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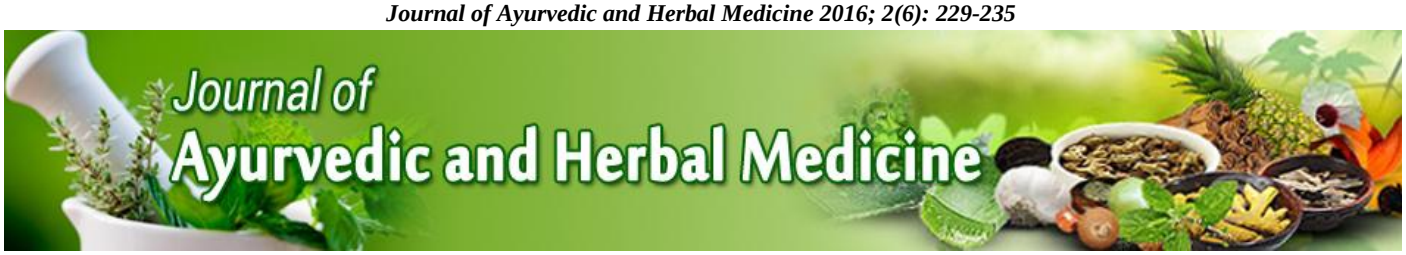

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Ayurveda medicinal plants for *Asthikshaya* (Osteoporosis): A review

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ABSTRACT

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 *doṣa, dhatuand mala*. The function of dhatu is *dharaṇa* (maintain the structure) of the *sharira* (body). Among the *dhatu*, *asthidhatu* is responsible for maintenance of structural frame work of the body. It gives shape to the body and protects the vital organs. Concept of osteoporosis has explained under 18 types of *kṣhaya* by *Acharya Carakain* sutra sthan kiyantahshirasiya adhyaya. *Asthikṣhaya* pathogenesis can be explained in many ways in Ayurveda. According to the principles of *ashrayaashrayibhava, asthidhatu* is the seat of *vata doṣa* and inversely related to each other. Increase of vata is the main factor responsible for *asthikṣhaya*. *Acharya Caraka* has opined increase of vata may follow two patterns; one is from margavaraṇa and another is from *dhatukṣhaya* which can further lead to *asthikṣhaya*. Osteoporosis or porous bone is a global problem characterized by low bone mass and structural deterioration of bone tissue, leading to bone fragility and an increased risk of fractures of the hip, spine and wrist. Men as well as women are affected by osteoporosis but females are at higher risk. This risk even increases at the time of menopause, which is the period of hormonal imbalance. Treatment available in modern science is mainly symptomatic and not devoid of adverse effects. *Ayurveda* treatment visualizes the human body as a single unit and this approach has opened many innovative approaches for treatment. On this background present study was taken to analyze the fundamental concept of *asthikshaya* and to find out single herbs beneficial for it. Drugs from classical texts along with commonly used in practice have been analyzed in context of *asthikshaya*. Study reveals that drugs like *guduchi, ashwagandha, prishnaparni, samanga, vacha* etc. possess *kaphavatashamak* properties which helps in breaking the pathogenesis by clearing and nourishing the *srotas* (channels). Drugs like *madhuyasti, priyangu, vidarikanda, shatavari* etc. have *vatapittashamak*, *balya* (tonic), *brimhan* (nourishing) properties works directly on *dhatukshaya*.

Keywords: *Doṣa, Dhātu, Mala, Asthi kṣaya, Mārgāvaraṇa, Tarpak*.

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INTRODUCTION

A*yurveda* is a "Divine science" due to its origin as well as its incredible strength[1]. It has two aims; one deal with the preventive way that is to safeguard the health of the healthy individual and another is the curative way that is to treat the disease[2]. The three pillars of life are *mana* (mind), *atma* (soul) and *sareera* (body) and their perfect balance considered as complete health in *Ayurveda*[3]. Ayurveda explains this human body as a homeostasis of *dosha*, *dhatu* and *mala*[4]. The function of *dhatu* is *dhāraṇa* (maintain the structure) of the *śarīra* (body). Among the *dhātu*, *asthidhātu* is responsible for maintenance of structural frame work of the body. It gives shape to the body and protects the vital organs. *Asthi dhātu* is the seat of *vāta doṣa*[5]. *Asthi* and *vāta* are reciprocalto each other. *Asthi kshaya* is explained in 18 types of *kshaya* by *acharya charak*[6]. It can be compared to osteoporosis in contemporary era. Osteoporosis is a systemic skeletal disease characterized by the low bone mass and microarchitectural deterioration of bone tissue, with a consequent increase in bone fragility and susceptibility to fracture[7]. It is a growing public health problem worldwide. Worldwide osteoporosis causesmore than 8.9 million fractures annually[8]. It affects both genders; however is more prevalent in women, particularly after the menopause[9]. Osteoporosis affects 200 million women worldwide. Worldwide, 1 in 3 women and 1 in 5 men over age 50 will experience osteoporotic fracture. It is projected that more than about 50% of all the osteoporotic hip fractures will occur in Asia by the year 2050[8]. Osteoporosis is the second most common metabolic bone disease in India[10]. Bone loss is only partly reversible and treatment available in the contemporary science is mainly symptomatic and later surgical interventions were done but these all are not devoid of adverse effects. Prevention and early intervention can prevent osteoporosis in majority. On this background present study was taken to analyze the fundamental concept of *asthikshaya* (osteoporosis) and to find out single herbs which are safe, cost effective from Ayurveda classics for the

betterment of life. Drugs from classical texts along with commonly used in practice have been analyzed in context of *asthikshaya* with special reference to *margavarana* and *dhatukshaya*.

Ayurveda concept of *asthi-kshaya*

Interpretationof word '*Asthikshaya*':

The word *Asthikshaya* is composed of twowords *Asthi* and *Kshaya*. The word *Asthi* is derived fromthe root 'As' + 'Kthin' meaning "To Stay" or in thesense of "Stability"[11]. The definitions of *asthi* are '*asyate kshipyateyat*'; '*asyate iti asthi'; 'mamsabhyantarasthah-sharirastha sapta dhatvantargata dhatuvisheshaha*'[12]. That which is present in its own state fora long time is called *asthi*. Sushruta mentions that *twacha*,*mamsa* etc. tissues gets destroyed soon (after death), but *asthi* persists in its own state for a long time. Hence, it is called as the *sara* of the *Sharira*[13]. Similarly the definitions of *Kshaya* are '*Kshiyate anena iti Kshaya*';'*Kriya kshayakaratwat tu Kshaya ityucyatebudhaihi*'; '*Kshaya vyadhi visheshaha*'[14]. That which decreases is called as *Kshaya* or the *kriya* which causesthe decrease either qualitatively or quantitatively is knownas *Kshaya* and it is a *vyadhi vishesha*. So, the combinedmeaning of a*sthi kshaya* is decrease in bone tissue.

Asthi Dhatu Guna* and *Karma

Asthi is *guru (heavy)*, *khara (rough)*[15], *kathina (hard)*, *sthula (bulkiness)*, *sthira (stable)* and*murtimad*. Its function is *deha dharana (provides structural framework to the body)*, *Majja pushti (nutrition to the bone marrow)* andit is the seat of *vata*[16]. The etiological factors for *asthi kshaya* are notmentioned separately in the texts. However, Charaka has explained the *samanya nidana* (general etiological factors) which lead to the *kshaya*of 18 types[17] which includes mostly the *vataprakopak nidan* like excessive exercise and intake of dry vegetables, irregular dietary habits which includes excessive fasting, dieting and limited foods, excess of food also, excess of worry, grief, fear, hunger, waking at nights, letting out excess of blood, *dosha*, *dhatumala*and time factor (*adana kala* and *vridhavastha*). *Majja dhatu* which is present inside the *asthi dhatu* provides nutrition to *asthi*. The factors responsible for the vitiation of *asthivaha* and *majjavaha srotas* are also responsible for *asthi kshaya*. The dietary factor such as intake of *abhishyandi* and incompetent foods of *majjavaha sroto dushti*[18] provocates v*ata* due to obstruction leads to vitiation of *vata*. Vitiation ofa*sthivaha srotas* directly leads to aggravation of *vata*,resulting in *asthi kshaya*.

Symptoms: *Asthikshaya* symptoms described in different *samhita* are *asthibheda*, *asthishula*, *keshalomanakhasmashrudanta vikara* and *paata* (disorders of hair, nails, teeth), *sandhi shaithilya*, *rukshta* (dryness)[19,20].

Samprapti: Similarly, *samprapti* of *asthikshaya* has not been explained directlyin Ayurvedic classics, keeping in mind all the etiological factors explained under *vatavyadhi*, *asthikshaya* pathogenesis can be explained in several ways. According to the principles of *ashrayaashriyabhavaasthidhatu* is the seat of *vatadoṣa*, while *majjadhatu* which is present inside the *asthi* provides nutrition to *asthi*. Provocation of *vata* is the main factor responsible for *asthi kṣaya*. Itmay follow two patterns one is from *margavaraṇa* and another is from *dhaatukṣaya*[21]. Hence the causes of vitiation of *vata* may be further classified into *sakshatdhatu* and *margavaranakarakanidana*. Chakrapani has explained *dhatu kshaya* as *sarakshaya* and *margavarana* as *vega pratibandha* leading to*vata prakopa*[22]. By the over indulgence in these *nidan,* the*srotas* become *rikta* (devoid of unctuousness) because of decrease of body tissues and obstruction in thechannels. This leads to provocation of *vata* and this vitiated *vata* fills in the channels which are devoid of unctuousness and vitiate them further leading to thestronger provocation of its own. Beside this, proper nourishment of *dhatu* is verymuch essential in maintaining the qualitative and quantitative normalcy of the *dhatu*. Proper functioning of *jatharagni*, *bhutagni* and *dhatwagni* is essential in performing this important function. Due to the improper functioning of *jatharagni*, it can lead to formation of *aam* (indigestion) which can further cause *strotorodh* (obstruction in channels) leads to improper nourishment of *asthi* resulting in *asthikshaya*. As *asthi* is composed of *parthiv*, *tejas* and *vayu mahabhuta*[23]; any functionaldeformity in any of these *bhutagni* leads to improper conversion of *parthiv*, *tejas* and *vayavya ansh* which can further lead to nutritional deficit resulting in *asthikshaya*. *Dhatwagni* leads to the deformity in the transformation of *poshakadhatu* (*Dhatu* specific nutrients) into *poshya/sthayi dhatu*, resulting in *dhatu vikriti*. Mental factors and *kala* (age factor) also play a vital role in the pathogenesis of *asthikshaya*. Thus, there is no single pathogenetic mechanism leading to *asthikshaya*. *Samprapti* of *asthikshaya* is therefore a complex mechanism.

***Asthikshaya* in contemporary era**

In present era, on the basis of above mentioned etiological factors, symptoms and pathogenesis, *asthikshaya* can be correlated to osteoporosis. The word "Osteoporosis" was coined by Pommer in 1885 which means "porous bones". The word osteoporosis is composed of two words i.e. 'Osteo' and 'Porosis'. 'Osteo' is derived from the Greekword 'Osteon' means the 'bone tissue' and 'Porosis' isderived from the Latin word 'Porosus' which means'full of pores'[24]. It may be localized to a certain bone or region, as in disuse osteoporosis of a limb, or may involve the entire skeleton, as a manifestation of a metabolic bone disease. Generalized osteoporosis may be primary or secondary[25]. It may be seen as a consequence from the involutional losses associated with aging and also from the additional losses related to natural menopause in women. This condition is called as the 'Primary Osteoporosis'. Osteoporosis caused or worsened by other disorders or medication exposures is referred as 'Secondary Osteoporosis'[5].

In 1994 World HealthOrganization (WHO) defined osteoporosis operationally to be femoral neck bone mineral density (BMD) value 2.5 standard deviations or more below the mean for normal young white women, or t-score of -2.5[26].

There are many risk factors related to lifestyle for developing bone loss and osteoporosis such as a diet havinglow calcium, magnesium and vitamin-D; smoking or tobacco in any form, lack of exercise (sedentary life style), alcoholism, advanced age, history of fracture as an adult, female gender, caucasian race (White origin), menopause, surgical menopause (radical hysterectomy or oophorectomy in early age)[27,28,29]. Additionally, genetics is a factor. Women after 35 yearswith a family history of osteoporosis have almost twice the risk of developing the disease, compared to women without a family history[30].

Bone metabolism occurs throughout life. It involves repetitive turnover cycles for formation of bone osteoclasts and osteoblast. Osteoclast, breaking downthe bone structure, referred as bone resorption andbone osteoblast building up the bone structure, known as bone remodeling[31]. In both sexes, peak bonemass is reached within three years after linear growth stops[32]. In women estrogen is needed to keep a healthy balancebetween bone resorption and bone remodeling[31]. Perimenopausal women are mainly susceptible to bone lossdue to the fluctuating and declining estrogen levels. Duringthe perimenopausal transition, serum estradiol levels can fall from 10% to 20%, and the level of serum estrone which is a four fold weaker than estrogen falls to about 25% to 35% of the premenopausal level. During this time, bone resorption can increase by 90%, whereas bone formation increases by only 45%. This imbalance in bone resorption and remodeling leads to accelerated bone loss[31]. In the first five to seven years after menopause, a woman can lose up to 20% of herbone density, and this loss can lead to osteoporosis[29]. Most of the patients are asymptomatic until they develop a complicating fracture (most common in hip, humerus, ribs and wrist) which often occurs with minimal trauma.

The most frequent symptoms are pain in the back, tenderness, general debility, muscular weakness, abdominal distension, insomnia, loss of appetite, osteo-arthritis, constipation and ileus and deformity of spine (kyphosis and scoliosis) and loss of height[5,33]. Prevention and treatment is possible if it is diagnosed early and accurately. But, it often remains undiagnosed until a fracture occurs. So, screening of people must be increased for this disease. Bone mineral density (BMD) is the most important criteria for the diagnosis of osteoporosis. The gold standard for measuring BMD is the dual-energy X-ray absorptiometry (DEXA) densitometer, a specialized X-ray device that precisely quantifies BMD at the spine, femur, and other skeletal sites[34].

Management

Modern treatment is mainly intended at preventing further bone loss and fractures. It maintains thebone mass through calcium and vitamin D supplementation, hormone replacement therapy (HRT), and use of certain drugs like bisphosphonates, selective estrogen receptor modulators (SERMs), anabolic steroids but usually produce long term side/adverse effects[35].

Ayurveda treatment visualizes the human body as a single unit and this holistic approach has opened many newer methods for treatment. The treatment of *asthikshaya* includes *nidana parivarjana* (Avoidance of etiological factors), *shodhana* (Biopurification), *shamana* (Palliative treatment), *rasayana* (Rejuvenation), *pathyapathya* (Proper diet).

Nidana parivarjana:Avoid the excessive indulgence in etiological factors responsible for provocation of *vata*, vitiation of *asthi*, *majjavahasrotas* and also the psychic factors.

Shodhana: It is indicated in *bahudoshaavastha*.Vaghbhatta had mentioned the *asthikshayachikitsa*[36] as:

Asthi Sankshayat Jatan Kshira Ghritaihi Tikta Samyutaihi Bastibhistatha ||

Acharya charak has given the similar line of treatment for *asthi pradoshaja vikara w*hich includes *panchakarma*, especially *basti* which contains *kshira*, *ghrita* and *tikta dravya*[37]. Table no. 1 is having drugs which are mostly *tikta* in *rasa*.

Asthyashrayanam vyadhinam pancakarmani bheshajam |

Bastayaha kshira sarpishi tiktakopahitani cha || (C.Su.28/27) ||

Shamana:

The main aim of Ayurvedic therapy in *asthigatvata* includes *vatashamak* (*asthi* is the seat of *vata*), *tarpak* and *brihman*[38] treatment. Sushrut explained the principle of *asthikshaya* as *Tatra Swayoni Vardhana Dravya Prayogaha Pratikaraha* (Su.su.15). Below described herbs in table no. 2 have mainly *Vatahar*, *tarpan*, *brihman*, *balya* and *asthisandhankar* property.

Research studies have also showed that drug like *guduchi, samanga, ashwagandha, vacha, dadima* have antiosteoporotic and phytooestrogenic properties which strengthen the bone. Similarly drugs in table no. 2 were mostly rich in calcium[42,43] as proven by their nutritional values. According to modern science there is calcium deficiency in *asthikshaya* (osteoporosis). So, it can be used in osteoporosis. Few recent experimental studies for supporting the study were given below:

Guduchi[44]

Study was carried out on ethanolic stem extract of *Tinospora cordifolia* (TC) (10, 50, 100mg/kg b.wt.) subcutaneously for 4 weeks on ovariectomized rats. Study reveals that ovariectomized rats treated with TC (10 mg/kg b.wt.) showed estrogen like effects in bone as the bone loss in tibia was slower than ovariectomized control and thus has the potential for being used as antiosteoporotic agent.

Samanga[45] –*In vitro* study was done on four medicinal plants for evaluation of antiresorptive activity in the treatment of bone loss disease. All the four drug decoction inhibited osteoclastogenesis similarly to standard alendronate at the highest doses, but *Hemidesmus indicus* was found effective at lower concentrations also.

Shatavari[46,47]- Study was carried out on aqueous and methanolic extracts of *Asparagus racemosus* root in ovarectomized rats to evaluate the antiosteoporotic activity. Study showed significant effect on mineralization, ossification and osteoclastic activity suppression in histopathological examination. It showed significant results in biochemical parameters, also reduced serum alkaline phosphatase activity, serum calcium significantly and also inhibited the ovariectomized induced excessive loss of calcium in urine.

Studies of ashwagandha[48], *vacha*[49], *dadima*[50], *madhuyashti*[51,52], *vidarikanda*[53], *parushak*[54], *padmabeeja*[55] also shows anti- osteoporotic properties.

DISCUSSION

Samprаptivighatana (breaking of pathogenesis) is the prime line for the treatment of any disease in ayurveda. So, treatment of *asthikshaya* should be done considering both the facts for *vata prakopa* that is *margavaran* and *dhatu kshaya.*

In *margavaran*, *strotoshodhak* treatment should be given which clears the channels and nourishes the next *dhatu*. Drugs or medicinal plants given in table no.1 are mostly having *katu*, *tikta rasa, snigdha guna*. *tikta rasa* is having *strotoshodhak* property which acts on margavaran. But *tikta rasa* is *vata propaka*. So, it shouldnot be used in *asthikshaya* as *vataprakopa* increase the *asthikshaya*. It can be explained like this; as*vaghbhat* have mentioned that *asthikshaya* treatment with *tiktaksheer sadhita basti*. Arundatta commenting on it explains *dravya* which have*snigdha*, *soshana* and *khara property* are used in *asthikshaya*. *khara* is the main property of *asthi*. D*ravya* which have both *snigdha* and *shoshan* properties are not available that's why this principle was explained. Use of *ksheera (snigdha)*, *ghrita* with *tikta rasa (shoshan)* produces *khara* properties which helps in *asthivridhi*. In the same way, drugs given in table no. 1 can be given single or in combination with other drugs (table no. 2) In *dhatu kshaya* (*asthikshaya*) includes *vatashamak* (*asthi* is the seat of *vata*), *tarpak* and *brihman*treatment. *Vata* is having properties *laghu*, *ruksha*, *sheeta*, *khara*, *sukshma, chala*, *vishada*, medicinal plants described in table no. 2 are mostly *vatashamak* due to predominance of *guru, snigdha guna*, *madhura vipaka* and *ushna virya*. Hence, it can be used directly in *dhatukshaya* condition.

Table 1: Drugs which works on margavaran

Sr. No.	Sanskrit name	Family	Botanical name	Effect on Dosha & important Uses	Part used	Reference
1.	*Guduchi*	Menispermaceae	*Tinospora cordifolia* Willd.	*Tridoshahar*	Stem	Bh.p.3/9[39]
2.	*Prishniparni*	Fabaceae	*Uraria picta* Desv.	*Tridoshahar Asthibhagnasandhankar*	Root	Ch.su.25/40[40] Bh.p.3/35
3.	*Ambashthaki*	Menispermaceae	*Cissampelos pareira* Linn.	*Vatashleshmahar*	Root	Bh.p.3/192
4.	*Samanga*	Rubiaceae	*Rubia cordifolia* Linn.	*Kaphapittahar*	Root	Bh.p.1/189-190
5.	*Kataphala*	Myricaceae	*Myrica esculenta* Buch Ham	*Vatakaphahar*	Stembark	Bh.p.1/181
6.	*Ashvagandha*	Solanaceae	*Withania somnifera* linn.	*Vatakaphahar, shothakshayapaha, Balya, Rasayan*	Root	Bh.p.3/189,190
7.	*Sthira* (*Shalaparni*)	Fabaceae	*Desmodium gangeticum* DC.	*Tridoshhar, Shoshahar, brihmana, rasayan*	Wholeplant	Bh.p.3/31-33 Ch.su.25/40
8.	*Vacha*	Araceae	*Acorus calamus* Linn.	*Vatashleshmahara*	Root	Bh.p.1/103 Dh. Ni.
9.	*Dadima*	Puniceae	*Punica granatum*.	*Tridoshhar*	Fruit	Su.su.46/142
10.	*Arjuna*	Combretaceae	*Terminalia arjuna* Roxb.	*Kaphapittahara, Sandhankara*	stembark,Heartwood	Bh.p.5/27
11.	*Asthishrinkhala*	Vitaceae	*Cissus quadrangularis* Linn.	*Vatakaphahar,*	Stem	Bh.p.3/226
12.	*Yavani*	Apiaceae	*Trachyspermum ammi* Sprague Linn.	*Vatakaphahar*	Fruit	Bh.p.1/77
13.	*Guggul*	Burseraceae	*Commiphora mukul* Engl.	*Tridoshhar, Asthibhaghnasandhankar, balya,*	Gum- resin	Bh.p.2/39-41
14.	*Shunthi*	Zingiberaceae	*Zingiber officinale* Roscoe.	*Vatakaphahar*	Stem	Ch.su.27/296 Bh.p.1/45
15.	*Methika*	Fabaceae	*Trigonella foenum-graecum* Linn.	*Vatakaphahar*	Seed	Bh.p.1/95.
16.	*Shimshapa*	Fabaceae	*Dalbergia sissoo* Roxb.	*Vatakaphahar*	Heartwood	Su.su 45/123
17.	*Shirisha*	Fabaceae	*Albizzia lebbeck* Benth.	*Tridoshhar*	Heartwood	Bh.p.5/14
18.	*kushtha*	Compositae	*Saussurea lappa* C.B. Clarke	*Vatakaphahara*	Root	Bh.p.1/173
19.	*Tila*	Pedaliaceae	*Sesamum indicum* Linn.	*Tridoshhara*	*Seed*	Bh.p.8/63-65

Abbreviation: Bh.P.- Bhava prakash, Dh.ni.- Dhanvantari nighantu, Ch.su. – Charak samhita sutra sthan, Su.su. - Sushrut samhita sutra sthan, Kai. n. – kaidev nighantu

Table 2: Drugs which acts on dhatukshaya

Sr. No.	Sanskrit name	Family	Botanical name	Effect on *Dosha* & important Uses	Part used	Reference
1.	*Madhuyashti*	Fabaceae	*Glycyrrhiza glabra* Linn.	*Vatapitakshayahara*	Root	Bh.p. 1/145, 146
2.	*Jivanti*	Ascleipiadaceae	*Laptadenia reticulata* W. & A.	*Tridoshhara, balya, vrishya, rasayan*	Root	Bh.p.2/50-51 Kai. ni.
3.	*Priyangu*	Verbenaceae	*Callicarpa macrophylla* Vahl.	*Vatapittahara*	Seed, flower	Bh.p.2/104
4.	*Vidarikanda*	Fabaceae	*Pueraria tuberosa* DC.	*Vatapitahara, Brihmana,*	Rhizome	Su.su.46/301

				Balya, rasayan		Bh.p.3/180,182
5.	*Shatavari*	Liliaceae	*Asparagus racemosus* Willd.	*Vatapitahara Balya, shothajit, kshayanashak*	Rhizome	Su.su.46/302 Bh.p.3/184-188
6.	*Bala*	Malvaceae	*Sida cordifolia* Linn.	*Vatahara, Balya*	*Root, Seed*	Ch.su.25/40
7.	*Atibala*	Malvaceae	*Abutilon indicum* Linn.	*Vatahara*	*Root, Seed*	Dr.vi.[41]
8.	*Falgu*	Moraceae	*Ficus carica* Linn.	*Tarpan, brihmana Vatajit*	Fruit	Ch.su.27/128
9.	*Parushaka*	Tiliaceae	*Grewia asiatica* Linn.	*Vatapitahara, brihmana, kshaya nashak*	Fruit	Bh.p.6/99 Ch.su.27/128
10.	*Kokilaksha*	Acanthaceae	*Asteracantha longifolia* Nees.	*Vatahar, Amashothahar*	Seed	Bh.p.3/225
11.	*Priyala*	Anacardiaceae	*Buchanania latifolia* Roxb.	*Vatapittahar, Brihmana*	Fruit, Seedkernel	Bh.p.6/84,85
12.	*Padmabeeja*	Nymphaeaceae	*Nelumbo nucifera* Gaertn.	*Vatahara, balya*	Seed	Mp.ni.3/8
13.	*Utpalabeeja*	Nymphaeaceae	*Nymphea stellata* Willd.	*Tridoshhar*	Seed	Bh.p.6/94
14.	*Nikochaka*	Pinaceae	*Pinus gerardiana* Wall.	*Vatahar, balya, brinhana*	*Seed*	Mp.ni. 6/64
15.	*Makhanna*	Nymphaeaceae	*Euryaleferox* Salisb. Nymphaeaceae	*Vatapitahar, balya*	Fruit	Dr.vi.
16.	*Kharjura*	Palmae	*Phoenix sylvestris* Roxb.	*Vatapitahara, Brimhana, kshatkshayanashak*	Fruit	Bh.p6/115-120 Ch.su.27/127
17.	*Vatada*	Rosaceae	*Prunus amygdalus* Batsch.	*Vatapitahara*	Seed kernel	Bh.p. 6/123,124
18.	*Shringataka*	Onagraceae	*Trapa bispinosa* Roxb.	*Pittahar*	Fruitkernel	Bh.p. 6/12,13
19.	*Tavakshir*	Zingiberaceae	*Curcuma angustifolia* Roxb.	*Vatapitahar, kshayahar*	Rhizome	Dr. vi.
20.	*Vanshalochan*	Poaceae	*Bambusa arundinacia* Willd.	*Vatahar, brihman, balya*	Resin	Bh.p.1/*117*-118
21.	*bhallatak*	Anacardiaceae	*Semicarpus anacardium* Linn.	*Vatapittashamak,vrishya, brihman*	Seedkernel	Bh.p.1/231

Abbreviation: Bh.P.- Bhava prakash, Ch. Su.- Charak samhita sutra sthan, Su.su. - Sushrut samhita sutra sthan,Dr.vi.- Dravyaguna vigyan, Mp.ni – Madanpala nighantu

Table 3: *Raspanchaka*[41] of drugs given in table no.1

Sr. No.	Sanskrit name	*Rasa*	*Guna*	*Virya*	Vipaka
1.	*Guduchi*	*Tikta, kashaya*	*Guru, snigdha*	*Ushna*	*Madhura*
2.	*Prishniparni*	*Madhura, tikta*	*Laghu, snighdha*	*Ushna*	*Madhura*
3.	*Ambashthaki*	*Tikta*	*Laghu, tikshna*	*Ushna*	*Katu*
4.	*Samanga (manjishtha)*	*Tikta, kashaya, madhura*	*Guru, ruksha*	*Ushna*	*Katu*
5.	*Kataphala*	*Kashaya, tikta, katu*	*Laghu,tikshna*	*Ushna*	*Katu*
6.	*Ashvagandha*	*Tikta, katu, madhura*	*Laghu, snigdha*	*Ushna*	*Madhura*
7.	*Sthira* (*Shalaparni*)	*Tikta, madhura*	*Guru, snigdha*	*Ushna*	*Madhura*
8.	*Vacha*	*Katu, tikta*	*Laghu, tikshna*	*Ushna*	*Katu*
9.	*Dadima*	*Madhura, kashaya, amla*	*Laghu, snigdha*	*Ushna*	*Madhura*
10.	*Arjuna*	*kashaya*	*Laghu, ruksha*	*sheeta*	*Katu*
11.	*Asthishrinkhala*,	*Madhura*	*Laghu, ruksha*	*Ushna*	*Madhura*
12.	*Yavani*	*Katu, tikta*	*Laghu, ruksha, tikshna*	*Ushna*	*Katu*
13.	*Guggul*	*Tikta, katu*	*Laghu, ruksha, tikshna,*	*Ushna*	*Katu*

			vishada, sukshma, sara		
14.	*Shunthi*	*Katu*	*Laghu, snigdha*	*Ushna*	*Madhura*
15.	*Methika*	*Katu*	*Laghu, snigdha*	*Ushna*	*Katu*
16.	*Shimshapa*	*Kashaya, katu, tikta*	*Laghu,ruksha*	*ushna*	*Katu*
17.	*Shirisha*	*Kashya, tikta, madhura*	*Laghu, rukshna, tikshna*	*Ishad ushna*	*Katu*
18.	*Kushtha*	*Tikta, katu, madhura*	*Laghu, rukhsa, tikshna*	*Ushna*	*Katu*
19.	*Tila*	*Katu, tikta, madhura, kashaya*	*Guru, snigdha*	*Ushna*	*Katu*

Table 4: *Rasapanchakaof* drugs given in table no. 2

Sr. No.	**Sanskrit name**	***Rasa***	***Guna***	***Virya***	***Vipaka***
1.	*Madhuyashti*	*Madhura*	*Guru, snigdha*	*Sheeta*	*Madhura*
2.	*Jivanti*	*Madhura*	*Laghu, snigdha,*	*Sheeta*	*Madhura*
3.	*Priyangu*	*Tikta, kashaya, madhura*	*Guru, ruksha*	*katu*	*Sheeta*
4.	*Vidarikanda*	*Madhura*	*Guru, snigdha*	*Sheeta*	*Madhura*
5.	*Shatavari*	*Madhura, tikta*	*Guru, snigdha*	*Sheeta*	*Madhura*
6.	*Bala*	*Madhura*	*Laghu, snigdha, picchila*	*Sheeta*	*Madhura*
7.	*Atibala*	*Madhura*	*Laghu, snigdha, picchila*	*Sheeta*	*Madhura*
8.	*Falgu*	*Madhura*	*Guru, snigdha*	*Sheeta*	*Madhura*
9.	*Parushaka*	*Madhura*	-	*Sheeta*	-
10.	*Kokilaksha*	*Madhura, amla, tikta*	*Guru, snigdha, pichila*	*Sheeta*	*Madhura*
11.	*Priyala*	*Madhura*	*Snigdha, guru, sara*	*Sheeta*	*Madhura*
12.	*Padmabeeja*	*Madhura, tikta, kashaya*	*Guru, ruksha*	*Sheeta*	*Madhura*
13.	*Utpalabeeja*	*Madhura*	*Laghu, snigdha, picchila*	*sheeta*	*Madhura*
14.	*Nikochaka*	*Madhura*	*Snigdha, guru*	*Ushna*	*Madhura*
15.	*Makhanna*	*Madhura*	*Guru, snigdha*	*Sheeta*	*Madhura*
	Kharjura	*Madhura*	*Snigdha, guru*	*Sheeta*	*Madhura*
16.	*Vatada*	*Madhura*	*Snigdha, guru*	*Ushna*	*Madhura*
17.	*Shringataka*	*Madhura, kashaya*	*Guru, ruksha*	*sheeta*	*Madhura*
18.	*Tavakshir*	*Madhura*	*Laghu, snigdha*	*sheeta*	*Madhura*
19.	*Vanshalochan*	*Kashaya, madhura*	-	*Sheeta*	*Madhura*
20.	*Bhallatakabeejamajja*	*Madhura*	-	-	-

CONCLUSION

Asthikshaya (Osteoporosis) being a multifactorial disorder needs a holistic approach to treat it. Prevention is better than cure. So, early diagnosis, prevention and intervention should be done in order to treat it easily. Ayurveda is a system of medicine which can prevent this by considering all the etiological factors involving in its pathogenesis. Drugs given above can be given either single or in combinations considering all the factors like *dosha, dushya, kala, bala, agni* etc. of the patients. Use of these drugs according to Ayurveda fundamentals can become a boon for the prevention of this disease. However, most of the drugs are not studied yet; further researches should be carried out in order to confirm these effects.

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