

STUDY OF BONE DENSITY AND ANALYSIS OF CALCIUM FOR ASSESSING ASTHIKSHAYA IN PEOPLE PERFORMING YOGA AND NON YOGA

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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, dhatu and mala. The function of dhatu is dharaṇa (maintain the structure) of the sharira (body). 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. Ayurveda treatment visualizes the human body as a single unit and this approach has opened many innovative approaches for treatment. In the present experiment we study bone density and analysis of calcium in Yoga and Non Yoga people.

Keyword: Bone density, athikshaya, yoga and non-yoga

INTRODUCTION

Ayurveda is known as the science of life. The main aim of Ayurveda is to maintain health of the healthy person and to cure the illness of diseased person.^[1] In Ayurveda *nidanpanchaka* is described as tool of disease diagnosis.^[2] *Upashaya* in *nidanpanchaka* has described in 18 types. Among that *Hetuviparitarthkari Upashaya* is one type which can be also specified as *Aharatmak*, *Viharatmak* and *Aushadhi upashaya*.^[3] According to Ayurveda; *Vat*, *Pitta* and *Kapha* are the pillars (*tristhuna*) of human body.^[4] *Vat* and *Asthi* has *Ashrayashrayibhav* and inversely proportional to each other so *Asthi* causes *Vatprakopa* according to *samhitas*.^[5] But here we are studying walking as a *Upashayatmak* factor for *Asthi*.

Kshaya means loss, decline, decay, diminution or waning. Dalhan has aptly defined *kshaya* as '*swapramanhaani*'.^[6] So whereas Chakrapanidatta described it as *rahasaha* or *nyuntvam*. These three Sanskrit words together are more than sufficient to explain the present concept of *Asthi*. In Ayurveda under the heading *Asthi* many signs and symptoms are described as *AsthiThoda*, *DanthaBhanga*, *NakhaBhanga*, *Roukshyam*, *Paarushyam*, *Kesha Prapatanam*, *Loma Prapatanam*, *NakhaPrapatanam*, *SmasruPrapatanam*, *Sramah*, *Sandhi Shaithilyam*, *AsthiBadhaMamsabhilaasha*.^[7]

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

.Osteoporosis is the most common bone disease in humans, representing a major

public health problem. It is more common in Caucasians, women, and older people. Osteoporosis is a risk factor for fracture just as hypertension is for stroke. Osteoporosis affects an enormous number of people, of both sexes and all races, and its prevalence will increase as the population ages. Bone tissue is continuously lost by resorption and rebuilt by formation; bone loss occurs if the resorption rate is more than the formation rate. The bone mass is modeled (grows and takes its final shape) from birth to adulthood: bone mass reaches its peak (referred to as peak bone mass (PBM)) at puberty; subsequently, the loss of bone mass starts. PBM is largely determined by genetic factors, health during growth, nutrition, endocrine status, gender, and physical activity. Bone remodeling, which involves the removal of older bone to replace with new bone, is used to repair microfractures and prevent them from becoming macrofractures, thereby assisting in maintaining a healthy skeleton. Menopause and advancing age cause an imbalance between resorption and formation rates (resorption becomes higher than absorption), thereby increasing the risk of fracture. Certain factors that increase resorption more than formation also induce bone loss, revealing the microarchitecture. Individual trabecular plates of bone are lost, leaving an architecturally weakened structure with significantly reduced mass; this leads to an increased risk of fracture that is aggravated by other aging-associated declines in functioning.^[10]

Average age of population is on rise. Average age of Indian population is

62 years at present (47 years in 1947). Decadal growth rate for population above 60 year age is 5-8% higher than that for total population. India is expected to have 11 Crore senior citizens (>60 year age) by year 2015. Aging, too, is an important cause of osteoporosis^[11].

Saushirya is an action of *Vatdosh*.^[12] *Asthishosh* and fractures are a feature of *Asthigatvaat*.^[13] *Medodhatu* provides nutrition to *asthidhatu* (*Asthipushti*) whereas as this *Soushirya* (*dourbalya, laghav*) is a feature of *majjakshaya*. *Shosha* by itself is a *vatprakoplakshan*.^[14]

Asthiakshaya (decrease in bone tissue) is a condition explained in Ayurveda, under the heading of *Ashtadashakshayas*.^[15] In *Asthiakshaya* there is diminution of *Asthidhatu*. Similar to this, there is a condition known as Osteoporosis in western medicine which means 'Porous bones'^[16]. Thus *Asthiakshaya* can be correlated with Osteoporosis.

Walking will prevent further bone thinning; a good program of walking will help to maintain bone density. To keep those T-scores in Bone Mineral Density from dropping, walking is just about the easiest way to exercise. In brisk walking, bones respond to pressure by building more bone; while jumping rope, jogging, and team sports like basketball are ideal bone-builders.^[16]

WHO defines low bone mass on the basis of T score i.e. standard deviation (SD) of bone mineral density (BMD) with reference to mean of young adult population.

T Score: 0.00 to -1.00 Normal ; -1.00 to -2.5 Osteopenia ; < -2.5 Osteoporosis.

T score of less than -2.5 SD and evidence of one or more fragility fractures means established osteoporosis. A fragility

fracture is one which occurs due to fall from no greater than standing height of an individual or with normal use.^[18]

Calcium metabolism refers to the movements and regulation of calcium ions (Ca^{2+}) into and out of various body compartments, such as the gastrointestinal tract, the blood plasma, the extracellular and the intracellular fluid, and bone tissue. An important aspect of calcium metabolism is plasma calcium homeostasis, the regulation of calcium ions in the blood plasma within narrow limits.^[19] In this process, bone tissue acts a calcium storage center for deposits and withdrawals as needed by the blood, via continual bone remodeling.^[20] A low calcium intake may be a risk factor in the development of osteoporosis in later life.

Asthiakshaya is a geriatric physiological phenomenon and in today's world everyone wants to be a happy and healthy adult. For to be a healthier older adult along with medication (if required) exercise is also important. To prevent further hazards of osteoporosis in older adults Bone Mineral Density and serum calcium level will help to evaluate *Asthiakshaya*.

Aim and Objective:-

1. To assess role of yoga in prevention of *Asthiakshaya* with special reference to Osteoporosis by evaluating Bone Mineral Density and Calcium.
2. To study and compile *Asthiakshaya* with special reference to Osteoporosis
3. To study role of Bone Mineral Density (BMD) and calcium levels in *Asthiakshaya*

Materials And Methods:-

Study design : It is observational analytical study.

Study Setting: Survey will be carried in selected community. Investigations will be carried in our Ayurved Hospital, Mumbai , India.

No. Of subjects:- Total no. 200

Subjects are selected in 2 groups.

- GROUP 1- Active Yoga (according to WHO-for 30 minutes a day , 5 days a week,^[23]
- GROUP 2- Non yoga (subjects not fulfilling active yoga norms.)

Inclusion Criteria:-

1. Age group- 40-60 years.
2. Group 1 –yoga -
3. Group 2- non active yoga.
4. Irrespective of sex , religion, socio economic status.

Initial assessment was done by observing Asthikshaya lakshanas in the both groups.

Detailed case history was taken from the selected subjects as per CRF.

Serum calcium and bone mineral density values were investigated of the subjects of both the groups.

Degree of Asthikshaya was evaluated by gradations and correlated with readings of BMD and Sr. Ca levels.

Exclusion Criteria:-

1. Age group < 40 years and > 60 years.
2. Active yoga doing vigorous exercise like gym etc.

3. Known cases of uncontrolled systemic disorders – DM , HTN , Hypothyroidism
4. Known cases of HIV, Tuberculosis, malignancy etc.

A special case record form will be prepared for the records of Asthikshaya, Bone Mineral Density and Calcium tests for age group of 40-60 years will be prepared with consent form having details of subject history , physical signs and symptoms and laboratory investigations as given in subjective and objective criteria and as mentioned in classical and allied sciences and will be analyzed statistically by applying **chi-square** test for subjective criteria.

INSTRUMENTS AND RELATED Analysis:

1 .Bone densitometry: A bone mineral density (BMD) test measures how much calcium and other types of minerals are in an area of bone . There are two types of this test. Here I will use the following type.

Peripheral DEXA (p-DEXA). These smaller machines measure the bone density in your wrist, fingers, leg, or heel.

The most common and accurate way uses a dual-energy x-ray absorptiometry (DEXA) scan. DEXA uses low-dose [x-rays](#).

Measurements: T-score compares your bone density with that of a healthy young women

- a) Normal : A T-score is within the normal range if it is -1.0 or above.
- b) Abnormal : T-score- Between -1 and -2.5, you may have early bone loss (osteopenia).T-score- Below -2.5, you likely have osteoporosis.

2 . Serum Calcium: To measure the levels of calcium in collected serum Erba assay kit will be used.

Instrument : Biochemistry Analyzer (model CHEM7)

Measurements: a) normal range: calcium test in adults is between 8.6 and 10.2 milligrams per deciliter (mg/dl).

b) Calcium level < 8.6 milligrams/deciliter hypocalcaemia.^[25]

CRITERIA OF ASSESSMENT OF SUBJECTS:

Assessment will be done on the basis of subjective parameters.

SUBJECTIVE CRITERIA:

1. Asthitod(Pain)
2. Nakhabhang(Nail deformity)
3. Keshapatan(Hair fall)
4. Daantabhang(Dental loosening)
5. Dourbalya(weakness)

OBJECTIVE CRITERIA:

1. Asthisaushirya-Bone density
2. Calcium level

Observation and Results:

In GROUP 1 pittpradhan vaatanubandhi prakriti and in GROUP 2 kaphapradhan vatanubandhi prakriti found more dominantly. Considering both the groups, the number of participants was found more in age group 40-45. The workers like office workers, and house wives were found more in both the groups. Almost equal level agni distribution were found in both the groups with small variation.

For the association between asthitod, Nakhabhang, keshapatan, dantabhang and dourbalya with BMD and serum calcium level, the chi square test was performed at the degree of freedom level 6 and found the chi square value is more than 16.81 at the degree of freedom 6 that indicates $p > 0.01$. hence we can state that there is a strong and association between Asthitod and BMD with serum Calcium levels. As the BMD and Calcium Value increased Asthitod decreases with severity.

DISCUSSION

According to the textual references asthi and vaatadosh have aashrayashrayi bhava sambandha. Asthi dhatu is the aashraya of vaata and vaata dosh is aashrayi of asthidhatu. Again asthivasrotas can be affected by sevana of vatakar aahar and vihara (Ch soo 28). But the exercise of practising yoga promotes asthivruddhi and asthipushti in this study. Yoga can be beneficial if done consistently and properly. Yoga also improves balance and flexibility, which can prevent falls and therefore prevent fractures. The exercise of practising Yoga promotes asthipushti and increase in BMD and sr Ca levels. It can be said that Yoga practice effects on asthidhatvagni and supports asthidhatvagni. The function is regulated and maintained by continuous and regular doing Yoga. Therefore qualitatively avikrit asthidhatu is formed in the body. Hence we can say that the process of regular Yoga practice acts on asthidhatu positively by vikriti vishama samavay.

Conclusion

1. This study clearly concludes that there is a definite role of practicing yoga to prevent Asthikshaya (Osteoporosis).
2. The experiment clearly concludes that there is a strong association between BMD and calcium levels. calcium levels were also in lower range in the participants who were having low BMD levels.
3. There is a strong association between ($P > 0.01$) Asthitoda, Nakhabhanga, Keshapatana, Dantabhanga, Daurbalya and BMD and Calcium levels.
4. It can be concluded that BMD and calcium levels are directly proportional to Osteoporosis.
5. Clinical study reveals that regular practicing yoga prevents Asthikshaya and strengthens Asthidhatu as it is easy to perform, cost effective and without any side effects.

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