

## **Ayurvedic Approach on Anatomical Basis of Endocrine Disorders: A Review**

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### **Abstract**

An estimated 108 million people in India suffer from endocrine and metabolic disorders. The disorders relating to endocrine system can be grossly divided into functional abnormalities and structural abnormalities. While functional disorders like hypothyroidism, DM type 1, etc. are very common in present day clinical practice, some of the common structural abnormalities result in diseases like thyroid adenoma, undescended testis etc. Thorough understanding of the anatomical organization of the endocrine system can help in the clinical diagnosis of these conditions leading to early detection. The management of many of the above disorders involves surgical measures which also require a well off anatomical understanding. Role of *Ayurveda* in the determination and development of organ are many factors such as *Prakruthi* (constitution of the body), Nature of *Shukra* (nature of sperm) and *Shonita* (nature of ovum), *Garbhashaya* (nature of uterus), Season (fertility time), Food and deed of mother, *Panchamahabhutha* (five basic element of nature).

### **Keywords**

*Doshas, Endocrine system, Anatomical disorders, Prakruthi*



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## INTRODUCTION

According to *Ayurveda*, the whole system comprises three parts- Body, Mind and Spirit. These three work in accordance to each other<sup>1</sup>. The missing link between the Mind and Body on which modern sciences had poured the money in millions is the endocrine system. Endocrine system works according to the master gland (most of the cases) which is a part of the hypothalamus (**where all the emotions located**). The endocrine system is made up of glands that produce and secrete hormones. These hormones regulate the body's growth, metabolism (the physical and chemical processes of the body), development and functions. The hormones are released into the blood stream and may affect one or several organs throughout the body. Hormones are chemical messengers created by the body. They transfer information from one set of cells to another to coordinate the functions of different parts of the body. The major glands of the endocrine system are the hypothalamus, pituitary, thyroid, parathyroid, adrenals, pineal body, and the reproductive organs (ovaries and testes). The pancreas is also a part of this system; it has a role in hormone production as well as in

digestion. The endocrine system is regulated by feedback in much the same way that a thermostat regulates the temperature in a room. For the hormones that are regulated by the pituitary gland, a signal is sent from the hypothalamus to the pituitary gland in the form of a "releasing hormone", which stimulates the pituitary to secrete a "stimulating hormone" into the circulation. The stimulating hormone then signals the target gland to secrete its hormone. As the level of this hormone rises in the circulation, the hypothalamus and the pituitary gland shut down secretion of the releasing hormone and the stimulating hormone, which in turn slows the secretion by the target gland. This system results in stable blood concentrations of the hormones that are regulated by the pituitary gland<sup>2</sup>.

**AYURVEDIC REVIEW:** In *Ayurvedic* medicine, goitre is called '*Galaganda*' and is described in detail<sup>3</sup>. It classifies thyroid diseases into three types; *Vataja* (hyperthyroidism), *Kaphaja* (hypothyroidism) and *Medaja* (thyroidal cyst). The symptoms of these diseases are described in detail in the *Ayurvedic* medicine and modern medicine. '*Śarīra Vicaya*' is the Ayurvedic term that

represents both Anatomy and Physiology. 'Vicaya' means the special or detailed knowledge. As per *Charaka*, the detailed knowledge of normal human body is helpful to understand the factors influencing health and therefore such knowledge is widely appreciated by experts<sup>4</sup>.

### **Theory of 'Tridosas': A Physiological**

**Perspective:** This theory forms the basis of *Ayurvedic* physiology, pathology and pharmacology. Though, the term 'Dosa' means 'the disturbing factor', it has got definite physiological importance in normal state. Basically three 'Dosas'- 'Vāta', 'Pitta' and 'Kapha'- are responsible for maintenance of homeostasis in the body, and health is nothing but a state of equilibrium of these 'Tridosas'. Disease is manifested as a result of disturbance in the state of equilibrium among these 'Dosas'. The concept of 'Tridosas' is basically a theory and any single substance or structure in the body can not represent a 'Dosa'. 'Vāta' is responsible for all movements and it is the initiating and controlling factor. 'Pitta' performs the activities like digestion, metabolism, production of heat and that is why it is called 'Agni' meaning 'Fire'. 'Kapha' performs the functions like protection, strength, stability and resistance. As *Ayurveda* is based on functional

understanding of body, the different entities representing 'Tridosas' at each level of organization can be assumed by analyzing these functions. In generalized terms, the nervous, endocrine and immune mechanisms can be equated to 'Vāta', 'Pitta' and 'Kapha' respectively. *Prakriti* literally meaning constitution or nature, and consists of the *tridoshas* (*vata*, *pitta*, and *kapha*)<sup>4</sup>. The three striking constitutions of *prakriti* (*vata*, *pitta*, and *kapha*) present a set of metabolic tendencies which help in determining the reaction of body and mind when confronted by a stimulus. Each dosha has its distinct properties and functions which are universal to living systems and are present in all organisms. In *Ayurveda*, the three *doshas* are understood to have their regions within the body where they predominate; *vata* below the navel, *pitta* between the clavicle and navel, and *kapha* above the clavicle<sup>6</sup>. Generally there is a natural predominance of one or more *doshas* in an individual. In human body, functions like cell division, movement, and excretion of wastes are mainly governed by *vata prakriti*; while anabolism, growth, maintenance of structure, storage, and stability are contributed by *kapha*; and *pitta* is primarily responsible for metabolism, thermal regulation, and homeostasis<sup>7</sup>. Each

*prakriti* has specific physical, physiological, and psychological attributes (*gunas*) which totally depends upon involvement of each dosha in an individual<sup>8</sup>. Every individual must maintain their balance of *doshas* as determined by their *prakriti* in order to remain healthy.

*Prakriti* is believed to be determined at the time of conception and remain unaltered during the lifetime with contributions from environmental factors including maternal diet and lifestyle. Every individual can be categorized into various combinations of *vata*, *pitta*, and *kapha prakriti* depending upon the predominance of each dosha and is independent of race, ethnicity, language, and geography, which will be specific for each individual<sup>8</sup>. The susceptibility to different diseases depends upon the type of *prakriti* constitution in an individual. Therefore, assessment of *prakriti* analysis will not only help in understanding the physical and mental constitution of patient, but also plays a vital role in prognosis, diagnosis, treatment, and prevention of many complex diseases.

*Vata*, *pitta*, and *kapha prakriti* are found to have unique metabolic activities. According to Ayurveda, *kapha* is slow, *pitta* is fast, and *vata* is considered to have variable metabolism. Various studies have tried to

establish correlation between specific *prakriti* types and different metabolic activities occurring in the body. Recently, a study reported that body mass index (BMI) in *vata-pitta prakriti* was significantly less as compared to *kapha-pitta prakriti* and the *vata-pitta prakriti* individuals were found to be having maximum platelet aggregation<sup>10</sup>. Etiology of Obesity as per *Ayurveda-Acharya Charaka* has mentioned the *Nidana* of *Sthaulya* analytically in most of them is exogenous types of causes. Endogenous types of causes have been mentioned by *Acharya Sushruta & Vagbhatta*. *Vagbhatta* also mentioned *Ama* as causative factor. Only *Charaka* has defined *Beejdosha* as one of the cause of *Sthaulya*. In context with *Sthaulya*, exogenous causes are *Meda* stimulating diet & regimens where as *Dosha*, *Dhatu*, *Mala* & *Srotas* etc. come under endogenous *causes*. In modern science obesity is also caused by endocrinal disease pituitary:- Frohlich's syndrome, puberty adiposity, pregnancy, Thyroid-Hypothyroidism, Adrenal cortex- cushing's syndrome, Gonadal- Eunchoidism sometime polycystic ovary syndrome, Pancrease-islets-cell tumors. Some other reference of The *Ayurvedic* classical literature is documented along with many hypothetical concepts. An *anguli pramana* one of them

The *Sharir Pramana* is only tool for determining the *ayu* of an individual. Researchers have discovered that a quick study of the hands more specifically, the lengths of the index and ring fingers can tell a lot about a person's personality and risk of disease. Of course, your digits don't actually control these issues; it's closer to the other way around<sup>11</sup>. In boys, "during fetal development there's a surge in testosterone in the middle of the second trimester" that seems to influence future health and behavior, says Pete Hurd, a neuroscientist at the *University of Alberta*. One easy-to-spot result of this flood of testosterone: a ring finger that's significantly longer than the index finger. Scientists are not at the point where they can factor in finger length to arrive at a diagnosis, but they have gathered evidence that shows how this prenatal hormone imbalance can affect a person for life, from increasing or decreasing your risk of certain diseases.

**Modern view:** Anatomical changes in body related to endocrine disorder abnormal endocrine development/function can impact on many different systems. For example, insufficient maternal dietary iodine impacts on foetal thyroid gland thyroid hormone production, which in turn can lead to abnormal neural development. Alternatively,

we now know many environmental and therapeutic chemicals have a wide range of effects on the endocrine system. Sex hormones from the gonads have significant effects prenatally and postnatal, specifically at puberty with a role to play in male/female biological maturity and have wide actions throughout the body. Major glands are pituitary, thyroid, parathyroid, adrenal, pineal Body, reproductive organs, ovary and testis etc. Hormone Action Steroids – insoluble in water, carried in the blood and released near the vicinity of the target cell, Non-steroidal hormones - epinephrine, growth hormone, Prostaglandins – act locally, affecting only the organ where they are produced.

**Pituitary Gland<sup>12</sup>:** The hormones of the pituitary gland help regulate the functions of other endocrine glands. The pituitary gland has two parts—the anterior lobe and posterior lobe—that have two very separate functions. The hypothalamus sends signals to the pituitary to release or inhibit pituitary hormone production.

The pituitary gland is often dubbed the "master gland" because its hormones control other parts of the endocrine system, namely the thyroid gland, adrenal glands, ovaries, and testes. However, the pituitary doesn't entirely run the show. In some cases, the

hypothalamus signals the pituitary gland to stimulate or inhibit hormone production. Essentially, the pituitary acts after the hypothalamus prompts it.

Disorders - Pituitary adenomas arise from adenohypophyseal cells and are almost always benign<sup>13</sup>. They are arbitrarily designated as micro adenomas (<10 mm) and macro adenoma ( $\geq$ 10 mm). Autopsy studies suggest that up to 20% of normal persons harbor pituitary microadenomas<sup>14</sup>. Pituitary tumours discovered by computed tomography (CT) or magnetic resonance imaging (MRI) examination, in the absence of any symptoms or clinical findings, are referred to as *pituitary incidentalomas*. The prevalence of pituitary incidentalomas found by MRI is a Pituitary tumor can manifest with signs and symptoms of pituitary hypofunction, hormone hypersecretion, or mass effect. Impingement on the chiasma by a pituitary tumour results in visual field defects, most commonly bitemporal hemianopia<sup>15</sup>. Patients with sellar mass pressing on the optic chiasma should have a Humphrey visual field test. Lateral extension of the pituitary mass to the cavernous sinuses can result in diplopia, ptosis, or altered facial sensation. There is no specific headache pattern associated without 10%, and the majorities are micro

adenomas. Most patient with functioning adenomas present with sign and symptom related to hormonal hypersecretion: Acromegaly (via the action of GH and insulin-like growth factor -1, IGF-1), Cushing disease (via the action of ACTH and cortisol).

**Acromegaly**<sup>16</sup> is a rare disease caused by a GH-secreting pituitary adenoma in more than 99% of patients. At diagnosis, about 75% of patients have macro adenomas. The mean age at diagnosis is about 45 years. Clinical features of acromegaly may be related to excess GH or IGF-1 or to associated mass effect including hypopituitarism, because most patients present with pituitary macro adenomas. Excess growth hormone before the fusion of the epiphyseal growth plates results in gigantism. Acromegalic patients probably carry an increased risk of malignancy such as premalignant adenomatous colon polyps and colon cancer, although published data vary greatly in their findings clinical features<sup>17</sup>. Inside pituitary fossa bitemporal loss of vision due to compression of loss of vision, outside pituitary fosse - diplopia extra ocular muscles dysfunction, papilledema, Weight gain loss, heat intolerance increase sweating. skeleton changes - enlargement of hand and feet,

spade like hands, enlargement of supraorbital ridges, enlargement of facial bones and Prognathism, spacing part of teeth, clavicles thickened, changes in spine – osteoporosis, kyphosis, lordosis and scoliosis, carpal tunnel syndromes skin and subcutaneous tissue tongue enlarged with difficulty in articulation, thickening of lips and nose, skin coarse and greasy, thickening of soft tissue and hand and feet mammary hyperplasia, hypertrichosis. Hypopituitarism in juvenile on selective gonadotropic failure normal or increase stature, gonadal and genital underdevelopment, amenorrhea in female's selective growth hormone failure with dwarfism. Pituitary dwarfism very slow rate of growth and hypoglycaemic attacks in childhood, no mental defect and no disproportion in the size of the body and limb of the child, hypogonadism may be superadded. The bones are often thin and centre of ossification delayed in appearance<sup>18</sup>.

**THYROID DISEASES:** Hyperthyroidism Graves' disease is a type of autoimmune problem that causes the thyroid gland to produce too much thyroid hormone, which is called hyperthyroidism. Graves' disease is often the underlying cause of hyperthyroidism. Graves' disease may present clinically with one of these

characteristic signs:<sup>19</sup> exophthalmos (protuberance of one or both eyes) fatigue, weight loss with increased appetite, and other symptoms of hyperthyroidism/ thyrotoxicosis rapid heartbeat, muscular weakness. Two signs are truly 'diagnostic' of Graves' disease (*i.e.*, not seen in other hyperthyroid conditions): exophthalmoses and nonpitting oedema pretibial myxoedema. G Thyroid Gland Autoimmune problems—of which there are many different types—develop when your immune system causes disease by attacking healthy tissues. Researchers do not completely understand what causes autoimmunity, although there seems to be a genetic connection, as cases of Graves' disease tend to run in families. For unknown reasons, like many autoimmune diseases, Graves' is also more likely to affect women than men.

**Physical Signs and Symptoms -** If Graves' disease goes untreated, physical signs and symptoms may develop. Goitre - Goitre is an enlarged thyroid gland. A goitre related to Graves' disease is diffuse *thyrotoxic goitre*. As the thyroid gets bigger, the patient's neck may begin to look full or swollen. Sometimes goitre makes swallowing difficult, causes coughing, and may disrupt sleep. **Eye Problems -** Eye problems connected to Graves' disease can

go from very mild to very severe, which causes protruding eyes and limited eye movement. The medical term for this is *exophthalmos*, and it can make you appear as though you are staring. Skin Thickening - Some patients with Graves' disease may develop thickening of the skin over the front of the lower leg called the tibia. The disorder causes skin lesions that are patchy and pink. Rarely are other areas of skin affected. This skin problem is also called *pretibial myxoedema*.

In Hypothyroidism, Myxoedema or myxoedema is a term used synonymously with severe hypothyroidism. It is also used to describe a dermatological change that can occur in hypothyroidism, and some forms of hyperthyroidism. Myxoedema refers to deposition of mucopolysaccharide in the dermis, which results in swelling of the affected area. One manifestation of myxoedema occurring in the lower limb is pretibial myxoedema a hallmark of Graves's disease, an autoimmune form of hyperthyroidism. Myxoedema can occur in Hashimoto's thyroiditis and other long-standing forms of hypothyroidism, as well as Graves's disease.

Hashimoto's disease<sup>20</sup> Hashimoto's thyroiditis is an autoimmune disease, a disorder in which the immune system turns

against the body's own tissues. In people with Hashimoto's, the immune system attacks the thyroid. This can lead to hypothyroidism, a condition in which the thyroid does not make enough hormones for the body's needs. Located in the front of your neck, the thyroid gland makes hormones that control metabolism. This includes your heart rate and how quickly your body uses calories from the foods you eat. Hashimoto's symptoms may be mild at first or take years to develop. The first sign of the disease is often an enlarged thyroid, called goitre. The goitre may cause the front of your neck to look swollen. A large goitre may make swallowing difficult. Other symptoms of an underactive thyroid due to Hashimoto's may include Adrenal cortical hyper function:- Cushing's Syndrome<sup>21</sup> refer to the clinical manifestation induce by chronic exposure to excess glucocorticoid .Common symptoms of Cushing's syndrome (due to an adrenal, pituitary, or ectopic tumour) can include: moon face, buffalo hump, truncal obesity, upper body obesity, round face and neck, and thinning arms and legs, Skin problems, such as acne or reddish-blue streaks on the abdomen or underarm area, High blood pressure, Muscle and bone weakness, Moodiness, irritability,

or depression, High blood sugars, Slow growth rates in children.

Congenital Adrenal Hyperplasia (CAH)<sup>22</sup> Symptoms of CAH range from mild to serious. Some people with mild CAH are never diagnosed because their symptoms do not cause them any problems. Symptoms of the mild form of CAH, which can be diagnosed in children or adults, may include<sup>23</sup>: Shorter than average final height, Early signs of puberty (in children), Acne, Irregular menstrual periods and possible trouble getting pregnant (in women), Excess facial hair (in women).

Symptoms of the severe form of CAH, which is diagnosed in children, may include: Dehydration, Low blood pressure, Low blood sugar level, Trouble keeping enough salt in the body, Altered development of the external genitalia in girls, which is noted at birth and may require surgery to correct, Shorter than average final height, Early signs of puberty, Irregular periods and possible trouble getting pregnant (in women), Excess facial hair (in women), Benign testicular tumors and infertility (in men).

## DISCUSSION

In *Ayurvedic Samhita*, some description is similar to endocrine system. Some well known facts, e.g. concept of *Ayurvedic* contraceptives, gonads, *Shukra*, liver, *Vajikarana* etc., are the areas of *Ayurveda* which can be closely correlated to the modern endocrine system. An endocrine disorder – Goitre is described in *Ayurveda* as *Galganda*. Administration of testicular tissue (Organotherapy) is also described for cure from impotency.

Concept of *Dosha* and Endocrine system can also be correlated. *Dosha*, which are invisible, are the working state and systems of the body. *Vata* shows high in activity, *Pitta* is a state where body is on a hyper mode and third is the *Kapha* which tells that system is slow and sluggish. The same is the endocrinology or effect of endocrine glands on the body. There are three states of the body, under the effect of the normal, hyper and hypo secretion of glands.

*Ayurveda* talks about the complete body and in modern sciences we are concerned about certain objects, not the complete body. So there is nothing different in the body. If someone is gaining the weight that is the effect of the low *Vata* or high *Kapha* and treatment is the balancing of these *Dosha*.

Healthy axis between body and mind - As we know these hormones are more like the

axis between the mind (not the brain) and the body, so it is important to remove the stress and to maintain the axis properly functioning for the complete health. A number of glands that signal each other in sequence are usually referred to as an axis, for example, the hypothalamic- pituitary- adrenal axis.

## CONCLUSION

The whole system comprises the three parts – Body, mind and spirit. These three work in accordance to each other. The missing link between the Mind and Body on which modern sciences have poured the money in millions is the endocrine system. Endocrine anatomical disorders, either caused by hyper or hypo functioning, are similar to the concept of *Dosha* in *Ayurveda*.

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