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Correlation between AMA and hypothyroidism: Conceptual study

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Abstract

Hypothyroidism is commonest endocrine disease. It affects quality of life of individual. In Modern medicine, Only treatment is synthetic thyroxine tablets which patients had to take lifelong.

The Phenomena of *Ama* as understand like outcome of improper digestion. *Samagni* is result of equilibrated states of functioning of *tridoshas*. *Agni* plays an important role in digestion of food as well as it maintain hormonal mechanisms. Thyroid Function largely depends on GIT health. Hypo, Hyper and Erractic function of *agni* may be followed by hypo, hyper and erractic function of thyroid gland. So hypothyroidism can be considered as a result of *ama* formation which is caused by *agnimandya*.

Keywords: Hypothyroidism, *Ama*, *Samagni*, *Agnimandya*

Introduction

The most common disorder of endocrine gland is thyroid disorders and hypothyroidism is one of most common disorder of thyroid gland. Hypothyroidism, Hyperthyroidism, Goiter and Iodine deficiency disorder, Hashimoto's thyroiditis, thyroid cancer are disorder of thyroid gland ^[1]. Thyroid hormones impact the functioning of almost all organs of our body. For growth and development of our body as well as for development of nervous system thyroid hormone is required. Thyroid gland released iodine- containing thyroid hormones, thyroxine (T₄) and Tri-iodothyronine (T₃). The major function of the thyroid gland is to maintain a high rate of metabolism. Hypothyroidism is a hypo metabolic clinical state resulting from inadequate production of the thyroid hormones for prolonged periods. Prevalence of hypothyroidism is 11% in India, affects 1 in 10 person ^[2]. It is 10 times more common in female as compared to male that increase with age ^[3].

The concept of *agni* gives us basic knowledge for the understanding theories of *ayurvedic* physiology as well as pathological status. Chemical Process involve in Gastro intestinal digestion is belonged with *kayaagni*. According to *charak* Life span, complexion, strength, health, enthusiasm, corpulence, luster, immunity, energy, heat process and vital breath all these depend on Agni. The term *agni* means fire but in functioning of human body this term indicated various factor which participate in direct course of digestion & metabolism ^[4]. According to the different functions and sites of action *agni* is of 3 main type i.e *Antaragni*, *Bhutagni*, *Dhatwagni*. The *agni* located in the jathara is responsible for digestion and absorption of the food called *Antaragni*. The *bhutagni* is responsible for transformation of heterogeneous substance to homogenous substance. The *Dhatwagni* along with *bhutagni* responsible for the metabolism ^[5].

Ama is a Sanskrit word that translates literally to mean things like "unripe," "uncooked," "raw," "immature," or "undigested." Approximately, it is configuration of un-metabolized waste that cannot be utilized by the body ^[6]. Due to impaired Agni food does not digest properly and develop unprocessed Rasa is known as *AMA*.⁷The effect of the thyroid hormone on body is similar to the functioning of *agni* and the symptoms of Hypothyroidism and *Ama* also resemble each other. So here an attempt has made to understand it.

AIM

To study the concept of Hypothyroidism and *ama* (*agnimandya*) & correlate with each other.

Type of Study

Conceptual type of study.

Materials & Methodology

- Literary study of Hypothyroidism.
- Literary study of *dhatwagnimadhyha & ama*.
- Comparative study.

Anatomy & Physiology of Thyroid

Thyroid gland is an endocrine gland of the body which is shaped like a butterfly, composed of two lateral lobes which are connected by a thin band of tissue called as isthmus. The thyroid gland is located in the neck in front of the trachea. Its weight is 15-25 grams [8]. A cut section of a normal thyroid is yellowish and translucent. The thyroid is composed of lobules of colloid-filled spherical follicles or acini. The follicles are the main functional units of the thyroid [9]. The follicles synthesize and secrete iodine-containing hormones: tri-iodothyronine (T_3) and tetra-iodothyronine (T_4) [7]. The thyroid gland also consists of a second type of cell called as parafollicular or C cells which synthesize and secrete the hormone calcitonin. It regulates blood calcium levels along with parathyroid hormone [8].

The thyroid gland secretes hormones T_3 and T_4 while TSH is secreted from the anterior pituitary gland. TSH stimulates the production & secretion of metabolically active thyroid hormones. Thyroxine (T_4) & Tri-Iodothyronine (T_3) are responsible for regulating diverse biochemical processes throughout the body which are essential for normal development as well as metabolic & neural activity [10].

Functions of Thyroid Gland [8, 11]

- Bone Growth
- Maturation of CNS.
- Adrenergic actions -increasing cardiac output, Heart rate, Contractility of Myocardium.
- Thyroid hormone increases general metabolism, BMR is increased, O_2 consumption and heat production is also increased. It also increases Glycogenolysis, Gluconeogenesis, Lipolysis.
- Carbohydrate mechanism: Thyroxine stimulates the absorption of monosaccharide from the intestine. Thyroid hormones increase the rate of absorption of carbohydrates from the gastrointestinal tract. It stimulates the process of glycogenolysis and also stimulates the consumption of glucose in the tissue.
- Protein Metabolism: Thyroxine hormone has anabolic effect on protein and enhancement of growth of all bodily tissues.
- Fat Metabolism: Thyroxine increases synthesis of lipids and also promotes lipolysis by mobilising and degrading the lipids.
- Iodine metabolism: Thyroxine helps in the absorption of inorganic iodide from the plasma and oxidation of iodide into iodine.

Hypothyroidism

Reduced production of thyroid hormone is termed as Hypothyroidism [12]. According to the time of onset it is divided into congenital and acquired, according to the level of endocrine dysfunction in primary and secondary or central and according to the severity in severe or clinical and mild or subclinical hypothyroidism [13].

The diagnosis may be easily performed by the measurement

of blood levels of thyroid hormones. Normal Range of thyroid are [8]

TSH = 0.4-4.0 mIU/L
Total T_4 = 5.4-11.5 mIU/L
Free T_4 = 0.7 -1.8 mIU/L
Total T_3 = 80 -220 mIU/L
Free T_3 = 260-480 mIU/L

TSH and FT_4 measurement are essential laboratory tests for the diagnosis of hypothyroidism and the differential diagnosis between primary (clinical or subclinical) and secondary one.

Primary Hypothyroidism: Decreased function of thyroid gland due to disease of thyroid itself.

Secondary Hypothyroidism: Decreased function of thyroid gland due to decreased TSH level.

Tertiary Hypothyroidism: Decreased function of thyroid gland due to decreased function of hypothalamus.

Subclinical Hypothyroidism: A condition with normal thyroxine and triiodothyronine level along with mildly elevated TSH level.

Cause of Hypothyroidism [8]

Primary Hypothyroidism

- Iodine deficiency
- Autoimmune Hypothyroidism- Hashimoto thyroiditis.
- Exogenous Goiterogens
- Congenital Hypothyroidism- Agenesis of thyroid Hypoplasia of thyroid Dysmorphogenetic goiter
- Iatrogenic Hypothyroidism- Surgical removal Radiation

Secondary Hypothyroidism

- Due to defect in pituitary hypothalamic axis.
- Failure of pituitary
- Failure of hypothalamus.

Clinical Features of Primary Hypothyroidism [8]

1. Lethargy
2. Mild depression
3. Disturbances in menstruation
4. Weight gain
5. Cold intolerance
6. Dry skin
7. Coarse brittle hair
8. Myopathy
9. Constipation
10. Reduced reflexes
11. Bradycardia

The clinical manifestation of hypothyroidism depending upon the age and onset of disorder are divided into 2 types – Cretinism- The development of hypothyroidism during infant or childhood.

Myxedema- It is development of hypothyroidism during childhood.

Clinical Picture ^[14]**Table 1**

Cretinism	Myxedema
Skeleton: Stunted growth, short club- like fingers, deformed bones and teeth	Skin and body: Irregular deposition of the fat on the body Swelling of tongue, hoarseness and slow speech.
Face: bloated face, idiotic look, saliva Dribbing	Face: Swollen puffy and oedematous look of the face and whole body
Abdomen: overweight or bloated belly, umbilicus often protruding.	Abdomen: overweight and bloated belly
GI Tract: Appetite is reduced. Motility of GI tract is reduced, Constipation	GI Tract and metabolism: Appetite and motility is reduced. Body weight is increased, Constipation. BMR is reduced by 35-40% Low body temperature.
Metabolism: BMR is reduced by 20-40%, low body temperature, deposition of fat especially above the clavicle.	Blood: low blood sugar and iodine. Increased sugar tolerance Raised serum Cholesterol
Susceptible to cold and flu, immunity is reduced.	Heart other symptoms: Slow heart rate (Bradychardia) Stroke volume and minute volume is reduced. So the cardiac output is reduced. Respiration rates are reduced.
Urine output is reduced.	Excretion of Nitrogen and urine output is reduced.
Dry scaly skin, hoarse cry and bradycardia	Lethargy and apathy

Agnimandhya in Ayurveda

Agni present in the jathara which digest the food is BHAGAVAN, he receives sweet and other tastes, he being subtle it is not possible to perceive him ^[15]. Jatharagni is the chief among all types of agnis because functions of *bhutagni* and *dhatvagni* depends on this. Aggravations or diminution of *jatharagni* results in aggravation or diminution of *bhutagni* and *dhatvagni* ^[16]. *Jatharagni* maintains the procedure of *paka* of *dhatu*s which is signify metabolism of tissues ^[17]. *Pacakagni* is stated to be responsible for digestion and metabolism. It is of 4 kinds based on the involvement of dosas: First variety is not associated with dosas and it is called SAMAGNI state and it is the physiological state of agni. Remaining 3 varieties of agni are the pathological ones, VISAMAGNI state due to vata, TIKSNAGNI state due to pitta, Mandagni state due to *kapha* ^[18]. According to acharaya sushrut, Mandagni is the state in which digestion process become weak and takes long times to digest the less quantity of food. In charak Samhita, mandagni is the state in which action of *jatharagni* is considerably inhibited due to *kapha*, in this time *agni* is unable to digest small quantity of food. While describing "agnimandya" Acharya Madhav has not only emphasized on "Mandaagni" alone but any kind of hyper functioning or hypo functioning of agni has been considered

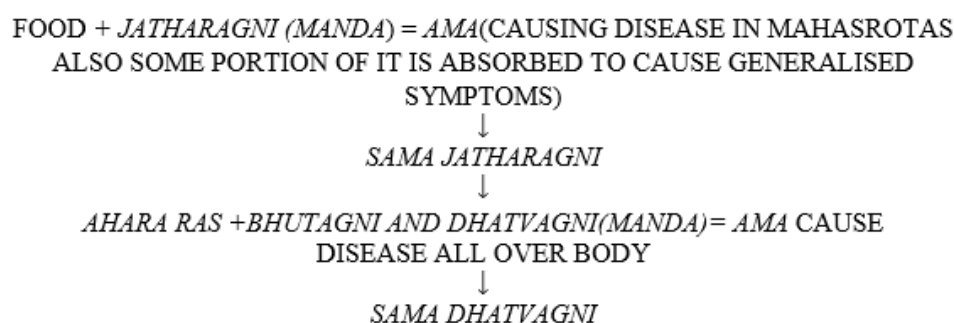
in the term "agnimandya". In pathogenesis of many disorder Agnimandya is main step. *Dosha-prakop* cause by *Hetusevan*. These *prakupitdosha* vitiate *dushya* and their *samuurchhana* which leads to many diseases ^[19].

Concept of AMA

IN *asthang hridhya vagbhatt* mentioned; Due to weakness in *agni* adhya rasa becomes immature, improperly metabolism substance called AMA, which manifests in *amasaya* ^[20]. According to Charak; Impaired digestion and metabolism due to hypofunctioning of *jatharagni* is called AMA and it exacerbates all the *dosa* ^[21]. Due to hypofunctioning of *agni* proper digestion of food doesn't take place leading to formation of AMA, which is responsible for the manifestation of almost all diseases. Food which is improperly digested having foul smell, excess unctuousness and develops lethargy in all body organ is called AMA ^[22]. According to Dalhana and Cakarpani, Ama formation not only done by *jatharagni* *mandya*, the whole *dhatvagnivyapara* may be impaired.

Production of Ama is complete at various level;

- *Jatharagni mardavata* (sluggish impaired functioning of agni)
- *Dhatvagni Daurbalya* (Altered functions of dhatvagni)
- *Bhutagni mandyata* (Defect in the functions of bhuta) ^[23]

Pathogenesis of Ama ^[24]

- *Asthayi Dhatu + Pacakansa (Manda)* = *Vrdhhi* of the dhatu
- *Asthayi Dhatu + Pacakansa (Tiksha)* = *Ksaya* of the dhatu

General Symptoms of AMA ^[25]

- *Srotorodha* -Obstruction to body channels

- *Balbhrinsha* -Loss of body strength
- *Gaurava* -Heaviness
- *Anil Mudhata*-Abnormal movement of Vata Dosha
- *Aalasya* -Laziness
- *Apakti* Indigestion
- *Nisthiva* -Excess drooling
- *Malsanga* -Obstruction to Mala eg. Purisha, etc.
- *Aruchi* -Loss of Taste
- *Klama* -Lethargy

Discussion on Comparison of AMA and hypothyroidism

Almost all disease arises due to sluggish functions of *agni*.^[26] in other word, Diminish and exaggerate functioning of the “*agni*” is the main cause of pathogenesis of any *vikruti*. *Kayaagni* present in its own place has portions of

itself, present in *dhatus* also. Their decrease (quantity, qualities, functions) and increase (quantity, qualities, functions) give rise to increase and decrease of *Dhatus* (respectively)^[27]. *Ama* is the outcome of improper digestion, in other word incomplete or partial digestion of food leads to *Ama*. Irregular digestion and metabolism cause imbalance in *Dhatus*^[28]. Due to hypofunctioning of *agni* proper digestion of food doesn't takes place leading to formation of *Ama*, which is responsible for the manifestation of almost all disease^[22]. Hypometabolism or *Mandagni* leading to state analogous to Hypothyroidism resulting in *dhaturvaddhi*^[27]. Here *manadyagni* mention not only *jatharagni mandya* but *mandya of dhatvagnis* and *bhutagnis* also. Disturbed functions of *agni* leads to formation of *ama*, the symptoms of *ama* and hypothyroidism are correlated as:

Table 2

Symptoms due to <i>Ama</i>	Symptoms of Hypothyroidism ²⁹
<i>Srotorodh</i>	Irregular deposition of the fat on the body, hoarseness and slow speech.
<i>Balbrinsha</i>	BMR is reduced, Bradycardia
<i>Gaurava</i>	Body Weight is increased, loss of appetite
<i>Anil Mudhata</i>	Deformed bones and teeth, constipation
<i>Aalasya</i>	Lethargy and apathy.
<i>Apakti</i>	Appetite is reduced, Indigestion
<i>Malsanga</i>	Motility of GI tract is reduced, Constipation
<i>Klama</i>	Lethargy

Conclusion

Thyroid gland is also one of the important glands of the endocrine system. The thyroid gland produces hormones that regulate the body's metabolic rate, muscle and digestive function, and bone maintenance. The special part of *agni* relates to hormonal mechanism. This aspect is important in relation of thyroid mechanism and *agni*. Recent studies shows that thyroid functions largely depends on GIT health. AS Symptoms of undigested food material is the symptom of *ama*. As discussed in this article there are some significant features of *Ama* mentioned by various *Acharyas* which are related with those of hypothyroidism.

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