Osteoporosis is a generalized skeletal disorder of low bone mass and deterioration in its architecture causing susceptibility to fracture. Multiple etiological factors like physical, hormonal, nutritional and life style contribute to the development of disease. It usually generates along with senile and postmenopausal changes in the body. Morbidity associated with Osteoporotic fracture is on the rise. Currently the disease is increasing in much earlier groups, owing to present lifestyle. So preventive strategies should be adopted much earlier as maintaining a healthy life style itself can protect against fractures in later life. As disease prevention and treatment have improved over last two decades, public awareness of Osteoporosis remains minimal particularly in rural areas. Conventional medications are often effective for symptomatic relief only. However this provides much scope to Ayurveda, which aims at treatment as well as disease prevention. It can be considered as a disease characterized by localization of vitiated *Vata* in *Asthi Dhatu* i.e.; '*Asthigata Vata*' resulting in *Asthi Kshaya*. *Vata Kopa* and *Asthikshaya* can result in osteoporosis. Condition can be managed in Ayurveda adopting *Asthigata Vata Chikitsa*, *Asthikshaya chikitsa*, *Bhagna chikitsa* and usage of drugs with *Brimhana*, *Rasayana* and *Vata Hara* property.

INTRODUCTION

Osteoporosis is characterized by low bone mass with micro architectural deterioration of bone tissue leading to fracture. Often called 'silent disease' as bone loss occur without symptoms. According to WHO Osteoporosis is second to cardiovascular disease as a global health problem. Much in the manner that asymptomatic conditions such as hypertension and dyslipidemia predispose to stroke and myocardial infarction respectively, a low bone density predisposes to osteoporotic fractures. The annual incidence rate of osteoporotic fractures in woman is greater than the combined incidence rate of heart attack, stroke and breast cancer. Since Osteoporosis affects elderly population which is growing, it will put a great burden to healthcare system as treatment is expensive.

Due to increasing Osteoporosis prevalence with age, the worldwide aging of the population and the changing lifestyle habits, the prevalence of Osteoporosis has risen significantly and will continue to in future.^[1] In most western countries while the peak incidence of osteoporosis occurs at 70-80yrs of age, in India it may afflict 10-20 yrs younger at age of 50-60.

**Osteoporosis
Definition**

World Health Organization operationally defines Osteoporosis as a bone density that falls 2.5 standard deviations below the mean for young healthy adults of same gender, also referred to as a T-score of -2.5.

**Types of Osteoporosis
Primary Osteoporosis**

Primary osteoporosis occurs without a known cause and includes both Juvenile and Idiopathic osteoporosis. Idiopathic osteoporosis can be further subdivided into postmenopausal (type 1) and age associated or Senile (type 2) osteoporosis which is due to oestrogen deficiency and ageing respectively.

Access this article online	
Quick Response Code	https://doi.org/10.47070/ijapr.v10i11.2581
	Published by Mahadev Publications (Regd.) publication licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0)

Table 1: Classification of Osteoporosis

Types of primary osteoporosis	Characteristics
Juvenile osteoporosis	<ul style="list-style-type: none"> Occurs in children/adults of both sexes Normal gonadal function Age of onset 8-14 yrs Hallmark characteristic: Abrupt bone pain/fracture following trauma.
Idiopathic osteoporosis	
Post menopausal osteoporosis	<ul style="list-style-type: none"> Due to estrogen deficiency. Phase of accelerated bone loss, of trabecular bone. Fractures of distal forearm and vertebral bodies common.
Senile osteoporosis	<ul style="list-style-type: none"> Ageing cause decreases of BMD Represents bone loss associated with ageing Fractures occur in cortical and trabecular bone. Fractures of wrist, vertebral and hip are common.

Secondary Osteoporosis

Can occur due to underlying diseases, deficiency or as drug induced.

Etiological Factors Leading To Osteoporosis

Bone formation and resorption are in equilibrium in adults up to the age of 50 years and so up to this age the bone mass is fairly constant. The bone mass declines steadily but slightly after age of 50. Excessive resorption than formation is the main cause. The precise mechanism leading to osteoporosis is not clear. Genetic factors play a role and studies have suggested that a major genetic component responsible for bone mass may be linked to polymorphism in the gene for vitamin D receptor. Nutritional factors like low calcium intake and low vitamin D level also identified as major contributing factors to poor bone health and osteoporosis.

Clinical Features

As this condition is asymptomatic in initial stages, diagnosis is often too late and usually by radiography. In many cases first symptom is a broken bone. Patients with Osteoporosis may not know that they have the disease until their bones become so weak, that a sudden strain, hump or fall causes a hip fracture or a vertebra to collapse. This is recognized by clinical features like severe back pain in middle or low thoracic, lumbar region which is aggravated by sudden movement, cough, sneezing etc. There will be shortening of vertebral column (intervertebral disc herniates into vertebral bodies). Patient will be presenting with Dowager's hump/Widow's hump denoting dorsal kyphosis with exaggerated cervical lordosis. Even trivial trauma cause fracture of axial skeleton. Round type of gibbus due to compression of thoracic vertebra is commonly seen. Other features include brittle hair, cervical spine compression, loss of vertebral height and skin wrinkles.

Diagnostic Tests

Assessment of Bone Mineral Density: Bone mineral density is expressed in grams per unit area and is recorded in comparison to the sex and age specific distribution of these values in the general population. BMD measures bone density in lumbar spine, femoral neck, distal radius etc. These tests are painless, non invasive and safe. It can detect a bone density before a fracture occurs.

Tests

X-rays

Decreased skeletal radio density is a late and unreliable sign of bone loss and becomes apparent only after a 30 percent reduction in mineral or skeletal mass.

Radiographic changes seen in spine are

- Loss of vertebral height
- Biconcave central compression (cod fish spine) due to the pressure of bulging disc into the bodies.
- Anterior wedge compression
- Bone density of vertebrae is reduced.
- Ground glass appearance due to generalized rarefaction

Quantitative Ultrasound

Quantitative ultrasound is a relatively recent and noninvasive method of estimating bone mineral status at peripheral skeleton.

Dual Energy X-Ray Absorptiometry

DXA is a highly accurate x-ray technique that has become standard for measuring bone density. It can be used for measurements of any skeletal site, clinical determinations are usually made of lumbar spine and hip.

Laboratory Investigations

For identifying secondary cause complete blood count, Renal Function test and Liver function test are to be done. Vitamin D level to be checked and if found low it is to be corrected. Thyroid function test is done to rule out hyperthyroidism.

Advances in Biomarkers of Osteoporosis

Micro RNA and long non-coding RNA are novel markers in osteoporosis.^[2]

Treatment

1. Management of osteoporotic fracture
2. Management of underlying disease
3. Pharmacologic therapies
4. Non-pharmacologic approaches

• Management of Osteoporotic Fracture

Depending on the location and severity of the fracture, condition of the neighboring joint and general status of patient procedures include open reduction and internal fixation with pins and plates, hemiarthroplasties and total arthroplasties.

In acute vertebral compression fracture recently developed technique involves percutaneous injection of polymethylmethacrylate into the vertebral body (vertebroplasty/kyphoplasty).

• Management of the Underlying Disease

Risk Factor Reduction

Reduce the impact of modifiable risk factors

Pharmacologic Therapies

Currently no treatment can completely reverse established osteoporosis. Early intervention can prevent osteoporosis in most people. If secondary osteoporosis is present treatment for primary disorder should be provided.

Non-pharmacologic Approaches

Protective pads worn around the outer thigh which cover the trochanteric region of hip can prevent hip fractures in elderly residents in nursing homes. Kyphoplasty and vertebroplasty are also useful non pharmacological approaches for treatment of painful vertebral fractures.

Ayurvedic Understanding of Osteoporosis

Osteoporosis, disease causing increased porosity of bone can directly be considered as *Asthisoushira*, but this is not mentioned as a separate disease entity but only as a symptom of *Majja Kshaya*. So it can well be considered as a disease characterized by localization of vitiated *Vata* in *Asthi dhatu* i.e.; '*Asthigata Vata*' resulting in *Asthi Kshaya*. It is to be remembered that all stages of *Asthigata Vata* need not end in osteoporosis. But a chronic pathology with definite phases of *Asthisaraheenata* can lead to *Asthisushirata*- Osteoporosis. *Asthigata Vata* is one among the *Dhatugata Vata Vyadhis* described in all Ayurvedic classics.^[3] It comes under the category of

Gata Vata explained in *Vatavyadhi*.^[4] *Prakarana* of *Charaka Samhita*.

Nidana of Asthigata Vata

Vatavyadhi Nidana in general can be considered as no specific *Nidana* is mentioned for *Asthigata Vata*. The deranged *Vata* gets lodged in the *Asthi* and cause *Asthikshaya*. As *Asthidhatu* is nourished by the nutrients passing through its own channels of circulation and both *Asthi* and *Asthivaha srotas* are having the same properties, the factors causing vitiation to the *Srotas* also cause vitiation to the *Dhatu*. *Asthi* and *Majja* are closely related to each other. *Charaka* explains that there is a metabolic co-operation between the *Dhatu* "*Paraspara Upasamsthabdha Dhatu Sneha Parampara*". Factors responsible for vitiation of *Asthivaha* and *Majjavaha Srotas* are responsible for *Asthi Kshaya*. The *Nidanas* for *Vatavyadhi* and *Vataprakopa Karanas* can be;

1. Food (*Aharaja*)
2. Regimen (*Viharaja*)
3. Psychological (*Manasika*)
4. Trauma (*Abhighataja*)
5. Other causes (*Anyat Nidana*)

Aharaja

- Intake of less nutritive food
- Lack of adequate quantity of food (*Alpabhojana*)
- Food which aggravate *Vata* (*Vatala Ahara*)

Over indulgence for long periods in foods and drinks which possess predominantly *Tikta*, *Katu* and *Kashaya rasas* and having *Rooksha*, *Laghu* and *Sita Gunas* aggravate *Vata Dosha*, prolonged intake of *Virudha* and *Mamsala Ahara* are vitiating factors of *Majjavahasrotas* and *Medovahasrotas* respectively, which in turn influence *Asthi dhatu*.

Viharaja

- Over exercise (*Vyayama*)
- Over indulgence in sexual intercourse (*Vyavaya*)
- Awakening during night time (*Prajagara*)
- *Apathya* regimen during treatment
- Excessive blood loss from the body
- Suppression of natural urges (*Vegadharana*)
- Constant irritation to the body tissues through repetitive stress and strain by continuous journey, unnatural and uncomfortable postures during journey, walking long distances, wrestling with a person of superior strength, carrying heavy loads etc.
- Lack of exercise, obesity and sleeping during day time are the vitiating factors for *Medovaha Srotas*.

Manasika

- Mental stress due to fear, grief, anger and excessive thinking.

Since *Vata* is the controller of *Manas*, any affliction to *Manas* vitiates *Vata dosha*.

Abhighataja

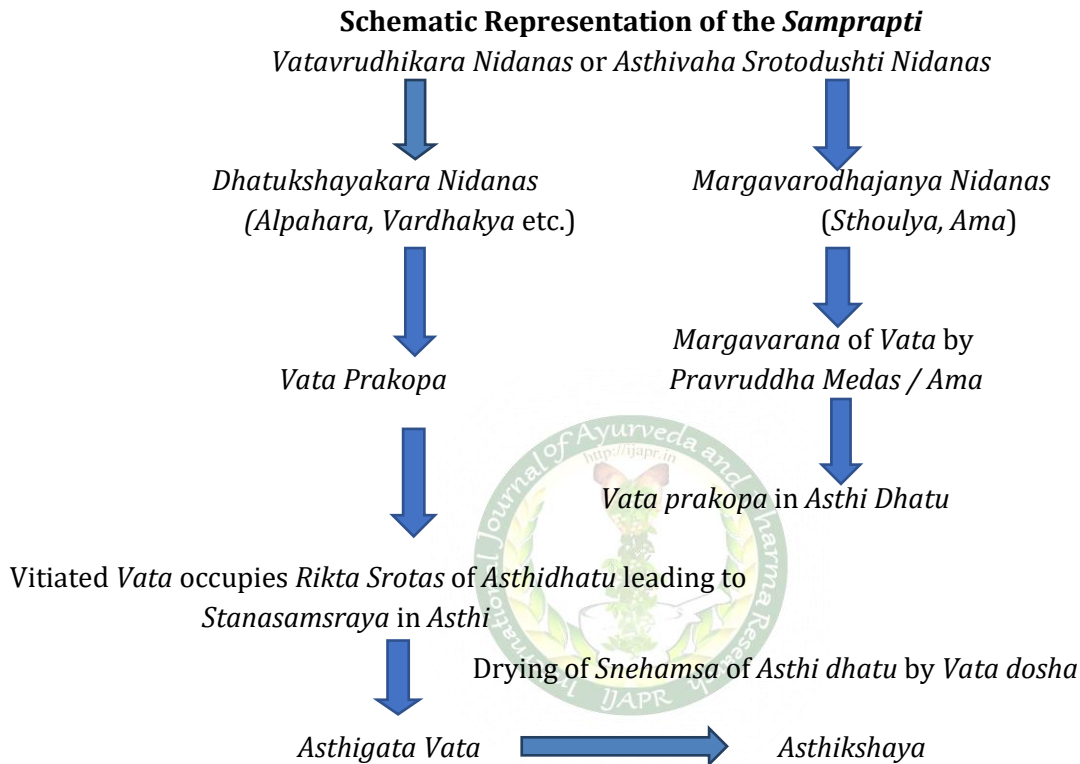
Trauma to *Sareera* vitiates the *Vata Dosha*. Leap from great height, accidental and surgical injuries to bones and tissues are the main causes.

Anyat Nidana

Samprapti

- *Panchakarma Vyapath* like *Atidosha* and *Rakta Sravana* and *Atiyoga* of *Langhana*
- *Dhatukshayakara Bhavas* like *Rogakarshana*
- *Vardhakya*
- Living in *Jangaladesha*
- *Amavastha*
- *Vishamopachara*

All these factors vitiates *Vata dosha* which lead to manifestation of *Asthigata vata*.



Poorvaroopa

Specific *Poorvaroopa* have not been mentioned for *Asthigata vata* in classics. Hence the *Poorvaroopa* of *Vata Vyadhi* can be considered which is told as *Avyakta Lakshana*. Thus the un-manifested symptoms of particular *Vata Vyadhi* should be considered as *Poorvaroopa*. Observations based on present clinical trial reveals that occasional pain in bone and joints, hair fall, *Bala Kshaya* etc which are ignored by the patients can be taken as prodromal symptoms.

Roopa

Asthigatavata manifests in the body with following *Lakshanas*

- *Asthiparvanam bheda*- Breaking pain over bony joints like interphalangeal joints, wrist joints, cervical joints, lumbar and sacral joints.
- *Sandhisoola*- Joint pain
- *Mamsakshaya*- Muscle wasting
- *Balakshaya* - Loss of strength
- *Asthibhaghna* - Fracture of bones

According to *Bhela Samhita*, a wide range of diseases are produced when *Vata* get aggravated in *Asthi* and *Majja*. It causes fractures of bones, shivering and wasting of body, epilepsy, lock jaw, lame by hand, lame by one leg or both legs, dislocation of joints and various other *Vatika* disorders.^[5]

Upadravas

In *Asthigatavata*, *Asthikshaya* is the net result which finally leads to *Asthi Bhagna*. This can be correlated to the fractures, vertebral compression etc seen as consequence of long standing osteoporosis.

Chikitsa

Vatopakrama includes *Snehana*, *Swedana* and *Mridu Shodhana*. The different foods with *Svadu*, *Amla*, *Lavana Rasas*, *Usna Guna*, *Abhyanga*, *Mardana*, *Veshtana*, *Seka Snigdoshna Vasthis*, different *Snehas*, *Mamsa Rasa*, *Taila* and *Anuvasana*.^[6]

Asthimajja Gata Vata Chikitsa

According to Acharyas Vagbhata and Charaka^[7] *Bahya* and *Abhyantara Snehana Prayogas* are mentioned. Dalhana while commentating on *Susrutha chikitsa*, suggests that *Bahya Snehana* includes *Pana*, *Vasthi* etc with *Vatahara* drugs which are specific to *Asthigata Vata Chikitsa*. *Kayaseka*, a type of *Parisheka* will be beneficiary to *Asthigata Vata*, since it adds more strength to bones. *Kayaseka* being a combination of *Snehana* and *Svedana*, increases *Dhatu Sara* and *Dhatu Dridatha* by regulating the *Dhatugata Vata*. *Maha Sneha* is the ideal choice in chronic cases because it is indicated in *Asthi Majja* related *Avarana Vyadhis*. Also *Ketakimooladi Tailam*, *Ksheerabala Tailam*, *Dhanwantharam Tailam*, *Mahamasha Tailam*, *Bala Tailam*, *Lakshadi Tailam*, *Rasa tailam*, *Shashtika tailam* etc can be used. *Abhyanthara Snehana* with *Guggulu tiktaka Ghritam*, *Indukantha Ghritam*, *Tiktaka Ghritam Gandha Tailam*, *Mahatiktaka Ghritam* can also be done. All these have specific action on *Asthi Dhatu*.

Asthivaha Sroto Dushti Chikitsa

Same as *Asthipradoshaja Vikara Chikitsa-Panchakarma*, especially *Vasthis* with *Ksheera* and *Ghritha* processed with *Tikta dravyas*.^[8]

Importance of Tikta rasa in the Treatment of Asthi Kshaya

Since *Akasa* and *Vayu bhutas* are predominant in *Tikta Rasa*,^[9] there is a chance of aggravation of *Vata*. To compensate this, *Ksheera* and *Ghritha* are added in combination. In an experimental study conducted by Renuka et al in Ovariectomized rats, *Panchatiktaka Ghrita* is found to have anti osteoporotic effect.^[10]

Upanaham

Upanaha with *Vatahara* drugs is advised by Acharya Susrutha. It includes *Saagni Upanaha* which is actually *Sankara Sweda* and *Niragni Upanaha* in which *Vatahara* drugs are tied over the affected part of the body for a time period of 12 hours.

Agnikarma

Agnikarma for *Asthigata vata* has been explained by Susrutha. In this method, various heated materials are used to cauterize the affected body part. Susrutha states that in the vitiation of *Vata* in the *Twak*, *Mamsa*, *Sira*, *Snayu*, *Asthi* and *Sandhi*, *Agnikarma* gives good relief.

Bandhana

It is same as *Upanaha* and *Unmardhana* are also advised by Susrutha.

Asthigata Vata can lead to severe *Asthi Kshaya*, since *Asthi* is the abode of *Vata* and both are reciprocally related. According to the principle *Vridhhi Samanair Sarvesham*, *Vipareethair viparyaya*.^[11] An increase results by the intake of substances having similar qualities or vice versa. Thus in *Asthi Kshaya*,

direct supplementation of bone in the form of cartilage is recommended.^[12] If the patient is not ready to consume this due to aversion, therapeutic application of the substances with similar qualities can be advised. The sluggishness of tissue fire of fat or fat tissue (*Medo Dhatwagni Mandya*) leading to an increase of fat and thereby depletion of bone (*Asthi Kshaya*) should be treated with *Medohara* drugs. Certain drugs like *Laksha* etc can directly promote bone formation.

Shodhana Chikitsa

Even though, *Pancha Shodhana Karma* is indicated for *Asthi Asritha Vyadhi*.^[13] Enema made from bitter substances (*Tikta Rasena Siddha Ksheera Ghrita Vasti*) is the treatment of choice especially for *Asthi Kshaya*. *Tikta rasa* aggravates *Vata*, but processing them milk, ghee etc converts their pharmacological action and enables them to produce osteogenesis. When *Snigdha Guna* of milk and ghee is subjected to drying by bitter taste, solidity and hardness are achieved.^[14] So milk enema having ingredients of *Tiktaka Ghrita*, milk boiled with *Panchatiktaka Dravyas*, *Tila Taila* and honey are commonly used in clinical practice. *Anuvasana* with *Tikta Rasa Ghrita* is also a treatment of choice.

Vasthi in Asthi Kshaya

Vasthi is desirable for diseases caused by *Doshas* of *Vata* predominance or *Vata* alone. Considered to be *Ardha Chikitsa* or *Agrya Chikitsa* among *Snehadi Karmas*, *Vasthi* even though staying in *Pakvasaya* draws out impurities from whole body, as the sun takes away sap of the earth even staying in the sky. Properly administered *Vasthi* promotes physical development, complexion, strength, immunity and life span.^[15] In *Asthi Kshaya Tikta Rasa Siddha Ksheera Vasti* is indicated and as per Susrutha, '*Dathasthu Prathamam Vasthi Snehayet Vasthi Vamkshanam. Ashtamo Navamaschapi Majjanamyadakramam*',^[16] by administration of eight *Sneha Vasthi's* it provides *Snehana* to *Asthi Dhatu*.

Rasayana in Asthi Kshaya

Rasayana denotes the process/way/means of attaining *Ahara Rasa* of good quality for the body and which destroys ageing and diseases. Ageing (*Jara*) considered as a '*Swabhava Bala Pravrittha Vyadhi*' i.e., occurs by nature. So Acharya Chakrapani, mentions that in diseases caused by ageing *Rasayana* therapy can play a major role. Ageing can be checked and retracted to some extent by timely and proper administration of *Rasayana* therapy. *Rasayana* corrects the structural deformity of *Dhatu*s thereby normalizing the functions, strengthens the *Dhatu*s and prevents instinct for secondary diseases. *Asthi Kshaya* which occur as a result of *Dhatwagnimandya* can be corrected by proper administration of *Rasayana*. *Rasayanas* like *Krishna Tila Rasayana*.^[17] is specially attributed for *Poshana* of *Asthi Dhatu*. *Guggulu Rasayana* processed

with *Brimhana Dravyas* like *Jeevaneeya Gana*, *Vajigandha* etc *Brahma Rasayana*, *Chyavanaprasha* are also beneficial.

Bhagna Chikitsa

As *Asthikshaya* results in *Asthi Bhagna*, *Bhagna Chikitsa* can also be adopted. *Kalka* of *Rasona*, *Madhu*, *Laksha* along with *Sita*, *Abha Choorna* with *Madhu*, *Abha Guggulu*, *Lakshadi Guggulu* can also be administered.

Use of Single Drugs

Studies of *Aswagandha*, *Vacha*, *Dadima*, *Madhuyashti*, *Vidarikanda*, *Parushak*, *Padmabeeja* shows anti-osteoporotic properties.^[18]

Sadyasadhyata

Vata Vyadhi is considered as one among the *Mahagadas* in Ayurvedic classics like *Charaka Samhita*.^[19] and *Susrutha samhita*. It is difficult to cure because of its deep seated and prolonged action. *Asthigata Vata*, since it affects the deep *Dhatu Asthi*, becomes more *Krichrasadhya*. *Charaka* opines the *Vatavyadhi* is either not curable due to *Sthana Gambheerata* or curable with effort in case they are of recent origin, in strong patients without any complications. *Yogaratanakara* has stated that all *Vatavyadhis* are *Asadhya* by nature and cure is dependent on God's grace. However, some of osteoporosis patients may get better relief depending on their *Prakrithi*, *Vayas*, *Bala* as well as severity of *Nidana*, *Dosha*, *Dooshya* etc of the disease.

Upasaya and Anupasaya

Upasaya and *anupasaya*^[20] are very important during treatment. In *Asthigatavata*, *Vatakopa* is the main *Nidana* and so the drugs which passify *Vata Kopa* will act as *Upasaya*. So drugs with *Ushna*, *Snigdha Guna* and *Brimhana* properties are prescribed. The medicines with opposite *Gunas* proved to be *Anupasaya*.

DISCUSSION

In Osteoporosis vis-a-vis *Asthigata Vata*, etiological factors are very important. In *Aharaja Nidana*, due to the *Rooksha*, *Laghu*, *Alpabhojana*, the *Ahara rasa* is improperly formed, which cannot properly nourish succeeding *Dhatu*s especially deep seated ones like *Asthi dhatu*. *Abhojana*, *Vishama Bhojana* etc may alter the *Agni* which have negative impact on *Rasa Dhatu* formation. *Ati Prajagara* i.e., excessive awakening at night alter the hormonal mechanisms of the body leading to increased resorption catabolism over the osseous tissue. *Diwaswapna* indicates sedentary lifestyle which is a cause of Osteoporosis. *Vegadharana* is a causative factor. Due to repeated suppression of bowel movements, the intestinal floral actions may be hampered leading to deficient calcium absorption. *Manasika Nidanas* like *Chinta*, *Soka*, *Krodha*, *Bhaya* etc

are the aggravating factors of *Vata*, since *Vata* is the controller of *Manas*. In conditions like stress, anger, fear etc hormones like cortisol will be excessively produced which increases calcium drainage from the body and retards calcium absorption from gut. Moreover as the age advances, there will be decreased anabolic and increased catabolic activity due to general increase of *Vata* according to age. In *Asthigata Vata*, *Samprapti* of *Vatavyadhi* is to be considered. Due to *Vatala Nidanas*, there occurs *Kapha Kshaya* and the binding force is lost and bones become brittle leading to *Asthigata Vata* and consequently *Asthikshaya*. In osteoporosis, recurrent fracture of bones is usually the presenting symptom even though other subjective symptoms are seen in early stages. *Bhela* considers *Asthibhagna* as the prime *Roopa* of *Asthigatavata*. *Asthigatavata* is a disorder which occurs due to localization of vitiated *Vata* in *Asthi Dhatu*. In this disease there will be *Asthidhatu Kshaya* which is caused by *Vata*. The treatment modalities mentioned here is *Brimhana* therapy which brings back *Vata Dosha* there by promoting the *Asthi Dhatu*.

CONCLUSION

Thus after analyzing all available literatures, Osteoporosis is understood as *Asthigatavata* in turn resulting in *Asthikshaya*. Various treatment modalities that can be utilized in this condition is also discussed. Since this is a silent disease as it is usually diagnosed when a fracture occurs, it becomes too late to intervene. So it is better if preventive strategies can be adopted from an early age onwards. Adopting Ayurvedic principles which gives equal importance in both preventive and curative aspects can be explored by extensive research in this field. Clinical trials can be conducted formulating a treatment protocol for managing Osteoporosis.

REFERENCES

1. Reginster, J. Yand N. Burlet, Osteoporosis: a still increasing prevalence. *Bone*, 2006. 38 (2 Suppl 1): P.S4-9
2. K0 N-Y, Chen L-R, Chenk-H. The role of micro RNA and long-non-coding RNA in osteoporosis. *Int J Mol Sci* 2020; 21: E 4886
3. R.K Sharma, Bhagavan Dash. *Charaka Samhita Vol V (Chikitsa sthana chp 27-30)*. Varanasi; Chaukhamba Sanskrit series office; Reprint 2007. P.29
4. R.K Sharma, Bhagavan Dash. *Charaka Samhita Vol V (Chikitsa sthana chp 27-30)*. Varanasi; Chaukhamba Sanskrit series office; Reprint 2007. P.29
5. K.H Krishnamurthy, Priya Vrat Sharma. *Bhela Samhita*. Varanasi; Chaukhamba Viswabharati; First Edition: 2000. P.451,452

6. Vagbhata. K.R Srikantha Murthy. Ashtanga Hridayam Volume I (Sutra & Sarira sthana). Varanasi; Krishnadas Academy; Reprint 2004. P.182
7. Agnivesa, Ram Karan Sharma, Bhagavan Dash. Cakrapanidatta. Caraka Samhita Volume V (Chikitsa Sthana chap 27-30). Varanasi; Chowkhamba Sanskrit Series office; Reprint 2009. P 49
8. Agnivesa, Ram Karan Sharma. Bhagavan Dash. Cakrapanidatta. Caraka Samhita Volume I (Sutrasthana). Varanasi; Choukhamba Sanskrit series office; Reprint 2011.P.579
9. Vagbhata. K.R Srikantha Murthy. Ashtanga Samgraha Vol I (Sutrasthana). Varanasi; Chaukhamba Orientalia; Reprint edition: 2015. P.336
10. Renuka Munsli, Samida Joshi, Falguni Panchal, Dipti Kumbhar, Pradip Chaudhari. Does Panchatiktaka ghrita have anti- Osteoporotic effect? Assessment in an experimental model in ovariectomized rats. Journal of Ayurveda and Integrative Medicine. 2021; Volume 12(1): 35-42
11. Vagbhata. K.R. Srikantha Murthy. Ashtanga Hridayam Volume I (Sutra & Sarira sthana). Varanasi; Krishnadas Academy; Reprint 2004.P.9
12. Vagbhata. K.R. Srikantha Murthy. Ashtanga Hridayam Volume I (Sutra & Sarira sthana). Varanasi; Krishnadas Academy; Reprint 2004. P.161
13. Agnivesha. Priyatvrat Vrat Sharma. Caraka Samhita Vol I (Sutrasthana to Indriyasthana). Varanasi; Chaukhamba Orientalia; Seventh 2001. P 230
14. Vagbhata. K.R Srikantha Murthy. Ashtanga Hridayam Volume I (Sutra & Sarira sthana); Varanasi; Krishnadas Academy; Reprint, 203. P.161
15. Susruta. Priya Vrat Sharma.Susruta Samhita Volume II (Nidana, Sarira and Chikitsa sthana). Varanasi; Chaukhamba Visvabharati; Reprint 2005. P.599
16. Susruta. Priya Vrat Sharma. Susruta Samhita Vol II (Nidana, Sarira & Cikitsa sthana). Varanasi; Chaukhamba Visvabharati; Reprint 2005. P.627
17. Vagbhata.Srikantha Murthy. Ashtanga Hridayam Volume II (Nidana, Cikitsa, Kalpa & Sidhi sthana). Varanasi; Chokhamba Krishnadas academy; Ninth 2017.P.408
18. Dipti, Khandelwal R, Aggarwal A, Jaiswal M L. Ayurveda medicinal plants for Asthikshaya (Osteoporosis): A review. J Ayu Herb Med 2016; 2(6): 229-235
19. Agnivesa. Priya Vrat Sharma. Caraka Samhita Volume I (Sutrasthana to Indriyasthana). Varanasi; Chaukhamba Orientalia; Seventh 2001. P.513
20. Vagbhata. Srikantha Murthy. Ashtanga Hridayam Volume II (Nidana, Cikitsa, Kalpa & Sidhi sthana). Varanasi; Krishnadas Academy; Fifth 2003. P.83

Cite this article as:

R Sreelekshmi. Understanding Osteoporosis and its Ayurvedic Management - A Review. International Journal of Ayurveda and Pharma Research. 2022;10(11):88-94.

<https://doi.org/10.47070/ijapr.v10i11.2581>

Source of support: Nil, Conflict of interest: None Declared

***Address for correspondence**

Dr. R Sreelekshmi

Assistant Professor,
Department of Kayachikitsa,
Amrita School of Ayurveda,
Kollam, Kerala.

Email: drslekshmi@gmail.com

Phone: 9142417621

Disclaimer: IJAPR is solely owned by Mahadev Publications - dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJAPR cannot accept any responsibility or liability for the articles content which are published. The views expressed in articles by our contributing authors are not necessarily those of IJAPR editor or editorial board members.