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Physiological correlation of the function of thyroid hormones as an entity of Agni

Review Article

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Abstract

Agni is an important concept explained in ayurvedic classics and which is considered as main causes for the manifestation of disease in the body. It controls the wide range of the biochemical reaction in the body from digestion to production of new cells. It has different forms like enzymes, hormones and secretions through which in controls the activities of body like production, maintenance and destruction of cells and tissues. Considered the role of thyroid hormones and its functions in the production maintenance of haemostasis od the body it can be considered as an entity of *Agni* (not whole Agni). Thyroid hormones play role in the digestion of food at GI level, it helps in biochemical reaction at tissue level and it also plays role in the conversion of the heterogenous substances to homogenous substances for the maintenance of haemostasis of body. So, here an attempt is made to corelate the functions of thyroid hormones as a part of *Agni.*

Key Words: *Agni, Homoeostasis, Enzymes, Metabolism.*

Introduction

Agni is the unique concept of Ayurveda related to *Pachana* i.e., digestion and metabolism. Agni is an entity that brings about all kind of transformations in the body(1). It grasps different components which take an interest and control the course of assimilation and digestion or any change within the tissue of a body and a sort of vitality which is delivered by different organelle under impacts of various exogenous and endogenous elements to yield vitality either to store (development/anabolism) or extend (work/catabolism) with the top goal of endurance of person (2). The thirteen types of Agni bring about all the chemical reactions and conversions in the body. Agni has been portrayed as an entity which can transform substances, which can acquire change substances, absorbs, which has the ability to go into minute channels, which copies, which sparkles and so on. As per Charak, the body parts are made up with cells which are incalculable and various in that capacity atoms which are exceedingly various, ultra-tactile and exact moment. As per modern science, the structural and functional unit of body is considered as cell. The cell with vitality is only active, without vitality cell will be considered as dead. So, the vitality of the cell depends on the energy liberated during biochemical reaction i.e., Krebs cycle. So, the cell can be considered as *jivaparamanu*. *Vata* and *agni*(3) are initiating factors in the body for the conjugation and deconjugation of the cells. In works of art, creation of body parts for example *avayavas* are shaped from the different *dhatus*. Along these lines, we can consider cells as the *dhatu paramanu*(4) or particles which are incalculable and utilitarian units of the body which have the vitality in it.

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Aims and Objectives

The present study aims to study functional relationship of thyroid hormones as an entity of *Agni* not as whole *Agni*.

Materials and Methods

For the understanding of functions of thyroid hormones and *Agni* in the human body, ayurvedic classical literature like *Carak Samhita, Sushruta Samhita Ashtanga Hridaya*, other ayurvedic text books etc were reviewed and also screened 90 articles published in PubMed, web of science indexed journals. After proper reviewing and collecting the information from classics, articles and books, it has been presented systematically for better understanding of functional correlation of thyroid hormones as an entity of *Agni*.

Literature Review and Discussion

Agni is an entity which helps in the normal development of the body from birth till death. The development of the body tissue depends on the metabolism and it is continuing process which takes place in the body. As *Agni* is responsible for the *Dhatu* production. In similar view, the thyroid hormones are also play an important role in the tissue metabolism at different level of life from foetus to an old age. Thyroid

hormones are two significant hormones which influence each cell in the human body and at all phases of the development. These hormones show it impact structure arrangement of the hatchling to till the passing in person. Thyroid hormones physiologically influence each organ framework in the body.

There are two significant metabolic thyroid hormones T3 and T4 which influence for all intents and purposes of each cell in the body and at all phases of life. The physiological activities of THs influence pretty much every organ framework. The natural vitality which is fundamental for the steady procedure in all the cells without which endurance of the body will be inconceivable. Such a basic organic vitality is given in the body by *Agni*.

Agni is innumerable because of its presence in each and every *dhatu paramanu* (cell) of the body. But, enumeration of the number of *Agnis* varies in various classical Ayurvedic texts *Agni* has been divided into 13 types according to the function and site of action. These are:

1. *Jatharagni* – one *Agni* present in the stomach and duodenum. – Role of thyroid hormones in the digestion, assimilation and absorption at GI level.
2. *Bhutagni* – five *Agni* from five basic elements. - Role of thyroid hormones in the conversion of heterogeneous substances to homogenous substances in the body.
3. *Dhatwagni* – seven *Agni* presents, one in each of the seven *Dhatus- role of thyroid hormones in the formation of body tissue i.e., metabolism*

Optimal functioning of these *agni* in the body is very important for normal functioning of the body. It assumes a significant job in the body for keeping up the homeostasis of the body as the thyroid hormones are powerful controllers of different physiological exercises like cell digestion, metabolic rate, muscle development and improvement, heart and stomach related capacities, mental health and support of bone by which we can anticipate the typical wellbeing of the individual. As clarified in the *Ayurvedic* classics vitiation of *Agni* in the body will create numerous neurotic conditions similarly unsettling influence in the ordinary physiological elements of hormones additionally produce the different issue

For these consistent procedures in all cells, a natural vitality is continually fundamental, without which the endurance of our body will be very inconceivable. The equivalent natural vitality is given by *Agni*. Thus, thyroid hormone acts similarly as that of *agni*. Typical working of agni in the body keeps up the individual healthy status as Thyroid hormones (THs), especially triiodothyronine(T3), are powerful controllers of different physiological exercises, including cell metabolic rate, heart and stomach related capacities, muscle work, mental health, and bone maintenance (5). Notwithstanding their urgent jobs in keeping up cell homeostasis, vitiation of *agni* in body will deliver numerous sicknesses as THs can cause different scatters, including cardiovascular ailment (6), diabetes mellitus (7), and ceaseless liver disease (8), when their levels in the body are out of equalization.

Ordinary body digestion is kept up by the *agni*. In light of the various capacities and site of activities, *agni* is of three kinds. Jatharagni which is situated in the *jathar* is answerable for the processing and ingestion of nourishment. The *agni* which changes over or does the changes of *vijatiya* substance (heterogeneous) in to the *sajatiaya* substance (homogenous) is referenced as *bhutagni*. The *agni* which is situated in the body tissues which acknowledges the homogenous substance components and aides in the arrangement of *dhatu* or tissue is called as *dhatwagni* which keeps up the phone digestion. The typical and legitimate measure of *Agni* is capable in keeping up the homeostasis of body.

Functional correlation of *jataragni* and thyroid hormones

Jatharagni is considered to be the *pradhyantam* (principal fire) of all the *Agni*. This Agni is situated in *Amashaya*, which contains food in it which stimulates the functions of digestion. *Pittadhara* kala situated between *amshaya* and *pakvashaya* (area between pylorus and ileocecal region(9) which is also considered as the stana of *agni* and *pitta*. There are five types of *Pitta* that also are considered in *Agni* as *Raag (ranjak pitta)* that has *rasa ranjan karma*, *Pakti (pachak pitta*) that has *ahaar paachan karma*, *Tejo (Alochak Pitta*) that has *darshan karma*, *Medho (Sadhak pitta*) that has properties to maintain as *Budhi, Medha*. *Ushma (Bhrajak pitta)* has properties to maintain skin complexion (10).

Pitta is originated by two words in Ayurveda which is indicative of metabolism and maintains the haemostasis (maintained heat in the body). *Jatharangni* is the energy which maintains the process of *dhatu* production, which is basically present in the gastrointestinal tract. It controls all the functions and balance of the other twelve *Agni* in the body which are equally important for the body. Its main function is digestion of food and it converts *ahara* into *ahara rasa* (11). Functions of *pitta* and *jatharagni* in body are same i.e., digestion and metabolism. By metabolism, it will provide energy to the body by metabolizing the food and by maintain the heat of the body and will provide luster and enthusiasm to the body (12).

Agni is one of the *panch mahabhuta* which is present in the human body as *pitta dosha*. According to *Sushruta*, there is no existence of any other *Agni* in the body without *pitta* because when the qualities/ properties of fire are diminished, the use of substances of similar qualities/properties have been prescribed and when the properties are greatly increased, resorting to cold treatments have been advocated. Functions of *pitta* and *agni* in human body are same. The element which is present in the physical and materialistic form and which is responsible for digestion, metabolism in human body is called as *pitta* in the Ayurveda. 'There is no *agni* apart from *pitta* and *pitta* itself is *agni'* asserts Charaka. The term *Agni* represents its function and the term *pitta* is used to designate its physical and material form. *Marichi* has also emphasized that the *Agni* present

in the *pitta* gives good or bad results when it is normal or vitiated (13).

Agni is located in gastrointestinal tract and is the main principal entity responsible for health and disease which is also called as *Jatharagni, Kayagni*, *Kosthagni*, or *Pachakagni*. During its normalcy it is responsible for longevity, complexion, strength, health, enthusiasm, well built, luster, immunity (*ojas*), temperature, other *Agni's* (*bhutagni* and *dhatvagni*) and other vital functions are dependent on *jathargni*. Therefore, healthy state of body and diseased condition is entirely dependent on status of *Agni*. *Jatharagni* is important for better functioning of other *Agni* in the body. In modern *Jatharagni* is related with the digestion of food which is done in stomach and intestines by the chemicals, hormones or enzymes secreted in the stomach and peristaltic movements in the intestine which helps for the digestion. A movement of the intestine is function of *saman vata* which is type of *vata dosha* and situated near the site of *agni*.

Digestion of the food substance starts from the mouth where mainly conversion of physical form of food occurs and main digestion of these substances i.e., carbohydrate, proteins, and lipid start in the guts with the help of the *pitta* and *saman vata*. As discussed previously *pitta* is present in the body in the liquid form which can be correlated with the digestive enzymes which are responsible for the metabolism at gut level and *saman vata* is an entity responsible for the normal movements of the gut. Normalcy of *Agni* and *saman vata* is very important to maintain the normal digestion, secretion of enzymes at gut which are required for the proper metabolism and motility of the gastrointestinal tract respectively. Disturbance in secretion of digestive enzymes and normal motility of the gut will interfere in these functions. Various digestive chemical and enzymes produced and secreted in the gastrointestinal tract will participate in the process of digestion. Thyroid hormones don't have any direct role as digestive enzyme in the gut but it plays role as controller for secretion of digestive enzymes and motility of the gut. For the proper functioning of the gut, structural integrity of intestine and normal development is also very important. Thyroid hormones are important for normal maturation of intestinal mucosal cells (14) and these hormones also necessary for stimulating the cell mitosis and growth in the crypt zones of the intestinal mucosa(15). Recent studies suggest that the gut plays a major role as a reservoir for the thyroid hormones, especially for T3, and it may also play a role in the regulation of hormone activity. Thyroid hormones increase the rate of secretion of digestive juices and motility of the gastrointestinal tract. Lack of thyroid hormone can cause constipation and increased thyroid hormone increases the rates of secretion of most other endocrine glands. Rate of stomach emptying in the duodenum depends on the level of circulating hormones and it is important factor for assessing the intestinal absorption during glucose tolerance test. The stomach emptying is prolonged in the hypothyroidism and rapidly emptying of stomach is observed in hyperthyroidism (16.17.18.19).

In gut many endocrine digestive enzymes and bile salts are secreted and which helps in the proper metabolism. Thyroid hormone increases the rates of secretion of most other endocrine glands i.e., pancreatic amylase. Thyroxin secretion increases the rate of glucose metabolism everywhere in the body and therefore causes a corresponding need for increased insulin secretion by the pancreas. In vitro study, suggesting an increase in mucosal glucose transfer per unit weigh of intestine (20, 21). It shows that excess or deficiency of thyroid hormones interfere with glucose absorption from the small intestine. Thyroid hormones increase d- glucose absorption and deficiency of thyroid hormones decreases (20, 22).

Bile salts (BS) are bio-surfactants present in the gastrointestinal tract (GIT) that play a crucial role in the digestion and absorption of nutrients. Bile salts are so-called facial amphiphiles. The importance of BS for controlled release and transport of lipid soluble nutrients and drugs has recently stimulated scientific interest in these physiological compounds.[23] The synthesis of bile salts is also affected by the thyroid hormones, a change in thyroid status profoundly alters normal bile salt pattern (24,25,26 27). It is clear that excess or deficiency of thyroid hormone may affect all levels of the gastrointestinal tract and that the resultant changes may have clinical as well as biochemical relevance. By understanding the functions and importance of thyroid hormones in the gut we can say these hormones act as *agni* at gut and helps in the digestion of food. So, these hormones can be considered as one of the entities of *agni* not as whole agni.

Functional correlation of *bhutagni* and thyroid hormones

Charak has mentioned that the five *bhutagni* digest their own part of the element present in the food materials. After the digestion of food by the *bhutagni*, digested materials containing the elements and qualities similar to each *bhutas* nourish their own specific *bhautika* elements of the body. These *bhutagnis* act after the Jatharagni present in the stomach and duodenum, acting on the food and causing their disintegration. In the modern physiological perspective, the action of Jatharagni can be equated with the digestion in the stomach and duodenum, and the action of the *bhutagni* can be equated with the conversion of digested materials in the liver and conversion of micro molecules at particular tissue level.

bhutagni converts these heterogeneous substances into homogeneous substances so that it can be utilized at the cellular level and helps in the formation of particular *pancha mahabhuta* Pradhan dhatu in the body. So we can consider the actions of *bhutagni* at two different level that one is immediately after the action of *jatharagni* (functioning thyroid and liver axis) and another one at *dhatu* level during the formation of dhatu with particular *dhatwagni*(cellular metabolism).

Normal thyroid function, which is essential for normal growth, development and the regulation of energy metabolism within cells, is dependent on a

normally functioning thyroid and liver axis. Liver is one of the most important target organs whereby THs regulate components involved in cellular metabolism. Liver involved in thyroid hormone excretion, conjugation and the synthesis of thyroid hormone binding globulin. TH is a key regulator of BMR (28) and the basal metabolic rate of all the cells such as hepatocytes cells of livers is regulated by the thyroid hormones (29) and these hormones regulates thermogenesis (30). Increased food intake, weight loss and elevated level of energy expenditure increases with increase in level of thyroid hormones (31). Resting energy expenditure (REE) is remarkably sensitive to TH, especially in athyreotic individuals (32). Functions of liver may disturb the functions of thyroid hormones and vies versa. Abnormalities may arise from thyroid gland dysfunction or as a consequence of the liver disease. There is also evidence that thyroid hormones affect the liver structure and function. Decreased thyroid hormones are also associated with reduced bilirubin and bile excretion. The activity of bilirubin UDP-glucuronyl transferase is decreased and there will be reduction of bilirubin excretion in hypothyroidism (33).

Cholesterol, phospholipids, and triglycerides concentration in blood plasma depends on thyroid hormones and there will be deposition of excessive cholesterol in the liver is observed in hypothyroidism, and increased thyroid hormones, decreases the concentration cholesterol, phospholipids and triglycerides and increases the free fatty acids. Liver involved in thyroid hormone excretion, conjugation and the synthesis of thyroid hormone binding globulin (34).

Functional correlation of *dhatwagni* and thyroid hormones

Dhatwagni is utilized for the arrangement of *dhatu utpati karma* (development of the dhatus). It is subdivided into seven sorts *Rasagni, Raktagni, Mamsagni, Medoagni, Ashthyagni, Majjagni and Sukragni* which at last structure the insusceptibility of the body. These *Agni* keeps up the elements of the organs of the body (35). *Dhatvagni* are the concoction or humoral basic variables which are answerable for the combination of tissue and elements of tissues. It additionally basic for changes from DNA to arrangement of proteins which required for the tissue combination. The seven *dhatu* which are created in the body with the helps separate *dhatvagni* bolsters the body which have its own useful element as hormonal or enzymatic element and with the assistance of those components it will process the materials and changes to reasonable structure to comparable substance and helps appropriate sustenance of the specific *dhatu*. *Dhatvagni* helps in the digestion of these substances at the cell level. The typical degree of thyroid hormone helps in the body for the arrangement of the seven *dhatus* in the body separately as it manages the digestion fundamental for ordinary improvement and development in the grown-up (36, 37, 38).

As we probably aware that *rasa* and *rakta* dhatu lies in the body with one another so it is exceptionally hard to separate from one another genuinely yet dependent on the capacity of these *dhatu* we can separate what dhatu prevail and which one is under dynamic. Along these lines, we study here impact of thyroid hormone on the *rasa* and *rakta dhatu* all in all. *Rasa dhatu mulastana* is *hridaya* and *rasavahini dhamanis* which are connected with the heart and veins (cardiovascular framework). Ordinary thyroid hormone level is significant for the typical capacity of the cardiovascular framework. Cardiovascular yield and blood stream increment with increment in the degree of thyroid hormones and diminishes with the diminished degree of these hormones. At times heart yield and blood stream increments up to 60 % or more when there are extreme thyroid hormones and tumbles to half of ordinary as there is decline in these hormones. *Hrid-spandana* for example palpitation is one of the side effects of *rasa dhatu kshsya*, thyroid hormone impacts the pulse and that would anticipate from increment in the cardiovascular yield. It implies these hormones have direct impact on the sensitivity of heart muscle which thusly expands pulse. It is significant on the grounds that *hrid-spandan* or palpitation is one of the significant physical signs in clinical utilizations for understanding the *rasa dhatu kshaya* or imbalance in the thyroid hormones.

Rakta dhatu is one of the dhatu in the body and its primary capacity in the body is *Jeevan* i.e., life of a person. *Rakta dhatu* is typically contrasted and platelets for example RBS, WBC, platelet check etc. Erythropoiesis is the component through which platelets generation takes in the human body. For ordinary erythropoiesis typical plasma level of thyroid hormones are required in the body and which assumes a significant job in the erythropoiesis. It is upgraded by thyroid hormones through hyper expansion of erythroid begetters and expands erythropoietin by quality articulation. Expanded thyroid hormones emission causes decline in the white platelets, thrombocytopenia, and neutropenia (39,40,41,42). Diminished emission of thyroid hormone causes different types of sickliness through lessening the oxygen digestion like normochromic-normocytic, hypochromic-microcytic or macrocytic (42). Alteration in other haematological parameters, for example, haemoglobin (Hb), haematocrit (HCT), mean corpuscular volume (MCV) ,mean corpuscular haemoglobin (MCH), white platelet (WBC) tally and platelet check is related with thyroid brokenness is seen as well (41) however all progressions come back to ordinary if an euthyroid (typical) state is gotten(43).Thyroid organ likewise crucially affects erythropoiesis by enlistment of erythropoietin discharge and furthermore expansion of erythroid progenitors (44,45,46). Typical muscle advancement, homeostasis and recovery require the official of T3 to the thyroid hormone atomic receptors (43, 47).

Skeletal muscle for example *mamsa dhatu* is a chief objective of thyroid hormone flagging, and impact of thyroid hormones on muscle contractility and metabolism (48) is likewise settled. Skeletal muscle is a tissue which gives the soundness to the body and is a

steady tissue which has terminally postmitotic myonuclei, helps in the recovery of the muscle (49). Satellite cells of muscle which helps in the fix of muscle fix, when these cells initiated, they can multiply and supply new myofibers and reconstitute these for later adjusts of regeneration (50, 51). Recovery of muscle takes puts in the four stage; first stage described by fiery reaction for example degenerative stage second, enactment and multiplication of satellite cells; third, separation and combination of myoblasts and forward stage is development and development of recently shaped myofibers (49) these occasions managed by the cross talk among myofibers and paracrine and autocrine administrative factors (52). Myogenesis is controlled by the ace transcriptional controller for example (myoblast assurance protein MYOD1 and which is straight forwardly constrained by T3 (53,54). Skeletal muscle has been perceived as a key TH focus for contractile capacity, recovery, and transport just as for digestion and glucose disposal (55, 56). TH incitement favours progress to quick jerk fibres and change to a quicker myosin overwhelming chain (MHC) structure. Skeletal muscle damage is related with a two-overlay increment in nearby T3 levels (57). Increment in the thyroid hormones causes muscle to respond with energy and expanded in these muscle causes the shortcoming as a result of protein catabolism and lack of hormones produces languid muscles and moderate unwinding after compression.

Meda dhatu is fourth among seven *dhatus*. *Dhatus* are body tissues as clarified in *Ayurveda*. It is corelated with the muscle to fat ratio. It is considered as *sneha* predominant *drava dhatu* which is having *guru* (heavy), *snigdha* (sleekness) properties and strength of *prithvi, apa* and *teja mahabhoota (*58). The elements of *medha dhatu* agreeing diverse acharya are *snehana* (lubrication), *sweda* (sweat), *dridhatva* (strength) and *asthipurana* (fortifying of bones) (59). The elements of the all the dhatus will be separated into two sections. one as *poshaka* and another is *poshya* according to acharya chakrapani (60). *poshaka* is the one which course in the body with blood and feed the tissues. Cholesterol and lipids flow in the body alongside the blood and support the fat tissue. Here *poshaka* is the fat tissue and it is stable in nature and put away in body. So here we can consider *poshya* as cholesterol, lipids and free unsaturated fats and *poshaka* as fat tissue and put away fat. Thyroid hormones are fundamental for the digestion of fat and fat digestion will be upgraded under thyroid hormones. Activation of lipids happens quickly from fat tissues and diminishes the fat stores. It builds the free unsaturated fat fixation in the plasma and within the sight of thyroid hormones; oxidation of unsaturated fats by the cells is quickened. The metabolic action of fat is fundamentally reliant on liver explicit activity of T3 and fat digestion is likewise a critical site of thyroid hormones actions (61). Cholesterol combination of lipids is managed by the thyroid hormone through various instruments. A significant pathway of cholesterol take-up and cholesterol combination is intervened through translation of the LDL-R quality and this significant pathway is T4 mediated (62). During grown-up life thyroid hormones manage the capacity of fat tissue by controlling the digestion of lipids (Mullur et al., 2014). Well evolved creatures have two sorts of fat tissue: white and darker fat tissue (WAT and BAT), with various phenotype, capacity and guideline. Creature models' investigations shows that the instrument of TH for actuating dark coloured fat tissue (63). The fat tissue is the fundamental spot for lipid stockpiling, other than its capacity in lipid transport, blend and preparation. The fat tissue stores vitality as fat, with the goal that this metabolic vitality can be utilized in the midst of craving or sickness. T3 manages expansion and separation of adipocytes, quality articulation, multiplication of preadipocytes and thermogenesis (64).

Thyroid hormones assume critical job in direct advancement of skeleton for example *asthi dhatu*. They are important to accomplish top bone mass (65). Expanded degree of thyroid hormones quickens bone turnover and loss of mineral thickness in 10-20%, chiefly in cortical bone (65,66,67). Thyroid hormone increments numerous metabolic exercises identified with bone arrangement. The assimilation of calcium from the small digestive system changes enormously in thyroid diseases (68). Be that as it may, Cook and his associates (23) had the option to show expanded faecal calcium discharge and negative calcium offset in nine patients with thyrotoxicosis and metabolic bone malady.

Sukra is the substance which is liable for all foundational body exercises including metabolic capacities and part of which leaves the body at the hour of sexual act and performs explicit elements of proliferation. Fundamental capacity of *sukra* is described to spermatozoa. *Sukra* is delivered as aftereffect of progressive evaluative transformation of *ahara rasa*. Rule capacity of *sukra dhatu* is to multiplication with sustenance and sustenance of the body (69). Proliferation isn't nearby capacity of testicles to create the sperm and penis to get raised at sexual act and discharge. Emission of thyroid hormones should be typical for ordinary sexual capacity. As *sukra kshaya* is answerable for loss of libido in the male comparably absence of THs prone to reason for drive. Thyroid hormones fundamentally manage semen quality by modifying serum testosterone level (70). Capacity of testis is controlled by 3,5,3′-triiodothyronine (T3) and thyroxin (T4) through genomic and nongenomic effect (71). Testis has germinal cells, Sertoli cells and Leydig cells. Genomic impacts result from the authoritative of T3 to its related receptor (TH receptor) in the core of Sertoli and Leydig cells. Hormone – receptor complex actuates quality translation and protein blend (72, 73). T3 follows up on non-germ cells by directing their expansion and differentiation (72, 71). Especially, TRα1 is the prevalent isoform in germ cells (from middle of the road spermatogonia to pachytene spermatocyte) and in Sertoli cells, whose improvement is managed likewise by TRβ1 and TRβ2 (72).

Nature of sperm and its creation relies upon the thyroid hormones. The overabundance of coursing thyroid hormones results in the oligozoospermia, teratozoospermia and asthenozoospermia. Variations

from the norm of these hormones are oftentimes partner with a decreased semen volume (hypoposia) (74). Diminished thyroid hormones in human are related with teratozoospermia. The quantity of morphology adjustments per spermatozoon, corresponds contrarily with serum T4 levels. Changed sperm motility, adjusted secretory action of the extra organs, and low discharge volume has been additionally revealed in diminished TH (70). Semen changes during hypothyroidism are reversible and for the most part vanish after accomplishing adjusting in the THs. Thyroid awkwardness prompts various modifications of semen quality that incorporate diminished volume, sperm thickness, sperm motility, and sperm morphology. Especially, concerning traditional parameters of the original liquid, hyperthyroidism causes hypospermia, oligozoospermia, asthenozoospermia, and teratozoospermia, though hypothyroidism is related all the more as often as possible with teratozoospermia(71).

Functions of *Agni* and thyroid hormones relation

In Ayurvedic works of art it has been clarified that numerous physiological capacities like absorption as kept up in the body by the Agni in an individual. it is also called as *dehagni, kayagni and jataragni*. *Dehagni* is the principle factor which is liable for *Aayu, Bala, Varna, Svasthya, Utsaha, Pusthi, Prabha* and the working of another Agni's too. At the point, when *agni* is working appropriately, all different exercises of the body occur regularly. As there is need of *agni* for physiological capacities comparably typical thyroid hormones are additionally significant for maintaining the wellbeing of solid people.

Singular shading appearance of the individual relies upon the *agni* status of the person. It is additionally affected by the ordinary degree of thyroid hormones in a person. Direct thyroid hormone activity on skin is interceded through the thyroid hormone receptor (TR). Thyroid hormone is a significant controller of epidermal homeostasis (75). Thyroid hormone receptors (TRs) have been distinguished in the layers of skin which are perceived as thyroid hormone restricting isoforms (76,77,78,79). Epidermal keratinocytes, skin fibroblasts, sebaceous organ cells contain TRs. These hormones are answerable for support of homeostasis of skin which at last influences the shading, appearance and surface of the skin. Unsettling influence of the thyroid hormones in the body influences the epidermal of the skin. Examiners have recognized components of the hypothalamic-pituitary-thyroid hormone pivot in human skin (80,81,82).

Bala of the individual is relies upon *agni* of the individual and which has been clarified as a one of the elements of the *dehaagni(Ca.chi 15/3)*. It is partitioned as *mansika bala* and *sharirika bala. Sharirika bala* is evaluated by the intensity of the muscle face to face which can be considered as quality of person. For the typical development and advancement of the muscle in the human body thyroid hormone plays a significant. Studies demonstrate that the immediate and roundabout complex transaction instruments impact the thyroid hormone motioning in muscle advancement and capacity. Authoritative of T3 to the thyroid hormone is required for typical muscle improvement, homeostasis and recovery (83,84,85). In human 30-40% of weight is contained by skeletal muscles which fundamentally represent the metabolic pace of the living being. What's more, it additionally impacts glucose take-up by skeletal muscle and aides in the glucose homeostasis. All considering every one of these likenesses in the elements of the *Agni* and thyroid hormone we can say that thyroid hormone is the one substance of the *Agni* which mysteries through the thyroid organ and aides in the keeping up numerous ordinary elements of the body.

Swastha is healthy status of an individual person. Strength of an individual relies upon the resistance of the individual. Solid safe individual won't experience the ill effects of incessant sickness and the individual who is having low invulnerability will experience the ill effects of regular irresistible infection and which may influence the general condition and development of individual. The framework which shields the creature from outside antigens, for example, microorganisms, malignant growth cells, poisons and harm signals is called as resistant framework and which is alluded as inborn and versatile immunity (84). The primary intrinsic cells are Neutrophils, NK cells, Macrophages and DCs. 1, 2 and 3 iodothyronine deiodinases (d1, d2 and d3) are the chemicals which directs the grouping of THs at cell level. D2 is an actuating protein, which is liable for generation of 50-80% of T3 at fringe district from T4 (86,87). TH digestion assumes a significant job in neutrophil work during disease. It has been shown that D3 is firmly communicated in murine neutrophils during incessant concoction inflammation and in intense bacterial contamination. proof has upheld the idea that D3 assumes a job in the bacterial slaughtering limit of neutrophils, either through age of iodide for the MPO framework or through adjustment of intracellular TH bioavailability (88). Ongoing outcomes have shown that intracellular TH levels are controlled by D3, assuming a key job in neutrophil work in zebrafish, mice and humans (89). NK cells intercede cytolytic exercises against tumour and infection tainted targets. Of note, NK cells likewise have characteristics of versatile insusceptibility and can obtain useful characteristics related with immunological memory (90). A positive connection between serum T3 focus and NK cell movement in solid old subjects was recorded. Over the previous decade, it has become certain that shifts in cell digestion are determinants of macrophage work and phenotype (91). The exercises of key compounds of glycolysis are controlled by THs in these cells, affecting macrophage digestion and function (92). THs improved the phagocytic action of intraperitoneal macrophages from hypothyroid rodents (93). In addition, T4 organization to old mice likewise expanded their phagocytic limit (94). A stimulatory effect of T4 (however not T3) on the phagocytosis procedure of refined peritoneal mouse macrophages was accounted for (95). THs upgraded microscopic organisms' cell communication and intracellular killing in mice Crude 264.7 and human THP-1 monocyte-inferred macrophage cell lines (96).

Conclusion

Important factor of digestion and metabolism in our body is *Agni* and it has been explained in the classics. The term *Agni* used in classics denotes the conversion of the heterogeneous substances and homogenous substance and which generates the bio energy in the body which responsible for the optimal functioning of the structural and functional unit of the body. *Agni* converts the food consumed by individual in the form *Dhatu uttapapti* and form of energy. it is explained in the classics that agni is the life of an individual's which gives life, complexion, strength, health, lustre and nourishment. Functions of thyroid hormones when correlated with the functions of Agni we find the similarity. Mainly three types of agni are explained. *Jataragni* functions can be correlated with the role of the thyroid hormones in digestion process. Thyroid hormones play role as controller for secretion of digestive enzymes and motility of the gut and normal functioning, development and structural integrity of GIT. THs control the secretion of enzymes of digestion and it is basic requirement of the digestion process. Without enzymes they will be no proper digestion and which may lead digestion problems and diseases. After the absorption of the nutrients from GIT, it reaches the liver through portal circulation which is considered as biochemical factory of the body. Major conversion of the heterogeneous substance into homogenous substances with the help of THs. the basal metabolic rate of all the cells such as hepatocytes cells of livers is regulated by the thyroid hormones. THs functions may disturb the liver function and it is also evident that THs affects the liver structure and functions and deficiency of THs is associated with bilirubin and bile excretion and reduced liver enzymes activity. These functions of the THs are correlated with the functions of the *bhutagni*. Once the heterogeneous substance converted into homogenous substance that is utilized by the *dhatvagni* and it built the Dhatu in the body. Functions of Dhatvagni are compared with the role of THs in the formation of the body tissues. TH is basic requirement in the body for the normal production from rasa Dhatu to *sukra Dhatu*.TH helps in erythropoiesis, lipid metabolism, muscle development, bone development by controlling the calcium metabolism, bone marrow development and also helps in the normal spermatogenesis. Increased or decreased secretion of TH affects the sperm quality and quantity. These functions of TH are correlated with the functions of *Dhatvagni* at each *Dhatu* level. By considering the similarities in the functions of TH and Agni, we can say that thyroid hormone is a one of the entity or substance of agni not as a whole and it is basic requirement of the body to maintain the health of an individual as that of Agni.

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