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 25 million, the figure can increase to 50 million. According to the classics, Asthi Kshaya is having the Lakshanas like Asthi Shalam, Kesha, Loma, Nakha, Dwija Prapatanam, Sandhi Shaitilya. As some of the Laskshana of Asthi Kshaya resembles with the signs and symptoms of Osteoporosis, to certain extent it can be compared to Osteoporosis. The detail knowledge of Nidana Panchak of Asthikshaya will help in its diagnosis and management.

KEYWORDS: Asthikshaya, Vata Dosha, Osteoporosis, Nidan Panchak.

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 Dosha, Dhatu and Mala. The function of Dhatu is Dharana of the Sharira.[1] Osteoporosis is one of the major signs that has increasingly been perceived as serious disabling disease in old age men and women aged above 40 years reaching Rajonivritti. It is not mentioned as disease in classical texts of Ayurveda. Yet, according to Sushrut it can be considered under Swabhavabala Pravritti Vyadhi.[2] In Praudhawastha and Jarawastha, where Vata starts overpowering Pitta Dosh and leads to Kshaya of all Dhatu.[3] According to the principles of Ashraya-Ashrayi Bhava by Vagbhat[4] Asthi Dhatu is the seat of Vata Dosha[5] and is inversely related to each other i.e., if there is Vata Vruddhi there is Asthikshaya. Asthikshaya 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 Srotoavardodha which obstructs supply of nutrition to the Asthivaha-strotas 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 bone tissue, with a consequent increase in bone fragility and susceptibility to fracture”. [6] Low levels of Estrogen cause imbalance in bone reabsorption and remodelling which leads to accelerated bone loss.[7] Though most of the Samhita explained about Asthi Dhatu, its structure, function and its various diseases, Detail description about Nidana Panchak of Asthikshaya is not available in our classics. Considering the above factors in this present study, an effort is made to understand the Nidana Panchak of Asthikshaya.

AIMS AND OBJECTIVES
To compile, study and evaluate the concept of Nidana Panchak of Asthikshaya from the available classical literature, commentaries, research works, articles on internet and available information in allied basic science.
MATERIAL AND METHODS
This article is based on a review of various Ayurveda classical literatures. Materials related to Asthikshaya, were collected as well as references were compiled, analysed and discussed for a thorough and in-depth understanding of the concept of Nidan Panchak of Asthikshaya.

NIDANA
Samanya Dhatukshaya Nidana[8]
- Ativyayama (excessive exercise)
- Anashana (fasting)
- Ati Chintu (worry)
- Raksha-Ashana (intake of dry food)
- Alpa-Ashana (intake of less food)
- Vata-Atapa Sevana (exposure to dust and sunlight)
- Bhaya, Shoka (excess of worry, grief, fear.)
- Raksha-Pana (intake of dry liquid like Ruksha Madya)
- Prajaqara (waking at nights)
- Ativartana (Atiyadhika Pravrutti) of Kapha, Rakta, Shukra, Mala,
- Kala (time factor (Adana Kala and Vridhavastu)
- Bhutopaghata (invasion of Bhuta, Preta etc.)

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

Majjavahasrotodushhi Nidana[9]
- Utpeshana (being crushed)
- Ati Abhisayandana (being filled with wet components of Kapha)
- Abhipravaha (trauma)
- Prapeedana (compressed)
- Virudha Ahara Sevana (consumption of incompatible and unwholesome food)

Parishhava Srotodushi Nidana[10]
- Sandharana (withholding urge of defecation)
- Ati Ashana (excessive eating)
- Ajernu (indigestion)
- Adhyashana (repeated eating)
- Durbalagni (weak digestion)
- Krusha (in emaciated persons)

Medovaha Srotodushi 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,[11] Beejabhaga, Beejabhagavayava
- Pitrija Bhava[12]
- Kulaja (Caucasians)
- Prakriti (Vata dominant Prakriti)

Jataja Nidana[13]: Vatakara Ahara, Vihara

Swabhava Nidana[14][15]: more in women and old age

Samprapti
Acharayas have mentioned about the Ashraya-Ashrayi Bhava which beautifully explains the relationship of various Doshas with the Dhatus. As per this theory Vata is the Ashraya 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, Stroto Pradusaka Nidanas of Medovaha, Asthivaha, Majjavaha and Parishhava 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 Jataraagni, Bhutagni, Dhatavagni is essential for the “Samyak Dhatu Poshana Prakriya”[16] in order to maintain the qualitative and quantitative normalcy of the Dhatus while explaining concept of Dhatu Utpatti.

Functional deformity in any of these Agnis especially the Dhatavagni leads to the Vikruti in the transformation of Poshaka Dhatu (Dhuta specific nutrients) into Poshya or}= Sthayi Dhatu, resulting in Dhatuwikruti. Hence, adaptation of the principles of Dhatu Poshana 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 Asthikshaya. 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 Asthikshaya effectively. Considering the above said factors it is learnt that the Pathogenic mechanism of Asthikshaya is not single mechanism whereas it is a complex mechanism.

Samprapti Ghataka of Asthikshaya
Dosha: Vata Pradhana (Vyan, 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, Raja, Shrana etc.
Dushya: Asthi is main Dushya in this disease with its Mala, Nakha and Kesha. but Kshaya of all Dhatus also occurs in later stage, hence all Dhatus including their Upadhatus can be under Dushya.

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

Ama: Jatharagni janya Ama and Dhatvagni janya Ama.

Strotas: Medavaha, Asthivaha, Majjavaha, Purishavaha Srotas.

Strotodusha Lakshana: Sanga.

Udbhava Shthana: Ama Pakwashaya.

Sanchara Shthana: Rasayani.

Vyakta Shthana: 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 Asthikshaya. Vatavardhaka Nidana along with the other Nidana itself forms the Nidana for the Asthikshaya due to the Ashraya Ashrayi Bhava of the Vata and Asthi. So Vriddhavata causes the disease Asthi Kshaya. As we all know that the Poorvaroopa in Vatavyadhi is Avyakta. Chakrapani in his commentary has clarified that Avyakta can be taken as Alpavaykata or as Asampoorna Lakshana or as mild Lakshana. So, the Lakshana in their mild form can be taken as the Poorvaroopa of Asthikshaya 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 Asthikshaya.

Rupa
- Asthibheda

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<th>Pathya-Apathya</th>
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<tr>
<td>1.</td>
<td>Rasa</td>
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<td>2.</td>
<td>Shukadhanaya</td>
<td>Nava Godhuma, Nava Shali, Rakta Shali, Shashtika Shali</td>
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<td>3.</td>
<td>Shimbhi Varga</td>
<td>Nava tila, Masha, Kulattha</td>
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<td>4.</td>
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<td>5.</td>
<td>Mamsa Varga</td>
<td>Ushtra, Go, Varaha, Mahisha, Mayura, Bheka, Nakula</td>
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<td>6.</td>
<td>Jala Varga</td>
<td>Ushnavajala, Shirasheetajala</td>
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<td>7.</td>
<td>Dugdha Varga</td>
<td>Go, Aja, Dadhi (Svadu Dadhi and Amla Dadhi, curd prepared from buffalo milk), Ghrita, Kilata</td>
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<td>8.</td>
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DISCUSSION

Nidana

In classics there is no direct mentioning about the Asthikshaya Nidana or the factors that cause Asthi-Kshaya. But the relationship between Asthi Dhatu and Vatadosha is beautifully explained through Ashrayashrauyi 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 Dosha is responsible for the Asthi Kshaya. Akalaja Jara (Rajonvirriti), Raksha Ahara Sevana for lifetime, sedentary life style, and low intake of Asthi Poshaka Amsha in diet serves as Nidana of Asthi Kshaya. Apart from this, factors like Mansaksa Nidana, Stroto Dushthi Nidana of Medovaha, Asthivaha, Majja Vaha and Purisha Vaha Strotas and also the factors that affects Jatharagni, Bhutagnis, especially Parthivagni, Vayavagni and Tejasagni and both Upachayakaraka and Apachayakaraka Asthi Dhatvagnis are also responsible for Asthi Kshaya.

Functional deformity in any of these Agnis especially the Dhatvagni leads to the Vikriti in the transformation of Poshaka Dhatu into Poshya or Sthiyai Dhatu, resulting in Dhatvikriti. Hence adaptation of the principles of Dhatu Poshana 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 Charak, Aurvita Marga of Vata causes it to become Prakupita and causes Rasadi Dhatu Shoshana. Obstruction of normal Gati of Vata (Vyanma) occurs due to the Margavarna. By this the Ahara Rasa Viksepa (Rasa Samvahan), Dhatu Vyuhana and Agni Samirana functions of Vanya Vata are affected. As a result of this, the Ahara Rasa containing the Poshak Amshas to the Dhatus will not be able to reach and nourish the Sthiyai Dhatu, Dhatu Vyuhana i.e., specific arrangement and permeability of the Poshak Amshas inside the Sthiyai Dhatus will not be possible and the functions of the Dhatvagnis 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 Strotas is rightly considered as Meda. Imbalance in Asthi Dhatvagni leads to improper formation of Sthiyai 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 Ashrayashrauyi 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 Vagbhat, Asthi Dhatu among the Sapta Dhatu is most fickle 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 Maragavaran Karaka, Nidana Sevana causing the Prakupita Vata to fill the Riktataata in Astivaha Srotases which are barren of Snehadi Ganas and cause Asthikshaya.

Poorna Roopa

As we all know that the Poorna Roopa in Vata Vyadhi is Aryakta. Chakrapani in his commentary has clarified that Aryakta can be taken as Alpa Vyaktata or as Asampooorna Lakshanas or as mild Lakshanas. Like Asthishula, Todha, Bheda, Shrama, Sandhishatitya, Danta Shadana, Naka Shadana, Danta and Naka Bhanga manifested in mild form.

Rupa

Acharya Charak has mentioned it along with the Lakshanas of Asthadosha (18 types) Kshaya.

In Harita Samhita the Lakshanas of Asthikshaya are described along with the Lakshanas of Kshaya (Rajayaksha). Pravrundha Vata Doshha is the main factor for the cause of Asthi Kshaya owing to the Ashrayaasrayi Bhava. So, the Lakshanas are due to the Vata Vruddhi, hence various types of Vadanam are seen in the Asthis and Sandhis. Since the Dhatu metabolism involves two Pakas viz. Prasada Paka and Kitta Paka, the Dhatus when affected simultaneously affects the Upadhatu 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, Upadhatu and Malas also.

CONCLUSION

Asthikshaya is a disabling disease which renders Human a bedridden life. The prevalence of Asthikshaya in old age males and in postmenopausal female are more. Peak bone mass is attained by the age of 30 years. Asthikshaya is one of the Swabhavabala Pravrutta Vyadhi as in this Vaya (Vriddhavashta) plays major role along with Vata
as Pradhana Dosa and Asthi as Pradhana Dhatu. Analysis of textual references regarding etiology of Asthikshaya discloses fact that Vatakara Nidana plays a significant role in manifestation of Asthikshaya. It is concluded that any abnormalities in Vana Vata, Udana Vata, Samana Vata Pachaka Pitta, Shleshmaka Kaptha, Kledaka Kaptha and Aharaja, Vikaraja Nidana result in Asthikshaya. There is no textual reference regarding the Purvarupa of Asthikshaya, so Lakshanas of Asthikshaya when expressed in mild nature are considered as Purvarupa of Asthikshaya. Lakshanas of Asthikshaya are Asthishthula/Toda/Bhedha, Sandhi Shaititya, Shrana, Danta Kesha Nakha Prapatala, Danta Bhanga, Nakha Bhanga. These Lakshanas have close resemblance with symptoms of Old age 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, Tikra and Ghrita, Mamsa, Mamsa Rasa, Niyantita Vayyama, Abhyanga and Swedana, Vata Nishaka and Vedana Shamaka Aushadhi are said to be the Upashayas of the Asthikshaya. Majja Khaya, Shukra Khaya, Oja Khaya and Fractures - Anga Bhanga should be considered as complication of Asthi Khaya.

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