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A CRITICAL REVIEW ON ASTHI DHATU STATUS IN STHOULYA WITH RESPECT TO BONE METABOLISM

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ABSTRACT

In Ayurveda, *dhatus* play an important role in healthy functioning of the body. As per Ayurveda, there is a sequential development of *dhatus* explained by means of *ksheeradadhi dhatuparinama nyaya* (rule of formation of *dhatus*)[1]. Considering the above, healthy formation of each *dhatu* depends on the status of the preceding one. According to this concept, *asthidhatu* forms from *medodhatu*[2]. If there is a *medo dhatu* derangement, proper formation of *asthi dhatu* will not take place. Here in this article, a primary step has been taken to find out whether this concept is working in present situation by considering both modern and Ayurvedic concepts. Recent evidence demonstrating an increased fracture risk among obese individual suggest that increased adipose tissue formation may have a negative impact on bone health. Decreased bone mass with obesity may be due to increasing adipogenesis, increase bone resorption, reduced Ca absorption.[3]

Keywords: *asthi dhatu, medo dhatu, sthoulya*, obesity, *ksheeradadhi nyaya*, bone formation.

INTRODUCTION

Nowadays there are many contemporary approaches for bridging Ayurveda with evidence-based medicine. It is because several concepts in Ayurveda is found to be proven through research. In fundamentals of Ayurveda there is concept of 7 *dhatus*. According to Acharya Susruta, healthy state of all the seven *dhatus* provides the total health of the individual. For the formation and maintenance of *dhatus* certain *dhatuparinamanyayas* are explained. In this *Ksheeradadhinyaya* explains the sequential development of *dhatus*. Considering the above, healthy formation of each *dhatu* depends on the status of preceding one.

Acharya explains *sthoulya* patients are the ones who have *calatva* in *sphik* (gluteal region), *udara* (abdomen) and *stana* (breast)[4] i.e. a person with excessive and abnormal increase of *medodhatu* along with *mamsadhatu* is found, it results in pendulous appearance of buttocks, belly, breasts. But a corresponding increase in energy cannot be seen along with the increased bulk of body. Also, *sthoulya* is the condition which is formed from deranged *medodhatu*[5]. Accord-

ing to *Ksheeradadhi dhatu parinamanyaya* if there is a *medo dhatu* derangement, the next *dhatu* i.e *asthi dhatu* does not undergo proper development, in classics itself, it has been said that in *sthoulya* the other *dhatus* will not be properly formed.[6]*Sthoulya* condition can be correlated with obesity or over weight. Obesity is a condition in which excess body fat accumulates to the extent that it may have a negative effect on health. People are generally considered obese when they have increased body mass index.[7]So obesity is such a condition, which makes the person vulnerable to many hazards like hypertension, infertility, diabetes, osteoporosis.

Obesity and osteoporosis are two of the most important diseases strictly related with an increased prevalence in both mortality and morbidity worldwide. Recent evidence demonstrating an increased fracture risk among obese individuals suggests that adipose tissue may negatively impact bone health, challenging the traditional paradigm of fat mass playing a protective role towards bone health.

Ksheeradadhi dhatu parinamanyaya

According to this theory the *poorva dhatu* is completely converted into *Uttara dhatu* as like the milk is totally converted into curd, the curd into butter and the butter into ghee. In the same way the consecutive steps in the process of the formation of *dhatus*. The entire *Ahara Rasa* is converted into*rasa dhatu*. The entire *rasa dhatu* is converted to *rakta dhatu* & the *rakta dhatu* is converted to *mamsa dhatu*, *mamsa dhatu* converted to *medo dhatu* and so on. This is also known as *krama parinamapaksha*.

If the whole *rasadhatu* is converted into *rakta* and the entire *rakta dhatu* into *mamsa* and so on, without leaving no *rasa* behind, then if a man fasts for 3 to 7 days, then the body should have either become filled with *sukra* only or it may leads to death, which is not practically found in any cases. This rule will not be applied in case of certain *prabhava pradhana dravyas* like Aphrodisiac, Anti toxic, *Rasayana drugs*, because they do not require this subsequent process to act, as they directly act on the part in which they must act.

Regardless of such critics, the commentators have justified this theory by saying that, the *dhatus* after their *Dhatwagnipaka* are divided in to 2parts- *kitta* and *prasada bhaga*[8]. The *prasadabhaga* is again divided in to 2 parts –*sthoolamsa & sookshmamsa*. In *sthoolamsa* part, the said *dhatu* get nourished or formed as in case. The *sookshmamsa*, again divide in to two parts- formation or nutrition of *upadhatu* & other part becomes subsequent *poshakarasa* in which the subsequent *dhatwagni* act to form the next *dhatus*. Thus, there is no question of complete conversion of the *dhatus*. The digested food gets divided in to 2 parts i.e. *kitta & Sara*. The fine liquid portion of waste product of food becomes *mutra* & the solid portion becomes *sakrt*.

Sthoulya and medodhatu vikriti

The word *sthoulya* is derived from the root *sthu* with suffix ac which stands probably for thick or solid or strong or big or bulky. According to *Acharya Charaka sthoulya* are the ones with *chalatva* in *sphik, sthana* and *udara*. Caraka has also described *sthoulya* under eight undesirable constitutions (*astanindita)* based on their ugly/awkward appearance, victims of public abuse, unmanageable health condition. *Sthoulya* is among *kapha* predominant diseases (*sleshmananatmaja*) involving *kapha* and *medas* as main *dosha* and *dushya* in the pathogenesis.[9]*Acharyas* prescribed that *sthoulya* is *bahudosaja* disease which further proves that it is the root cause of many other diseases.

Signs and symptoms of both *sthoulya* and *medovridhi* are almost same. It includes

- *Medomamsativrddhi* – excessive formation of *medas* and *mamsadhatu*
- *Cala sphik* – pendulous movement of buttock
- *Cala udara* – pendulous movement of abdomen
- *Cala stana* – pendulous movement of breast
- *Ayadhopacaya* – improper body structure
- *Anutsaha* – lack of enthusiasm

Not only in signs and symptoms in every aspect of *sthoulya samprati* the involvement of *medo dhatu* and *medovaha sroto dushti* are clearly visualized.

In *Astadosa of sthoulya*

Following are the eight disabilities are found in obese person:

1. *Ayusohrasa* (shortening of the life span) – due to *medodhatvagni mandyata*, decreased formation of *uttaradhatu* leads to *ayusohrasa*.
2. *Javoparodha* (lack of agility) when the *medo-dhatu* is increased in the body the person becomes laxer and more sensitive. He becomes unable to withstand any physical trauma or exertion.
3. *Krcchravyavaya* (difficulty in sexual intercourse) – excessive *medodhatu* causes depletion of all the other *dhatus*. So *sukra* is also depleted.
4. *Dourbalya* (general weakness)- due to imbalance of *saptadhatu* an obese person feels tired.
5. *Svedabadha* (excessive sweating) – due to excessive deposition of *medas/*fat, increase in *sweda* causes inability to bear the strain of any activity.
6. *Dourgandhya* (bad odour of body) –excessive *sweda* results in bad odour from the body.
7. *Ksudatimatra* (excessive hunger) – due to *medavrtavata* and *tiksnagni*, which result in *atik-sudha* and *pipasa*.
8. *Atipipasa* (excessive thirst) – a person feels excessive thirst.

Dusya- Almost all Acharyas have mentioned *sthoulya* under the caption of *medovrddhi*. Acharya Susruta has mentioned *sthoulya* as a *dushya* dominant disease and in this disease the excessive production of abnormal *medo dhatu* is clearly visualized. In disease *sthoulya*, excessive intake of *guru, snigdha* and *madhuradiguna* dominant diet, increase accumulation of *medodhatu*. Hence the involvement of *medodhatu* and *rasadhatu* as *dushya* is clearly visualised and later another *dhatu* gets involved and produces other diseases mentioned as *upadrava* of *sthoulya.*[9]

Srotas- Involvement of *medovahasrotas* is the main vitiating factor along with the involvement of other *srotas* in *sthoulya*.

Asthi dhatu - *Asthi dhatu* is the 5th*dhatu* among *sapta dhatu*. Function of *asthi* is *dharana* (supporting)**.** Bone provide support to the body and nourishment to bone marrow.[10]

Formation of *asthidhatu* – Embryologically *asthi dhatu* is formed from *parthiva bhava*. According to *acharyas*, *asthi* is formed by the action of *ushma* on *medas*. According to *dhatuparinama* concept, the *poshakamsha* of *Asthidhatu* is formed from *medo-dhatu*by the action of *dhatwagni* in *Dhatwagni vyapa-ra*. And it is divided in to 3 parts, viz *sthoola, sukshma & kitta*part.

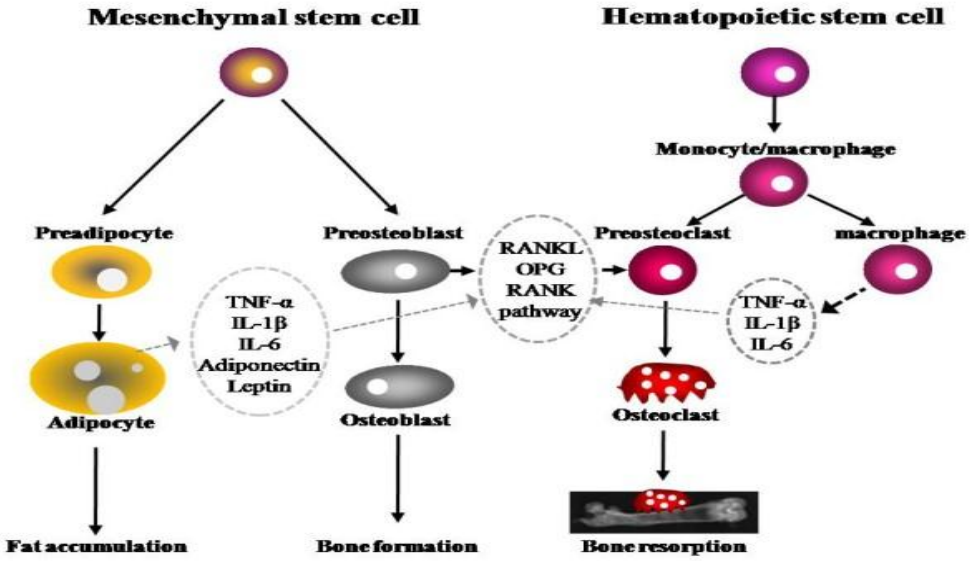
The *sthoola* part nourishes the *asthidhatu* in the body, from *sookshabaga upadhatu* of *asthi* and *sadharmiamsa* of next dhatu formed. *Asthidhatwagni* present in *asthidhatu* digests the essential nutrients of *medas* together with *pritwi, agni & aniladi* and synthesis *asthi* in the body. So, for the proper formation of *asthi dhatu* the essential elements are unvitiated *medo dhatu*, correct *medodhatvagni* and *asthidhatvagni*, proper channels of *medodhatu* (*medovahasrotas*). If there is any derangement in *medo-dhatvagni*, *medo dhatu*, *asthidhatvani* and *medovahasrotas* it can lead to derangement in *asthi dhatu* formation.

Bone is a dynamic organ that continuously undergoes significant turnover by a process called modeling and remodeling, involving bone resorption by osteoclast & bone formation by osteoblast. Bone mass at a time reflects the balance between bone formation & resorption. Osteoblast regulate the recruitment and activity of osteoclasts through the expression of the receptor activator of NF- k ligand (RANKL)[11]. Proinflammatory cytokine are the key mediators in the process of osteoclast differentiation and bone resorption. So up-regulated proinflammatory cytokines are primary mediators of osteopenia & osteoporosis.

Obesity & Bone Metabolism

Recent data from different epidemiological and animal studies strongly support that fat accumulation is detrimental to bone mass. That is obesity possibly affects bone metabolism through several mechanism. Both adipocytes and osteoblasts are derived from a common multipotential mesenchymal stem cell[7]. The pluripotent stromal cell differentiates into mature cell types—adipocytes, osteoblasts, and chondrocytes. Because the stromal cell can differentiate into an osteoblast or adipocyte, this can eventually determine the balance between bone and adipose tissue. This is further evident in multiple clinical conditions that show a relationship between bone marrow fat and Bone Mineral Density. Obesity is associated with chronic inflammation. There is an increased circulating and tis-

sue proinflammatory cytokines, so obesity may promote osteoclast activity and bone resorption through modifying the receptor activator RANKL/OPG pathway. Both osteoporosis and aging-related bone loss are associated with an increase in marrow adipogenesis, which may suggest a conversion of stromal cells to adipocytes rather than osteoblasts. Also increased fat intake may interfere with intestinal ca absorption & therefore decrease Ca availability for bone formation.[12]



DISCUSSION

According to Ayurvedic perspective, formation of *asthi dhatu* is de-arranged in *sthoulya* condition. There may be a *medodhatvagni* and *asthidhatvagni* vitiation occurring at the level of *dhatu parinama*. It leads to production of *ama*, which further leads to *srotorodha* i.e. obstruction of channels. This *srotorodha* condition either causes *mala sanchaya* (accumulation of vitiated elements) or *vata prakopa* (increased condition of *vata*). *Srotorodha* mainly occurs at *medovaha srotas* and *asthivaha srotas* because *dhatvagni* derangement is mainly seen at that level. So, this *mala sanchaya* condition leads to the accumulation of *bahu abadha medas* resulting in the condition *sthoulya*. In bone metabolism Modern research also suggests that decreased bone mass with obesity may be due to increasing adipogenesis because adipocyte and osteoblast cell are formed from a common precursor cell. The *srotorodha* (obstruction of channels) condition leads to reduced Ca absorption, and it in turn affects the bone formation. Also, Acharyas have considered that *medas* is one of the *moolasthana* of *asthivaha srotas*, and so it may be considered that *asthi dhatu* formation depends on *medo dhatu*. In obesity there is a *vata prakopa* condition because of obstruction of channels by *bahu abbadha medas*, it further leads to *asthi dhatu kshaya* which causes osteoporotic condition, the increased condition of *vata* considered as increase bone resorption.

CONCLUSION

In *sthoulya* condition there is a derangement in *medodhatu*. In *sthoulya* the *medovaha srotodushti* can be correlated with abnormal fat metabolism. According the *ksheeradhadinyaya* concept, *asthidhatu* forms from *medodhatu* and the *asthipushti* is one of the important functions of *medodhatu*. The deranged condition of *medhodhatu* will adversely affect proper formation of *asthidhatu* i.e. *asthi dhatu* status depends on the *medodhatu* vitiation. So, in *sthoulya* individual there is a vitiated condition of *asthi dhatu* mainly in form of *asthikshaya*. It further leads to decreased production of *uttaradhatus* and leads to imbalance in *sapta dhatus*. Increasing adipogenesis, increase bone re-

sorption, reduced Ca absorption in obese person resulting in osteoporotic changes in bones. Through this, the sequential development of *dhatu parinama* concept is found to become valid for some extent. Unrevealing the relationship between fat and bone metabolism helps to develop therapeutic agents to prevent or treat both obesity and osteoporosis

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