A Pathophysiological Aspect Of Asthi-Majjakshaya W.S.R To Osteoporosis

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ABSTRACT: Nearly 1 million folks annually report taking time away from work to treat and recover from musculoskeletal pain or loss of function due to overexertion. Osteoporosis is a major and emerging health problem worldwide. It affects an estimated 75 million people in United States, Europe and Japan combined. Osteoporosis is a disease that is characterized by low bone mass, deterioration of bone tissue, and disruption of bone microarchitecture: it can lead to compromised bone strength and an increase in the risk of fractures. There is no actual or relevant clinical entity mentioned in classics which can be correlated with osteoporosis term coined by contemporary science. In Ayurveda, Asthikshaya and Asthisaushirya may be discussed in this regard. The etiological factors for Asthikshaya and Asthisaushirya are assessed on the principles of Ashrayashrayi Bhava and in context of Majjakshaya. According to Ashrayashrayi Bhava, Asthi Dhatu is the seat of Vata Dosha and Asthi & Vata are inversely proportional to each other regarding increase and decrease. Increase of Vata leads to decrease of Asthi, therefore causes Asthikshaya. Asthisaushirya is not mentioned as a separate condition however as a symptom of Majjakshaya. Majjakshaya may take place after Asthikshaya as per the basic principles of Anulomakshaya. Since there is decrease of bone tissue in both the conditions, i.e., osteopenia and osteoporosis, it can be considered as Asthi-Majjakshaya attributable to its core of pathogenesis: 1) degeneration of bone tissue and 2) vitiation of Vata, the classical aspects of Asthi-Majjakshaya can be implemented in the disease osteoporosis.

Keywords: Ayurveda, Osteoporosis, Asthikshaya, Asthisaushirya, Asthi-Majjakshaya
INTRODUCTION

Nearly 1 million people annually report taking break from their work to heal themselves from musculoskeletal pain or loss of function occur as a result of taking too much work from their worn out body. Musculoskeletal disorders (MSDs) are injuries or pain in the human musculoskeletal system, including the joints, ligaments, muscles, nerves, tendons, and structures that support limbs, neck and back.[1] MSDs are the most frequent health complaint by European, United States and Asian Pacific workers and the leading cause of disability.[2] Osteoarthritis, rheumatoid arthritis, gouty arthritis, cervical spondylitis, lumbar spondylosis, osteoporosis are some of common musculoskeletal disorders affecting the large number of population worldwide. Osteoporosis is a major and emerging health problem worldwide. Osteoporosis is a disease that is epitomized by less bone mass and density, disintegration of bone tissue, and disarray of bone microarchitecture. If it is not treated timely, it may lead to compromised bone strength which will ultimately increases the incidence of fractures. It affects an estimated 75 million people in United States, Europe and Japan combined.[3] The number of women with osteoporosis is increasing in India. Statistical data retrieved from a population study that is conducted in small groups spread across the country to observe the prevalence of osteoporosis among women in India reveals that 230 million Indians expected to be over the age of 50 years in 2015, out of which 20%, i.e.,
~46 million are women with osteoporosis.[4] Thus, osteoporosis is a major public health problem in Indian women. There is no actual or relevant clinical entity mentioned in classics which can be correlated with osteoporosis term coined by contemporary science. In Ayurveda, Asthikshaya and Asthisaushirya may be discussed in this regard. The etiological factors for Asthikshaya and Asthisaushirya are assessed on the principles of Ashrayashrayi Bhava and in context of Majjakshaya. Thus, the classical aspects of Asthi-Majjakshaya can be implemented in the disease osteoporosis.

AIMS & OBJECTIVES

1. To review pathophysiological aspect of Asthi-Majjakshaya in context of Ashrayashrayi Bhava and Majjakshaya.

2. To review pathogenesis of osteoporosis according to modern.

MATERIAL & METHODS

The study is based on review of Ayurvedic & Modern text and also with researches related to the subject.

AYURVEDIC REVIEW:

Asthi Dhatu: Asthi Dhatu is fifth Dhatu amongst seven. It gets generated in intra-uterine life. When Medo Dhatu takes its origin in Medovaha Srotas, Medoagni acts on its nutrients coming from Ahara Rasa and from Mamsavaha Srotas. Medo Dhatu is produced in Medovaha Srotas. Part of Medo Dhatu reaches next Srotas that is Asthivaha Srotas; it takes part in production of Asthi Dhatu. Nutrients coming from Ahara Rasa and from Medovaha Srotas are acted upon by Asthyagni. Asthyagni acts on Prithvi, Agni and Vata predominant portions of nutrients and digests this bringing hardness to it and give rise to Asthi Dhatu proper.[5] Deha Dharana is the prime function of Asthi Dhatu. It also nourishes next Dhatu namely Majja Dhatu.[6]

Asthivaha Srotas: Channels of transportation for Asthaayi Asthi Dhatu to their destination are Asthivaha Srotas. Mula Sthana of Asthivaha Srotas are Medas and Jaghana.[7]

Majja Dhatu: Majja Dhatu is sixth Dhatu. The process of Dhatu formation commences in intra-uterine life and just like that Majja Dhatu is also formed during that phase of life. Once Asthi Dhatu is generated in Asthivaha Srotas, its Majja Sadharmi Amsha reaches Majjavaha Srotas. Here, it
actively takes part in the formation of Majja Dhatu. Majjagni acted upon it and transforms it into Majja Dhatu proper. Acharya Charaka gives a different dimension for the formation of Majja Dhatu. He says during formation of Asthi Dhatu, Vata Dosha creates spaces in bones. These spaces are filled with nourishing tissues of Medas which is known as Majja.[8] Majja Dhatu provides Snehana (unctuousness), Bala (strength) and does Shukra Pushti (nourishment of Shukra Dhatu) and Asthi Purana.[9]

Majjavaha Srotas: Majja Dhatu gets circulated throughout the body in Majjavaha Srotas. Asthi and Sandhi are considered as Mula Sthana of Majjavaha Srotas.[10] Majja is basically found in long bones in human body.[11]

Asthi-Majjakshaya:

Asthikshaya: Components of the body cannot undergo any change i.e. Kshaya or Vridhi without any involvement of the Srotas. Srotodushti will takes place when vitiated Dosha get localized in the Srotas. Exercise, involving excessive irritation and rubbing of bones and intake of Vata provoking food will lead to Sanga and Vimarga Gamana types of Srotodushti in Asthivaha Srotas.[12] It will lead to Vriddi or Kshaya of Asthi Dhatu. Diminution of Asthi Dhatu cause falling of hairs, nail, hairs of beard and teeth along with exertion and Sandhi Shaithilya.[13] According to Acharaya Sushruta features of Asthi Dhatu Kshaya are as- severe pain in bones, brittleness of teeth and nails along with dryness.[14] Acharya Dalhana adds that entire body becomes dry along with nails and teeth.[15] This is logical as Vata and Asthi Dhatu bear inter-relationship known as Ashrayashrayi Bhava.

Ashrayashrayi Bhava:[16] Another important point worth mentioning is Ashrayashrayi Bhava. Ashrayashrayi
Bhava is illustrated by Astanga Hridaya to explain the inter-relationship between Dosha and Dushya. It has two-fold meaning. One supplements pathological investigation and other adds to management of disease or Chikitsa. Ashraya is Adhara or support and Ashrayi is Adheya or ground for support. Dosha stays tuned with Dushya. The status of Dosha have high impact on Dushya. The Vriddhi of Dosha can be seen as Vriddhi of Dushya as the latter emulate the aggravated Dosha. This law is applicable to Shleshma and Pitta. This is general phenomenon but still every law has some exceptions. This law has again exception about the relation between Asthi Dhatu and Vayu. It means that Vriddha Vayu has tendency to abide Asthi. But it has no capacity to increase Asthi. On the contrary, Vriddha Vayu decreases and deteriorates the Asthi Dhatu and causes Asthikshaya.

Asthisaushirya: Asthisaushirya is not mentioned as a separate condition but as a symptom of Majjakshaya. Hemadri has commented on the word ‘Saushirya’ as ‘Sarandhratvam’ which means ‘with pores’. This condition is explained in the context of Majjakshaya. Majjakshaya may take place after Asthikshaya as per the basic principles of Anulomakshaya. Asthi and Majja are very closely related to each other, as Majja fills the Asthi. Charaka explains that, there is a metabolic co-operation between the Dhatu. Asthi and Majja also perform this function of mutual nourishment. The factors responsible for the vitiation of Asthivaha and Majjavaha Srotas are also responsible for Asthikshaya and Asthisaushirya. Majjavaha Srotodushti will lead to Majjakshaya. The person who is having Majjakshaya suffers from Vata Roga as its dryness is not appropriately balanced by Majja Dhatu. Due to lack of Asthi Purana function of Majja Dhatu person bears weak and small bones and develops Asthisaushirya.
THE COMMON ETIOLOGICAL FACTORS OF ASTHI-MAJJAKSHAYA:

TABLE NO. 1:

<table>
<thead>
<tr>
<th>Dietary</th>
<th>Lifestyle</th>
<th>Mental</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive intake of;</td>
<td>Excess of;</td>
<td>Excess of;</td>
<td>Trauma</td>
</tr>
<tr>
<td>• Dry, cold, scanty and light food</td>
<td>• Fasting</td>
<td>• Anger</td>
<td>• Injury to vital organs</td>
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<tr>
<td>• Viruddha Ahara</td>
<td>• Fighting with stronger person</td>
<td>• Fear</td>
<td>• Formation of Ama</td>
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<tr>
<td>• Abstain from food</td>
<td>• Exercise, Swimming and other physical</td>
<td></td>
<td>• Inappropriate treatment</td>
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<tr>
<td>• Irregular dietary habits</td>
<td>activities,</td>
<td></td>
<td>• Letting out excess of Rakta, Dosha &amp; Mala</td>
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<td></td>
<td>• Lifting heavy weights</td>
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<td></td>
<td>• Emaciation due to worry, grief and anger</td>
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<td></td>
<td>• Falling from fast moving vehicles,</td>
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<td></td>
<td>• Sexual intercourse</td>
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<tr>
<td></td>
<td>• Remaining awake at nights</td>
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<td></td>
<td>• Suppression of natural urges</td>
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<td>• Using uneven seats &amp; beds</td>
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<td>• Day sleep</td>
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TABLE NO. 2:

<table>
<thead>
<tr>
<th>Dietary</th>
<th>Lifestyle</th>
<th>Mental</th>
<th>Others</th>
</tr>
</thead>
</table>
| • Intake of Abhisyandi Ahara  
• Viruddha Ahara | --- | --- | • Crushing  
• Trauma  
• Compression. |

**Samprapti (Pathogenesis):**

1. Nidana Sevana
   - Vata Prakopa
     - Shhanasamshraya of Vata in Asthi
       - Dosha-Dushya Sammurchhana
       - Asthikshaya
         - Asthikshaya
         - Vata Prakopa
         - Asthikshaya
       - Majavaha Srotodushti Hetu
         - Ashrayashrayi Bhava
1. Astikshaya
   - Majokshaya
   - Asthisaushirya
   - Ashdupakaya
   - Vata Prakopa
   - Asthikshaya
Modern Review: The term “Osteoporosis” was coined by Pommer in 1885 which literally means “porous bones”. Etymologically, the word Osteoporosis is formed by combining two words, i.e., ‘Osteo’ and ‘Porosis’. ‘Osteo’ is originated from the Greek word ‘Osteon’ connotes ‘Bone tissue’ and ‘Porosis’ here represents a Latin word ‘Porosus’ which signifies ‘full of pores.’ Hence, essence of word Osteoporosis is ‘Porous bones.’ According to WHO, “Osteoporosis is a progressive malady of skeletal system. Its symptoms include low bone mass and disintegration of micro architectural network of bone tissue. Persons suffering with Osteoporosis have fragile bones and are more prone to fractures.”[22]

Etiological factors for Osteoporosis: Osteoporosis is one of the metabolic bone disorders, which is caused by many factors. It may be seen as a consequence from the involutional losses associated with aging and, in women, additional losses related to natural menopause. This condition is called as the ‘Primary Osteoporosis’. Osteoporosis that is manifested or worsened as a complication of other disorders or side effect of certain medications is termed as ‘Secondary Osteoporosis’.

The risk factors and etiological factors of Primary Osteoporosis are as follows: [23]
- Advanced age, history of fracture as an adult, history of fracture in an immediate relative, low body mass index (BMI) <19, female gender, Caucasian race (White Americans of Asian origin), menopause, surgical menopause (radical hysterectomy or oophorectomy in early age), low calcium diet, magnesium and vitamin-D deficiency, smoking or tobacco in any form, alcoholism, lack of exercise (Sedentary life style) etc.

Some of the causes of secondary Osteoporosis are: [24]
- Premature menopause, osteogenesis imperfecta, anorexia nervosa/bulimia, androgen insensitivity, Turner’s and Klinefelter’s syndrome, diabetes mellitus, hyperparathyroidism (1° and 2°), Cushing’s syndrome, gastrectomy & celiac disease, malabsorption, rheumatoid arthritis, glucocorticoids etc.

Pathogenesis of Osteoporosis: The specific pathogenetic mechanisms in Osteoporosis are poorly understood. There are multiple pathways that can lead to bone fragility and hence there are likely to be many different ways that Osteoporosis can develop. In essence, Osteoporosis is the failure to maintain the physiological
balance of the skeleton similar to the age-related degeneration processes in other systems (CVS, CNS, Renal etc).[25] Changes in bone mass are brought by an imbalance between bone resorption and bone formation processes that are normally coupled. In children and adolescents, rate of bone resorption is high, but bone formation is even higher, with the net result being skeletal accretion. Once peak bone mass (PBM) has been reached in the third decade of life, bone resorption generally outstrips bone formation and there is loss of skeletal mass. There are three major pathogenetic reasons for low bone mass. Each can have genetic and environmental causes.

1. Failure to achieve optimal peak bone mass. This is largely genetically determined, but can be substantially affected by lifestyle, particularly calcium intake and physical activity during skeletal growth.

2. Increased bone resorption has been reported in most Osteoporotic patients. Oestrogen deficiency is a major factor in women, especially after menopause, and apparently in men as well. Calcium and vitamin-D deficiency and reduced calcium absorption in older individual, leading to parathyroid hormone excess, also contribute. Endocrine abnormalities (e.g. primary hyperparathyroidism or hyperthyroidism etc.), cytokines, and other local factors that are possibly influenced by reduced mechanical function may play a critical role.

3. Inadequate bone formation. This may be due to complete loss of skeletal elements by excessive resorption, so that there is no template on which to form new bone; to age related impairment of osteoblast function, or to changes in local and systemic factors that regulate bone formation.[26]

**DISCUSSION:**

*Vata Dosha* is very much potent for the occurrence of *Asthi* related disorders because of its unique relationship with *Asthi*. Practice of *Vata Prakopaka Ahara* and *Vihara* causes *Vata Prakopa*. *Sthanasamshraya* of that *Prakupita Vata Dosha* occurs in *Asthivaha Srotas* where *Kha-Vaigunya* is already present and *Dosha-Dushya Sammurchhana* takes place resulting in *Vata Vriddhi* that ultimately leads to *Asthikshaya*. *Asthikshaya* causes *Uttrouttra Dhatukshaya*. On the other hand, *Vriddha Vata* also contributes to the occurrence of *Majjakshaya* as there is diminution of *Sneha Ansha* of *Majja Dhatu* due to *Ruksha Guna Vriddhi*. It also affects
the Asthi Purana function as dryness is not appropriately balanced by Majja Dhatu, thus causes Asthisaushirya.

CONCLUSION:

Asthikshaya is a condition in which there is decrease in the Asthi Dhatu leading to many undesirable effects. Asthisaushirya which means ‘porous bones’ occurs as a result of Majjakshaya. Since there is decrease in bone mineral density in osteoporosis it can be considered as Asthi-Majjakshaya. Because of its core of pathogenesis: 1) degeneration of bone tissue and 2) vitiation of Vata, the classical aspects of Asthi-Majjakshaya can be implemented in the disease osteoporosis.

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