Hypothyroidism: Management Based On Ayurvedic and Modern Therapeutic Perspective

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Date Received: 30th May 2016; Date accepted: 18th June 2016; Date Published: 20th June 2016

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Abstract

Hypothyroidism is the pathological condition in which the level of thyroid hormones declines to the deficiency state. This communication addresses the therapies employed for the management of hypothyroidism as per the Ayurvedic and modern therapeutic perspectives on the basis of scientific papers collected from accepted scientific basis like Google, Google Scholar, PubMed, Science Direct, using various keywords. The Ayurveda describe hypothyroidism as the state of imbalance of Tridoshas and suggest the treatment via use of herbal plant extracts, lifestyle modifications like practicing yoga and various dietary supplements. The modern medicine practice define hypothyroidism as the disease state originated due to formation of antibodies against thyroid gland and hormonal imbalance and incorporate the use of hormone replacement i.e. Levothyroxine, antioxidants. Various plants like Crataeva nurvula and dietary supplements like Capsaicin, Forskolin, Echinacea, Ginseng and Bladderwrack can serve as a potential area of research as thyrotropic agents.

Keywords: Hypothyroidism, Herbal plants, Tridosha, Levothyroxine, Ayurveda.

INTRODUCTION

Hypothyroidism is the major endocrine disorder seen in general population. It is characterized by the deficiency of thyroid hormones to abnormal levels. This condition leads to the reduction in basal metabolic rate, affect physical and mental growth during infancy or childhood. It is prevalent among every one from ten adults in India, nearly 10.95 % in major cities of with significantly females number outweighing the male i.e. (15.86% female and 5.02% males). This prevalence is 4.6 % in the developed world. Main causes are Hashimoto’s thyroiditis (autoimmune thyroiditis), deficiency of iodine, surgical removal of thyroid gland i.e. thyroidectomy, radioactive treatment etc. Hypothyroidism is associated with various pathological states that render person dependent on hormone replacement therapy lifelong. Hence, it calls for the understanding of ayurvedic concept of this disease and establishing the management of hypothyroidism through Ayurvedic principles.

The Ayurveda, considers the balanced state of agni (enzymatic activity), tridoshas (bodily humours), dhatu (metal) & mala (impurity) as the foundation for the orderly functioning and samacastha (homeostasis) of human body. If any of the element gets disturbed, it give rise to disease state. All these elements, also controls the working of thyroid gland, which is located in the neck region (Kantha) also, is the place (sthana) for Kaphadosha (mucous), Prana (breath) and Udana Vayu (vital air), Mamsa (flesh) and Medadhatu (fatty tissue).

This review aims to discuss both Ayurvedic and modern medicine concept of hypothyroidism pathophysiology, line of treatment and future areas of research based on use of herbal plants or dietary supplements. The idea is studied from information obtained from accepted scientific basis like Google, Google Scholar, PubMed, Science Direct, using various keywords

1. TYPES:

According to modern medicine concept, based upon the etiology of disease, severity of disease and the time of occurrence of hypothyroidism, it may be classified as:

a. Primary hypothyroidism
b. Secondary hypothyroidism

 PRIMARY HYPOTHYROIDISM

Primary hypothyroidism is the most common form of the disease and is characterized by a reduction in thyroid hormone levels due to a problem with the thyroid gland itself. The most common cause of primary hypothyroidism is an autoimmune condition called Hashimoto’s thyroiditis. In this condition, the immune system attacks the thyroid gland, leading to inflammation and destruction of the gland. This can result in a decrease in the production of thyroid hormones, such as thyroxine and triiodothyronine.

SECONDARY HYPOTHYROIDISM

Secondary hypothyroidism occurs when the thyroid gland is unable to respond to the increase in thyroid-stimulating hormone (TSH) levels from the pituitary gland. This is typically caused by a disorder in the pituitary gland, such as a tumor or a hormone deficiency, which prevents the pituitary from producing sufficient TSH to stimulate the thyroid gland. In some cases, secondary hypothyroidism may be caused by damage to the pituitary gland, such as during surgery or radiation therapy.

REVIEW ARTICLE
On the basis of etiology:
1. Primary hypothyroidism (thyroid gland defects)
2. Secondary hypothyroidism (pituitary gland defects) and
3. Tertiary hypothyroidism (hypothalamic defects).

On the basis of time of occurrence:
1. Adult onset hypothyroidism
2. Congenital hypothyroidism

On the basis of severity:
1. Subclinical hypothyroidism
2. Overt hypothyroidism

The prevalence of primary hypothyroidism is high accounting for over 95% of the total hypothyroidism. Central hypothyroidism of pituitary origin, occurrence rate is even lower i.e. 1 from 1000 cases due to pituitary adenoma. Hypothalamic defects associated central hypothyroidism has an estimated incidence of 1:65 000.

In Ayurveda, thyroid disorders are discussed under the term “Galaganda” (enlarged thyroid gland). This term is cited indirectly as “Galagand and Gandmala” in text, like Charaka, Sushruta and Ashtanghrudaya describing the manifestation in and around the neck, which can be correlated with goiter and thyroidism.

**ETIOLOGY (NIDANA)**

Primary (thyroid gland) hypothyroidism:
Autoimmune (Hashimoto thyroiditis or postpartum thyroiditis), Iatrogenic (Thyroidectomy, thyroid surgery, radioactive iodine therapy and antithyroid medications), miscellaneous (Iodine deficiency and excess, other medication induced, exposure to radiations, moderate or severe systematic illness, thyroid agenesis, defective thyroid synthesis, resistance to thyroid hormone.)

Secondary (Pituitary) hypothyroidism:
It may occur due to pituitary tumors, infarcts or trauma, surgery, infiltrative disorders (eg sarcoïdosis, histiocytosis, lymphoma, hemochromatosis), lymphocytic hypophysitis, infection and medications

**Tertiary (hypothalamus) hypothyroidism;**
Infiltrative disorders (eg. Sarcoïdosis, histiocytosis, lymphoma, hemochromatosis), and medication induced.

Medication induced hypothyroidism, is a great matter of concern these days. These medications could be part of therapy for other ailments but may directly or indirectly affect the thyroid function. Glucocorticoids, Bromocriptine, Octreotide, Opiates, pentolamine, growth hormone etc., they contribute to hypothyroidism via decreasing Thyroid stimulation hormone (TSH) secretion. Some drugs could adversely affect the thyroid hormone synthesis and their secretion (iodine, Amiodarone, thionamides, thiocyanates, amino glutethimide, perchlorate ions, lithium and certain cytokines), some act via altering thyroid hormones metabolism (rifampicin, phénytoïn, carbamazepine, barbiturates, tyrosine kinase inhibitors, β-blockers, iodinated contrast media etc. ) and some via increasing the absorption of goitrogens, Mitotane, fluorouracil etc., last but not the least affect the exogenous absorption of thyroid hormones (calcium compounds, sucralfate, ferrous compounds, colestérol, antacids, coffee etc.)

**PATHOPHYSIOLOGY (SAMPRAPTI):**
In Ayurveda, it is considered as state of “Pitta kshya (decrease pf pitta), Kapha vridhi (increase of kapha or mucous) and medodusthi (impairment of fat) thereby affecting the Srotas (channels) of body.” Ayurveda also considers it, as a state of disbalance between mind, body and soul due to grief, fear, anger, sorrow, excessive sleep and excessive vigour despite adequate food intake.

Modern therapeutics take into consideration the derangements in gonadal hormones, leptin, and other feeding- and sleep-related hormones that disturbs hypothalamic-pituitary (HPT) feedback system thereby, disturbing thyroid hormone levels. Hashimoto thyroiditis, is the result of cell and antibody-mediated destruction of thyroid tissue i.e. antibodies to thyroperoxidase, thyroglobulin, Thyroid Stimulating Hormone (TSH) and its receptors.

**SIGNS & SYMPTOMS:**
Clinical signs may include goiter (Galaganda), nonpitting edema, brittle nails, macroglossia,
slowed relaxation phase of reflexes, psychosis, bruising/bleeding, pericardial or Pleural effusion, ascites, hypothermia, hypotension, hypoglycaemia, altered mental status/coma\(^1\). Ayurveda, describes the symptoms of hypothyroidism in terms of tridoshas i.e. gastro intestinal symptoms i.e. weight gain (Kapha dosha), constipation, anaemia (Pitta dosha); Cardiorespiratory symptoms i.e. Bradycardia, hypertension (Vata dosha), neuromuscular symptoms i.e. muscle/joint pain, memory impairment, depression, weakness in extremities, difficulty with concentration, myalgias and arthralgias, paresthesias (Vata dosha); dermatological symptoms i.e. dry skin and hair, reduction in scalp, pubic and axillary hairs (Vata-Kapha dosha); reproductive symptoms i.e. irregular menses and/or menorrhagia, sexual dysfunction, impaired fertility (Vata – pitta dosha); Ocular symptoms i.e. blurred vision (pitta dosha); Ear-nose-throat (ENT) symptoms i.e. hearing problems (vata dosha), feeling of fullness in throat (kapha dosha), hoarseness of voice (Vata dosha); other general symptoms like fatigue, cold intolerance, sleepiness (Kapha dosha)\(^5\).

DISEASE MANAGEMENT:
Concept for the pathogenesis of disease are different in Ayurveda and modern therapeutic system. Accordingly the way of treatment also change, but ultimate goal is to overcome to diseased condition.

Modern therapeutic prospective:
The treatment as per the modern medicine practice include use of Levothyroxine sodium as a part of hormone replacement therapy (available as Synthroid, Eltroxin), thyroid extract preparation, and antioxidants such as selenium.

Levothyroxine Therapy:
Levothyroxine (T\(_4\)) is the standard replacement therapy in primary or central hypothyroidism\(^19\). Many physiological and pathological conditions can impair levothyroxine absorption such as patients factors (compliance), certain foods (e.g. grapes, coffee, etc.), drugs (e.g. antidepressants, sulfa drugs etc.) gastrointestinal diseases (e.g. H. pylori infection). Certain new formulations are introduced for patient with impaired absorption of Levothyroxine i.e. Liquid formulation (patented by Institute Biochimique SA (IBSA), Lugano, Switzerland) and soft gel formulation with improved bioavailability over traditional tablets\(^20\). Pharmacodynamic equivalence of T\(_4\) and L-triiodothyronine (T3) combination is believed to be approximately 1:3\(^21\). Hypothyroidism, in an adult can be treated by administering sustained-release formulation of T\(_3\) (0.005-0.03 μg/kg body weight/hour/day) in 5-25 μg dose at daily basis, without the need of administering the therapeutic dose of T\(_4\)\(^22\).

Selenium:
Administration of 200μg/day of selenium as selenomethionine) is effective in reducing the occurrence of Hashimoto thyroiditis, thyroiditis after delivery, and clinical hypothyroidism\(^19\).

Ayurvedic principles of treatment:
In ayurveda, thyroid gland is defined as a lymphatic Channel (rasabaha srotas)\(^23\). The treatment follows holistic approach towards mind, behaviour, body and overall environment. Its main aim is to clear the blocked channels in body before initiating any oral therapy so as to balance tridoshas and then switch to rasayana (rejuvenative) therapy. According to one of the basic principle i.e. “Saamanya Vishesh Siddhanta”, similar conditions, aggravate the disease condition, whereas, dissimilar things alleviate, this treatment methodology facilitate the decrease in kapha by the use of kapha inhibiting drugs, increase dhatugata (tissue level) i.e. pitta by the use of pitta enhancing drugs and lowers the meda (fat) by the use of meda neutralizing drugs. All these methods help, restores the homeostasis and metabolic activity in body which was altered by the blockage of channels by kapha\(^24\).

Dietary supplements:
There are various dietary supplements available that may mimic the thyroid function but are of unproven clinical benefit, it includes Asian ginseng, bladderwrack, capsicum, echinacea, and forskolin\(^19\). Other formulations used as thyroid supplements include Thyro-L#455 (Laminaria sarassum), B 37 K Para-Thy-Mix (Natural iodine from dulse with raw glandular extract), Sudha guggulu (Commiphora mukul), Kanchnar guggulu (Bauhinia variegata, C. mukul) and Gayatrin (B. variegata, C. mukul)\(^25\).

Yoga:
Yoga is believed to be useful art to rejuvenate your body and soul. The asana, useful in managing hypothyroidism are Sarvangasana (standing erect on shoulders), Hlasana (plough posture), Matsyasana (fish like posture), Naukasana (boat like posture), Surya-namaskar (salutation to sun), and some other useful pranayams include Suryabhedana (breathing from single nostril), Anulom- bilom (breathing from alternate nostril) and Ujayi (means victorious form of breathing).

**Herbal plant used traditionally in management of hypothyroidism:**

Since 1990’s, the soaring interest in traditional system of medicines have been witnessed globally. As the current estimates suggests the people in large numbers prefer phytomedicines (herbal medicines), alternative or complementary therapies over modern medicines and methods of treatment to ensure health care.

Plants already reported with thyroid stimulant activity is summarized in **Table 1:**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Botanical Name/Family</th>
<th>Common names</th>
<th>Part used</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><em>Bacopa monnieri</em> Scrophulariaceae</td>
<td>Brahmi</td>
<td>Whole plant</td>
<td>It raised both T3 &amp; T4, reduce oxidative stress, improves memory, concentration</td>
</tr>
<tr>
<td>2.</td>
<td><em>Withania somnifera</em> Solanaceae</td>
<td>Ashwagandha</td>
<td>Root</td>
<td>It lowered cortisol, raise thyroid hormones levels, lowers oxidative stress.</td>
</tr>
<tr>
<td>3.</td>
<td><em>Commiphora mukul</em> Burseraceae</td>
<td>Guggulu</td>
<td>Oleo-resin, gum</td>
<td>It improved thyroid histology, raised T3, T4 ratio.</td>
</tr>
<tr>
<td>4.</td>
<td><em>Moringa oleifera</em> Moringaceae</td>
<td>Shigru</td>
<td>Root, seeds, leaf</td>
<td>It raised thyroid hormone levels.</td>
</tr>
<tr>
<td>5.</td>
<td><em>Achyranthes aspera</em> Amaranthaceae</td>
<td>Apamarga</td>
<td>Whole plant</td>
<td>It raised thyroid hormones, glucose, reduced oxidative stress.</td>
</tr>
<tr>
<td>6.</td>
<td><em>Bauhinia variegata</em> Fabaceae</td>
<td>Kanchanara</td>
<td>Bark</td>
<td>It reduced swelling of neck, increased serum thyroid hormone concentrations, decreased Cholesterol and improved thyroid histology.</td>
</tr>
<tr>
<td>7.</td>
<td><em>Eichhornia crassipes</em> Pontederiaceae</td>
<td>Water hyacinth</td>
<td>Whole plant</td>
<td>It stimulated thyroid function.</td>
</tr>
<tr>
<td>8.</td>
<td><em>Bauhinia purpurea</em> Fabaceae</td>
<td>Khairwal</td>
<td>Bark</td>
<td>It raised thyroid hormone levels and decreased lipid levels</td>
</tr>
<tr>
<td>9.</td>
<td><em>Saussurea lappa</em> Compositae</td>
<td>Kuth</td>
<td>Root</td>
<td>It improved thyroid histology.</td>
</tr>
<tr>
<td>10.</td>
<td><em>Magnifera indica</em> Anacardiaceae</td>
<td>Mango</td>
<td>Fruit Peel</td>
<td>It raised thyroid hormone levels and reduced oxidative stress.</td>
</tr>
<tr>
<td>11.</td>
<td><em>Citrullus vulgaris</em> Cucurbitaceae</td>
<td>Water melon</td>
<td>Fruit Peel</td>
<td>It raised thyroid hormone levels and reduced oxidative stress.</td>
</tr>
<tr>
<td>12.</td>
<td><em>Cucumis melo</em> Cucurbitaceae</td>
<td>Musk melon</td>
<td>Fruit Peel</td>
<td>It raised thyroid hormone levels.</td>
</tr>
<tr>
<td>13.</td>
<td><em>Juda racemosa</em> compositae</td>
<td>Pushkarmool</td>
<td>Root</td>
<td>It stimulated thyroid histology.</td>
</tr>
<tr>
<td>14.</td>
<td><em>Crataegus muryula</em> Capparidaceae</td>
<td>Varuna</td>
<td>Bark, root</td>
<td>It possessed antitumour activity for extragrowths of thyroid</td>
</tr>
<tr>
<td>15.</td>
<td><em>Pistia startotes</em> Araceae</td>
<td>Jalakumbhi</td>
<td>Whole plant</td>
<td>It reduced swelling of thyroid.</td>
</tr>
<tr>
<td>16.</td>
<td><em>Cassia fistula</em> Caesalpiniaaceae</td>
<td>Aaragvadha</td>
<td>Root, leaves, flower, fruit pulp</td>
<td>It raised thyroid hormone levels, decreased cholesterol levels.</td>
</tr>
<tr>
<td>17.</td>
<td><em>Vitex nigundo</em> Verbenaceae</td>
<td>Nirgundi</td>
<td>Root, leaves, seeds</td>
<td>It reduce swelling of thyroids.</td>
</tr>
<tr>
<td>18.</td>
<td><em>Linum usitatissimum</em> Linaceae</td>
<td>Alsi/Bijari</td>
<td>seeds</td>
<td>It maintained thyroid health, boost production of thyroid hormones.</td>
</tr>
<tr>
<td>20.</td>
<td><em>Zingiber officinale</em> Zingiberaceae</td>
<td>Adrak</td>
<td>rhizome</td>
<td>It restored thyroid health in hypothyroidism.</td>
</tr>
</tbody>
</table>
Table 2: Prospectives of Treatment

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>Ayurvedic prospective:</th>
<th>Modern therapeutic prospective:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Use of herbal plant extracts or formulations to balance tridoshas or bodily humours with anti-kapha, anti-meda and pitta enhancing properties</td>
<td>Use of hormonal replacement therapy i.e. Levothyroxine sodium</td>
</tr>
<tr>
<td>2</td>
<td>Rejuvenation therapy or Rasayana therapy</td>
<td>Use of Antioxidants such as Selenium</td>
</tr>
<tr>
<td>3</td>
<td>Promotes Lifestyle modification, adoption of Yoga</td>
<td>Symptomatic management of associated ailments</td>
</tr>
</tbody>
</table>

The treatment for hypothyroidism, as per the Ayurvedic and modern medicine foundation can be summarized as Table 2:

FUTURE AREAS OF RESEARCH

Crataeva nurvula:
Crataeva nurvula commonly termed as Varuna is a valuable medicinal plants, belonging to the family, Capparidaceae, is reported to have analgesic, neuroprotective antiarthritic, anticancer, antidiabetic, cardioprotective, anti-inflammatory, antioxidant, hepatoprotective, nephroprotective activities. Ayurveda supports the use of leaves, stem bark and root bark of Crataeva nurvula to regulate equilibrium among three doshas (bodily humours) Vata (air), Pitta (earth) and Kapha (mucous or water). Various acute or subacute studies over Varuna extracts and herbal formulations establish its wide safety profile upto 5000 mg/Kg in rodents as per OECD guidelines.

Forskolin:
Forskolin, is active constituent of Coleus forskohlii, extracted from its root part. As per our knowledge, negligible work has been done on crude Coleus forskohlii in relation to hypothyroidism using in vivo models. However, the effect of Forskolin (an active constituent of Coleus Forskohlii) is demonstrated in increasing thyroid hormone production on isolated thyroid gland and in stimulating adenylate cyclase (cAMP) activity in mouse anterior pituitary tumour cells, an enzyme responsible for physiological functions of hormones.

Echinacea purpurea:
Echinacea purpurea with Laminaria in combination is patented in 2014 to be used as biologically active food additive to treat and normalize thyroid function.

Capsaicin:
Capsaicin is the principle pungent constituent of red pepper, which increases the levels of Uncoupling proteins 1 (UCPs 1) in Brown Adipose Tissue (BAT) and UCP2 in white adipose tissue thus suppressing accumulation of fat in body and adaptive thermogenesis. The levels of UCPs are regulated by thyroid hormones. But, no study revealing the direct effect of capsaicin on thyroid hormones is done.

Asian ginseng:
Asian ginseng, botanically known as Panax ginseng, effectively raised the levels of thyroid hormone T3 and T4 thus, showing positive regulatory action but adequate studies on it to prove its effectiveness in hypothyroidism is not reported.

Bladderwrack (Kelp)
Bladderwrack (Fucus vesiculosus) is a seaweed, which serve as a source of Iodine and have shown its efficacy in maintaining hormonal status but efficacy in raising thyroid hormones is not proven. These supplements are readily available for use in community, however are not regulated by Food and Drug Administration. Also, some of the cases of administration of kelp, reported the occurrence of thyrotoxicosis, secondary to weight lowering herbal supplements.

CONCLUSION
There are difference in the basis of understanding hypothyroidism in Ayurveda and modern therapeutics but the ultimate goal is achieve the effective management of disease but herbal method gains the edge over allopathic ones in terms of reduce side effects, holistic treatment and shorter duration which is lifetime administration in terms
of modern methods. To our best knowledge, no scientific data regarding the thyrotropic activity of various plants like *Crataeva nurvula* and dietary supplements like Capsaicin, Forskolin, Echinacea, Ginseng and Bladderwrack available except in the treatise of Ayurvedic medicine. Reported pharmacological activities and studies conducted on these plants and dietary supplement showed their role in management of hypothyroidism but has not yet proven clinically beneficial. This make them, suitable candidate to be studied extensively in context with hypothyroidism, and other associated disorders in preclinical studies using relevant animal models.

**References:**

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