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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*, *Asthi-kshaya* and *Asthisaukhya* may be discussed in this regard. The etiological factors for *Asthi-kshaya* and *Asthisaukhya* 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 *Asthi-kshaya*. *Asthisaukhya* is not mentioned as a separate condition however as a symptom of *Majjakshaya*. *Majjakshaya* may take place after *Asthi-kshaya* 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, *Asthi-kshaya*, *Asthisaukhya*, *Asthi-Majjakshaya*

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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 Amsa* 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

Vridhhi without any involvement of the *Srotas*. *Srotodushti* will take 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 *Vridhhi* 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 *Acharya 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 *Vridddhi* of *Dosha* can be seen as *Vridddhi* 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 *Vridddha Vayu* has tendency to abide *Asthi*. But it has no capacity to increase *Asthi*. On the contrary, *Vridddha 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*.^[17] Hemadri has commented on the word 'Saushirya' as 'Sarandhratvam' which means 'with pores'.^[18] 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*.^[19] *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:

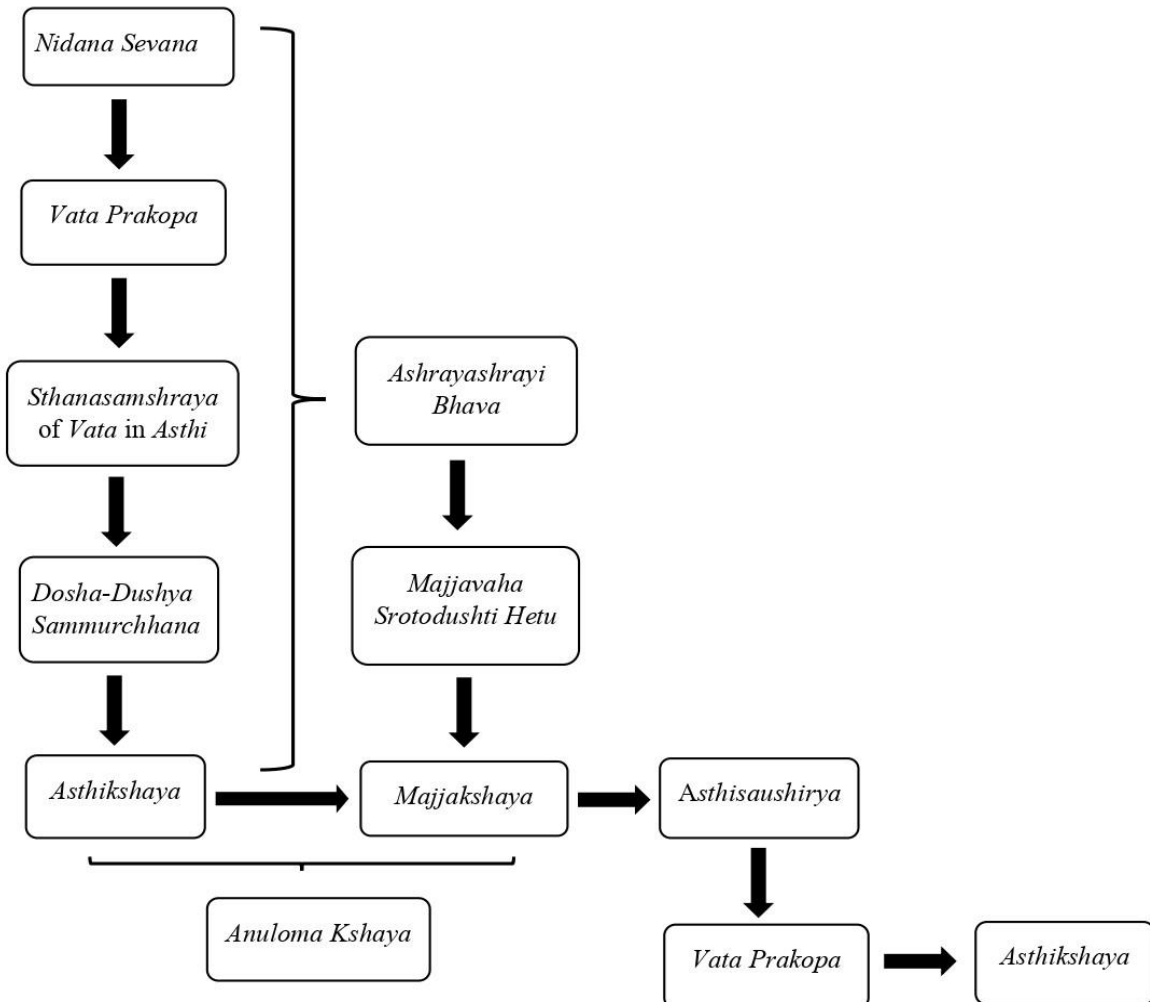
TABLE NO. 1:

Etiological factors that increase Vata^[21]			
Dietary	Lifestyle	Mental	Others
Excessive intake of; <ul style="list-style-type: none"> • Dry, cold, scanty and light food • Viruddha Ahara • Abstain from food • Irregular dietary habits 	Excess of; <ul style="list-style-type: none"> • Fasting • Fighting with stronger person • Exercise, Swimming and other physical activities, • Lifting heavy weights • Emaciation due to worry, grief and anger • Falling from fast moving vehicles, • Sexual intercourse • Remaining awake at nights • Suppression of natural urges • Using uneven seats & beds • Day sleep 	Excess of; <ul style="list-style-type: none"> • Anger • Fear 	<ul style="list-style-type: none"> • Trauma • Injury to vital organs • Formation of Ama • Inappropriate treatment • Letting out excess of Rakta, Dosha & Mala

TABLE NO. 2:

<i>Majjavaha Srotodushti Hetu</i>			
Dietary	Lifestyle	Mental	Others
<ul style="list-style-type: none"> • Intake of <i>Abhishyandi Ahara</i> • <i>Viruddha Ahara</i> 	---	---	<ul style="list-style-type: none"> • Crushing • Trauma • Compression.

Samprapti (Pathogenesis):



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 *Asthi kshaya*. *Asthi kshaya* causes *Uttroutra Dhatukshaya*. On the other hand, *Vridhdha 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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