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Conceptual study of Asthidhatvagni by evaluating association of Vitamin B12 and Vitamin D3

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Abstract
Agni is key factor in transformation of consumed aharadi dravyas (food articles) of vijatiya (Heterogeneous) origin to sajatiya (homogenous) nature. Agni is derivative of Tejas mahabhuta (fire element). It carries metabolic transformations in which the inherent feature is change. Agni is having 13 categories. Jatharagni (1 type) looks after the functions of food digestion and absorption. Bhutagni (5 types) turns all the vijatiya panchabhautika dravyas consumed to Sajatiya Panchabhautika Dravyas, i.e. conversion of heterogonous to homogenous. Dhatvagni (7 types) performs Synthesis and breakdown of tissues. Asthi is one of the dhatu which will be nourished by components similar to its composition the influence of asthidhatvagni. Here we can corelate vit B12 and Vit D3 with asthidhatvagni.

Keywords: Calcium, Vitamin B, Vitamin D, Dhatu, Dhatuagni

1. Introduction
One of the fundamental and most important body structures is asthi. The human body is composed of Dosha, Dhatu, and Mala, according to Ayurveda [1]. Asthi Dhatu, one of the seven Dhatus, is connected to Sharira's Dharana. Due to its difficulty, it aids in the development of a body frame that is appropriate. The words "Asyathe iti asthi" are the source of the word "Asthi." It implies that Asthi is a chemical that does not normally break down as quickly as other bodily tissues like muscles, arteries [2] etc. Even after death, it persists for a very long time. When vitamin B12 deficiency was first identified in 1849, it was thought to be fatal. However, in 1926, liver, which is high in vitamin B12, was shown to slow the progression of the condition. Vitamin B12 deficiency was first described in 1849, and was considered to have a fatal outcome until 1926 when a diet of liver, high in vitamin B12, was shown to slow the disease process. Much is now known about the biochemistry and metabolism of vitamin B12, however, the diagnosis of its deficiency has become more complicated with the classification of a “sub-clinical” deficiency category, characterized by serum vitamin B12 concentrations that were once considered to be adequate.

Before, it was believed that vitamin B12 insufficiency mainly occurred in severe vegetarians or people who had pernicious anaemia over a long period of time. The membrane that contains the Asthi Agni, which leaves the body in Pakvashaya, is known as the Purisha Dhara Kala. Prithvi Mahabhuta is dominant in Asthi Dhatu. Poshaka (unstable) Meda Dhatu creates Asthi Dhatu, which then enters the Purisha Dhara Kala and is consumed by the Asthiagni [3]. Teeth are also generated during this process, making them the Upadhatu (secondary tissue) of Asthi Dhatu in addition to the body's bones. The hair and nails are the malas (waste products) of this metabolic process. According to Ayurveda, Dhatu and Dosha both contain Ashraya Ashrayi Bhava or Dosha is considered to reside there [4]. For example, Rakta and Sweda are the residing sites for Pitta Dosha. Like that Vata Dosha resides mainly in Asthi Dhatu. Considering this, Vata Dosha vitiation plays an important role in the pathogenesis of Asthi Dathu Dushti. Pitta and Kapha Dosha vitiation lead to inflammatory or obstructive pathologies respectively in the bone. Upadhatu and Mala Dushti of Asthi include Kesha, Danta and Nakha Vikruti. So pathology in Asthi Dhatu may also lead to deformities in these body organs.

Cobalamin, generally known as vitamin B12, comes in cyano-, methyl-, deoxyadenosyl-, and hydroxy-cobalamin forms. Food contains traces of the cyano form, which is utilised in supplements [5]. The 5-deoxyadenosyl or methyl forms of cobalamin, which are needed as cofactors for the enzymes methionine synthase and L-methyl-malonyl-CoA mutase, can be created from the other forms of the vitamin. Purine and pyrimidine synthesis depends on methionine synthase.

The reaction, in which the methyl group of methyltetrahydrofolate is transferred to homocysteine to create methionine and tetrahydrofolate, depends on methyl cobalamin as a co-factor and is also dependent on folate. Megaloblastic anaemia is brought on by a vitamin B12 deficiency and the stoppage of this response. Folate deficiency independent of vitamin B12 also causes megaloblastic anaemia [6]. Methylmalonyl CoA mutase converts methylmalonyl CoA to succinyl CoA, with 5-deoxy adenosyl cobalamin required as a cofactor. It is a defect in this reaction, and the subsequent accumulation of methylmalonyl CoA that is thought to be responsible for the neurological effects in vitamin B12 deficiency.

Serum vitamin B12 is bound to proteins known as transcobalamins (TC). The majority of the vitamin, approximately 80%, is transported on the inactive TCI (also called haptocorrin). The active transport protein for vitamin B12 is transcobalamin II (TCII), which caries about 20% of the vitamin in the circulation. Holo-transcobalamin (holo-TC) is TCII with attached cobalamin, which delivers vitamin B12 to cells. A low serum vitamin B12 concentration can be associated with a deficiency of TCI, while TCII levels and so vitamin B12 status remain adequate.

2. Dietary calcium requirements

With crucial roles in the skeletal, cardiovascular, endocrine, and neurological systems, calcium is a necessary mineral. The majority (99%) of the body's calcium is found in the bones, where it serves as calcium storage and gives the skeletal system rigidity and shape. The remaining portion takes part in metabolic activities like enzyme activation, transmembrane transport, nervous system transmission, vascular and muscular contraction, and hormonal activity. Much research on the long-term effects of insufficient calcium intake is focused on bone health, particularly in relation to rickets in young children and fractures, osteopenia, and osteoporosis in older persons. Vitamin D is necessary for intestinal calcium absorption by the active, transcellular pathway and is involved in maintaining normocalcemia, which promotes bone mineralization, so dietary calcium requirements are partially dependent on vitamin D. 1, 2 In most adult populations, vitamin D deficiency is unlikely to be a rate-limiting constraint on calcium absorption, as only very low concentrations of 25-hydroxyvitamin D (25(OH)D) are associated with impaired calcium absorption [7-8]. The effect of vitamin D on calcium absorption in children is not clearly established.

Rasa (Chyle/Plasma/Lymph), Rakta (blood), Maamsa (muscle), Medo (Fat/Adipose tissue). Asthi (bone), Majja (Marrow), Sukra (Reproductive tissue). Sapta dhatus gets Preenanam (nourishment) from Aahararasa (chyle). Aahararasa is the end product of Jatharagni paka (Intestinal digestion). Each dhatu is of two kinds, Asthayi (mobile or non static) is poshaka dhatu (meant to nourish). Sthayi (fixed, static) is Poshya dhatu (already formed and existing). Srotas do not transport Sthayi dhatus. Dhatus that are formed consecutively from the asthayi dhatus one after another. Seven categories of Dhaatwagnis (Rasagni, Raktagni, Mamsagni, Medogni, Asthyagni, Majjagni, Sukragni), & Sapta dhatus (Rasa, Rakta, Mamsa, Medo, Asthi, Majja, S ukra), undergo Paaka (Metabolic transformation) in two different ways for the sustainers of the body. One is Prasaada paaka and other is the Kittapaaka [9]. The prasaada paaka is stated to yield the seven kinds of poshaka or Asthayi dhatus. Kitta paaka is the waste products. In Ayurveda the concept of dhatwagni and dhatwagni paaka (Metabolic transformation) provides an extensive field of research in the present day.

Ashti Dhatu Prayay (Synonyms) 1. Kikasam: Round structures. 2. Kulyam: Tubular or canal like structure. 3. Svadayitam: Animals like dogs like it. 4. Medasteja: Essence of Medadhatu. 5. Sara: Extract of body which remains even after death. 6. Majjakrit: Which produces Majja Dhatu. 7. Dehadharakam: This maintains body skeleton and bears body weight. 8. Karkaram: Rough.

3. Discussions

3.1 Concept of Dhatu

The term Dhatu is derived from Sanskrit root "Du dhatru" which means Dharana (to support) & Poshana (to nourish), Which promotes the growth of shareera (body) is dhatu. Dhatus are seven in number, Rasa, Rakta, Maamsa, Medo, Asthi, Majja, sukra. Sapta dhatus get Preenanam (nourishment) from Aahararasa (chyle). Aahararasa is the end product of Jatharagni paka (Intestinal digestion).

3.2 Dhatwagni

Dhatwagnis are seven Rasagni, Raktaagni, Maamsagni, Medogni, Asthyaagni, Majjaagni, Sukraagni. Dhatwagnis are located in its own dhatus (tissues). After Jatharaagni paaka & Bhootagni paaka aadya aahaara rasa (chyle) circulates in the body to reach all tissues. Seven categories of Dhaatwagnis (Rasaagni, Raktaagni, Mamsaagni, Medogni, Asthyagni Majjagni, Sukragni), & Sapta dhatus (Rasa, Rakta, Mamsa, Medo, Asthi, Majja, Sukra), undergo Paaka (Metabolic transformation) in two different ways for the sustainers of the body. One is Prasaada paaka and other is the Kittapaaka.All the seven Dhatus (seven element tissues of the body) contain their own Agni to metabolize the nutrient materials supplied to them through their own Srotas.

(i) Rasagni present in the Rasa Dhatu.
(ii) Raktagni present in the Rakta Dhatu.
(iii) Mamsagni present in the Mamsa Dhatu.
(iv) Medagni present in the Meda Dhatu.
(v) Asthyagni present in the Asthi Dhatu.
(vi) Majjagni present in the Majja Dhatu.
(vii) Shukragni present in the Shukra Dhatu.Each Dhatvagni or the bioenergy present in each Dhatu synthesizes and transforms the essential Rasa Dhatu required for that particular Dhatu or cell from the basic nutrients present in the Anna Rasa or essence of the diet that we consume. Each Dhatvagni has got a speciality to synthesize and transform the constituents suitable to its particular Dhatu. This action is a sort of selective action. Acharya Charaka has mentioned the fact that that the seven dhatus that are a support of the body contain their own Agni, and by their own Agni they digest and transform the materials supplied to them to make the substances alike to them for assimilation and nourishment [10].

The main cause of Asthivikruti is Vata Prakopa. According to the concept of Ashraya Ashrayi Bhava, Asthi is the seat of Vata dosha. There is an inversely proportional relationship between Asthi and Vata. If there is an increase in Vata, there is decrease of Asthi. In Asthi kshaya, there is decrease in Asthi dhatu content. Similar to Asthi kshaya, a disease condition called Osteoporosis, has been described in contemporary system of medicine. Decrease in the bone tissues causes brittle bones and increases the risk of fractures. Upadhatu of Asthi i.e. Nakha, Danta and Mala Kasha and Loma also become brittle in Asthi Kshaya. Rickets and osteomalacia can also be taken in relation to Asthikshaya. In our classical text, Asthi-kshaya is not mentioned as a separate

disease but is mentioned under Dhatu Kshaya. Nutritional deficiencies (Vitamin D, C, and Phosphorus) can result in the formation of weak, poorly mineralized bone. Tooth, nails, skin and bone have genetic connectivity they have paternal lineage. i.e. they come from the genes of the father. (Pitruja Bhavas) Thus bones are connected to the hard tissues like hairs, body hairs, nails and tooth genetically. Therefore pathology in one element will lead to the deformity and pathology in the other. Vivarnata and Sadana of Kesha, Loama, Nakha, Smashru is observed due to vitiation of Pitta and Vata Dosha. It is mostly due to local infection. Many things interfere with the development of a strong and healthy skeleton. Genetic abnormalities can produce weak, thin bones, or bones that are too dense. Many hormonal disorders can also affect the skeleton. Lack of exercise, immobilization, and smoking can also have negative effects on bone mass and strength. Inflammation can lead to bone loss, probably through the production of local resorbing factors by the inflammatory white cells. This process can occur around the affected joints in patients with arthritis. Bone tumor can be produced due to abnormal growth of tissue in bone. Asthi Vriddhi can be observed in various hormonal, genetic and tumorous pathologies. Bone pathologies can be simple or complex. Vata vitiation leads to weak or fragile bones that become osteoporotic and fracture easily. Pitta vitiation leads to bone infections (osteomyelitis) and inflammation. Kapha vitiation leads to excessively thick, dense bones. Other diseases of the bones are more complicated. Fractures can be considered as Agantuja pathology. Tumorous growth of bone can be considered under Sannipatik Dosha Prakopa.

4. Conclusion

In this article after a brief discussion of Asthi dhatu, Vit B12, Vit D3 and calcium with its correlation with Agni shows that Vit B12 and Vit D3 as energy convergent in the form of asthi dhatu, can be considered as Asthidhatvagni. Derangement in Vit B12 and Vit D3 level proved to be responsible for osteoporosis. Hence correcting these levels considering as Asthidhatvagni by Ayurvedic parameters, corrects the Asthi dhatu.

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