

# **HORMONAL CONTROL IN HUMANS, AND THE IMPACT ON THE MALFUNCTIONING OF THIS GLAND ON LIFE STYLES: A CRITICAL STUDY**

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## **ABSTRACT**

Endocrine glands secrete hormones that are extremely important for the functioning of the human body, any sort of malfunctioning can lead to havoc in the system. Each gland is as important as the other, but amongst them the more important ones are Pituitary, Adrenalin, and Thyroid. The pituitary is connected with the nervous system and ensures chemical balance in the human body. The cure to malfunctioning of such glands are in allopathic drugs which have, due to the increasing extent of malfunctioning, has improved in their impact and scope.

Lifestyle changes are recommended to ensure prevention of the disease.

**Keywords:** Endocrine Glands, Pituitary, Adrenalin, Thyroid, Allopathic medicines, lifestyle changes.

**Research Question:** The paper would research the malfunctioning of the endocrine glands on the health of individuals. The extent to which these glands under or over produce hormones impact the body systems adversely. What would be the effects of a dysfunctional Hormone on the human body? Could these issues be solved by allopathic medication, or is it possible for a prevention of such an impact? Are they age, culture, food habits, or environment related maladies? These are some of the questions that would be attempted in the course of the paper.

## **1. Introduction**

Adolf Butenandt, Tadeus Reichstein and Edward Adelbert Doisy discovered hormones in the 1920s and 1930s. Endocrine glands are a special group of cells in the human body that produce Hormones. These are one of the many substances that are made by glands which are in the human body. They enter the bloodstream and are sent to distinct organs by complex biological

processes to regulate physiology as well as behaviour. Therefore, playing an important role in controlling the actions of certain cells and organs, they can also be called ‘chemical messengers’, that coordinate different functions of the body.

There are a huge number of hormones that regulate many of the body functions which include growth, development, metabolism, electrolyte balances and reproduction.

## 2. Definition

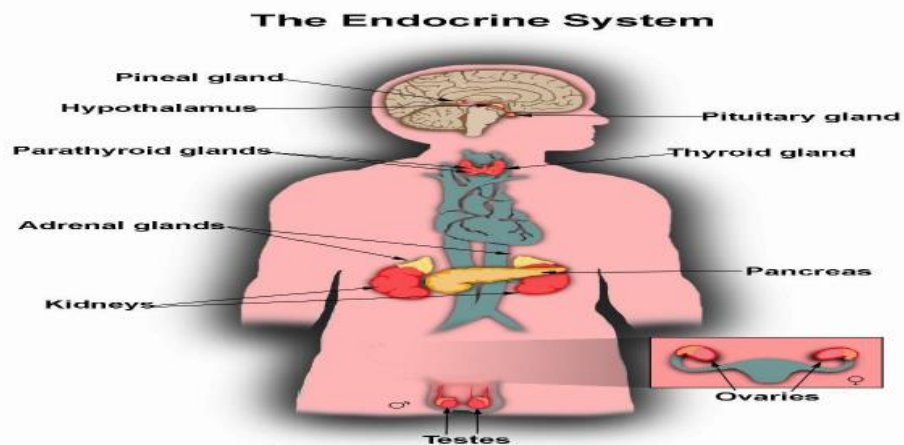
For the body to function smoothly, all the parts and the organs must communicate with each other in a ‘homeostasis state’. This means that neither the body temperature nor the levels of salt and minerals (electrolytes) in the blood should fluctuate beyond the predetermined levels.

There two systems which help in communication:

- The nervous system
- The Hormonal system (neuroendocrine system)

The first is responsible for rapid transmission of information within fractions of seconds between different body regions, while the second relies on the production as well the release of hormones from the glands and the transportation of these via the bloodstream, ensuring widespread and longer lasting regulatory actions. Both the above are complementary to each other. Stimuli from the nervous system influences the release of certain hormones and vice versa.

**Figure 1: The Endocrine System**



Source: Google Image

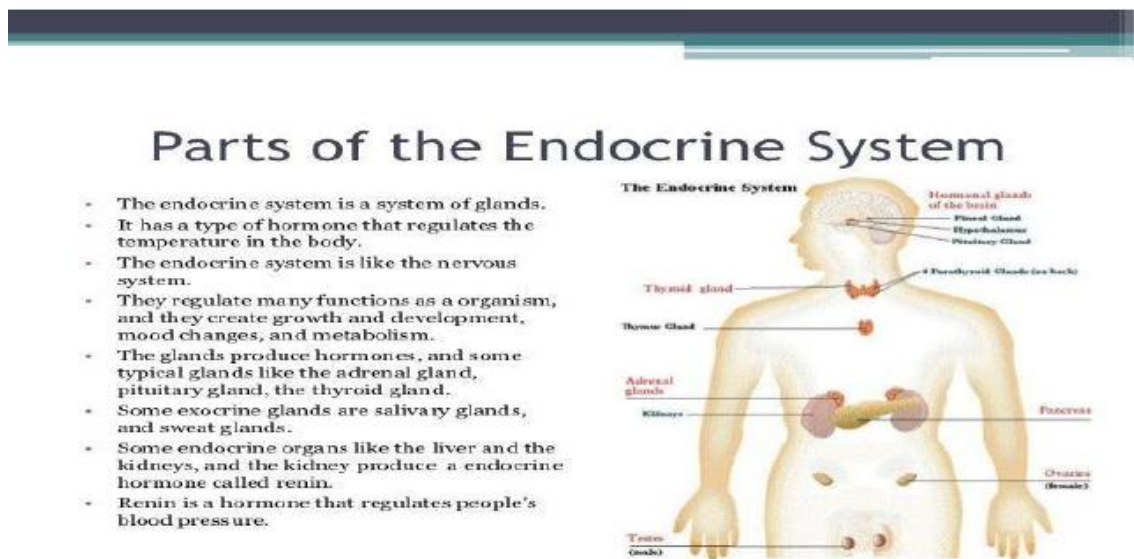
### 3. Parts and Functioning of the Endocrine system

The endocrine system is responsible for the regulation of a huge range of body functions, through the release of hormones. These hormones are released by glands of the endocrine system, whereby they travel through the bloodstream to various organs and tissues. The message is passed to the various organs and tissues, telling them ‘What to do/’ or ‘How to function?’.

The bodily functions that are controlled by the endocrine system are

- Metabolism
- Growth and development
- Heart rate
- Blood pressure
- Appetite
- Sleeping and waking cycles
- Body temperature.

Figure 2: Working of the Endocrine System



Source: Google Image

### 3.1 Types of Glands

There are two types of Glands in the Human Body:

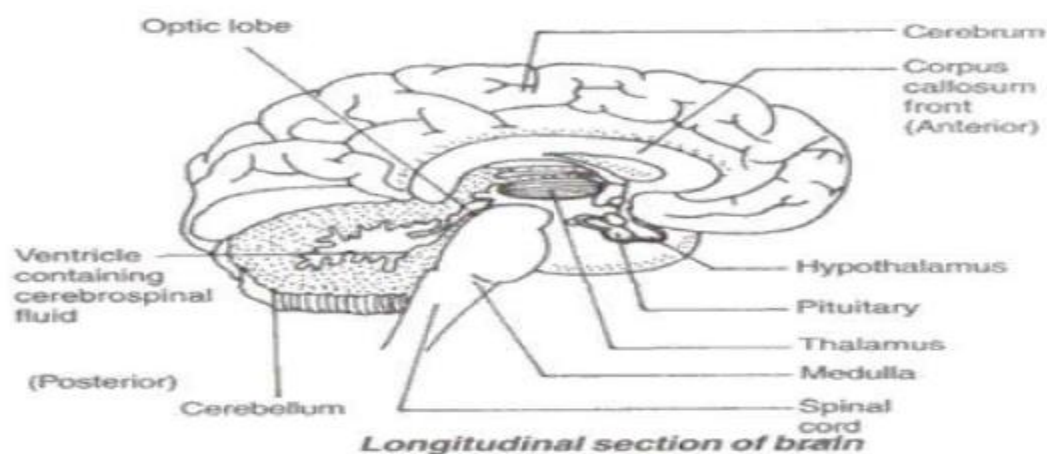
- Endocrine glands: These organs produce *hormones* that are directly released into the bloodstream. They then travel to tissues and organs all over the body. They do not have ducts.
- Exocrine glands: These *secrete substances* into a ductal system and further into an epithelial surface e.g., sweat, tears, saliva, milk and digestive juices that are released through a duct or an opening to a body surface.

### 3.2 Endocrine System

Hormones are molecules that are produced by endocrine glands. The endocrine glands are:

- Hypothalamus: This gland is present in the brain. Its function is to coordinate the endocrine system and link it with the nervous system. The Hypothalamus receives signals from various parts of the brain, and then releases as well as inhibits hormones based on these signals.
- Pituitary: The gland is located at the base of the brain, and is often called the ‘master gland’ as it plays an important role in a large number of functions of the body. These hormones either direct certain processes within the body or stimulate other glands to produce hormones. The pituitary gland produces the following hormones.

**Figure 3: Image of the Pituitary gland and the Hypothalamus**



Source: Google Image

- Prolactin (stimulates breast milk production, can also affect menstrual periods, sexual functionality, and fertility)
- Growth hormone (GH): This stimulates growth in childhood as well as maintains healthy muscles and bones in people of all ages.
- Adrenocorticotropin (ACTH): Cortisol is produced by this gland, which helps in maintaining blood pressure and blood sugar levels. It is also known as the “stress hormone”. The body produces a large amount of it when in stress.
- Luteinizing hormone (LH): This produces testosterone in the body.
- Follicle stimulating hormone (FSH): Helps in stimulating sperm production in males.
- Antidiuretic hormone (ADH): Produced by the hypothalamus but is stored and released from the posterior pituitary gland. It regulates water balance and sodium levels in the blood.
- Oxytocin: This too is produced in the hypothalamus but is stored and released from the posterior pituitary gland. It causes milk to flow during breastfeeding, as well as the progress of labour during child birth.
- Adrenal: These are found on top of both the kidneys. They are important in maintaining proper cardiovascular function, helping to respond to stressful situations, distribution of stored fats, production of body odour and pubic hair, and in promoting a healthy gastrointestinal system.
- Gonads (i.e., testes and ovaries): The ovaries are present in females and produce eggs as well as hormones like oestrogen, testosterone and progesterone. They play an important role in reproductive organ development, breast development, bone health, pregnancy and fertility. The testes are present in males and produce testosterone, which promotes the growth of the penis, as well as facial and body hair.
- Thyroid: located in front of a person’s neck. It is important in controlling an individual’s metabolism. It directly impacts the way a body uses energy, consumes oxygen and produces heat in the body system.
- Parathyroid: Is a set of four glands that are behind the thyroid gland. They facilitate the creation of Vitamin D, controlling an individual’s phosphorus and calcium levels. Extremely important for bone development and health.

- Pancreas: Important for maintaining healthy blood sugar in the body. This gland produces insulin and glucagon in the body.

The hormones can be classified according to its source, function, and its chemical structure into four types:

- Peptides
- Steroid hormones
- Amino acid derivatives
- Fatty acid derivatives

#### **4. Impact of Malfunctioning of glands**

The immediate impact of the malfunctioning of the endocrine gland is on growth and development, metabolism, sexual function and mood. The symptoms could be:

- Fatigue
- Weakness
- Unintended weight fluctuations
- Changes in blood glucose level
- Changes in cholesterol levels.
- Insomnia
- Brittle bones
- rashes on the skin
- Acne

##### 4.1 On the Human Body

The three main causes of the malfunctioning could be:

- 1) Underproduction of a certain hormone
- 2) Overproduction of a certain hormone

3) A malfunctioning in the production path of the hormone

Medical conditions that can affect hormone production are:

- Diabetes, a situation in which the body does not produce the hormone insulin
- Hyperthyroidism and hypothyroidism, this implies overactivity and underactivity of the thyroid gland
- Addison's disease, in this case the adrenal glands do not produce enough hormones
- Cushing's syndrome, where the adrenal gland produces excess corticosteroids
- Acromegaly, resulting in over production of growth hormones, resulting in uneven growth of the human body.
- Hyperglycemia, overproduction of glucagon, leading to weight loss, diabetes, and mucosal abnormalities.
- Hypoglycemia, the body produces more insulin than glucose in the blood, leading to diabetes
- Pituitary tumours (The pituitary and hypothalamus work together to regulate the daily level of hormones required in the body. If the level of hormones drops, it stimulates the hypothalamus to release the required quantity. Once they travel to the pituitary gland, they are further transported to other endocrine glands, say the endocrine gland, to increase or decrease production as the case may be. Tumours may result in decreasing amounts of production, further leading to malfunctioning of some body systems.
- Iodine deficiency (goitre). Iodine is a mineral of the earth. The body needs iodine to make thyroid hormones. Iodine is obtained through the food that we eat; it is also added to table salt. The government has ensured fortified products to make up for some of the deficiencies that might arise due to dietary considerations. This deficiency is a significant cause of mental development problems in children, resulting in negative implications on the reproductive functions, as well as on the IQ levels in school going children. The most serious consequences are brain damage and irreversible mental retardation, that is caused by iodine deficiency.

Several environmental and genetic factors interfere with the process of thyroxine synthesis which results in goitre formation. The most important environmental factors are

1) iodine deficiency in the environment 2) goitrogens. These are chemical substances that occur

primarily in plant foods. These interfere in thyroxine synthesis by inhibiting the enzymes involved in the synthesis of thyroxine. Iodine enters the body in the form of iodate or iodide in the water and the food that is eaten. The iodate is converted to iodide in the stomach. The thyroid gland traps and concentrates iodide and uses it in the synthesis and storage of thyroid hormones.

**Figure 4: Iodine Deficiency Disorders**

### Iodine Deficiency Disorders



Goiter



Cretinism

**Source: Google Image**

#### 4.2 On the life style

Endocrine dysfunctions could lead to various neurologic manifestations, like headaches, myopathy, and at times coma. Besides these the other effects could include:

- Vomiting
- Vision changes
- Irritability could also be discovered in small children
- Optic atrophy and vision.

There are serious repercussions when the endocrine system malfunctions. Each one of them is important in the smooth functioning of the body. The Pituitary gland is an extremely important one and so is the thyroid gland. Insufficiency of the hormone adversely impacts behavioural and cognitive changes, seizures, psychosis, involuntary movements, lethargy, diarrhoea, nausea, vomiting and in extreme cases coma and heartfailure.



If any of the above symptoms are noticed, it is essential to address it and take remedial measures to correct it. Medication in most cases is the answer, but the right dosage has to be decided on the continuous consultation with the specialist. It is a possibility that a long and prolonged intake of the medicine may be required to address the disease, at times it might be a lifelong dependency on the medicine. This is a small price to pay compared to the effects that the malfunctioning of the hormone generates.

### **5). Reasons and Diseases associated with the malfunctioning of Glands**

Endocrine disorders could be grouped into two categories

- Endocrine disease that results due to the deficient or excessive production of the hormone, also known as hormone imbalance.
- Endocrine disease due to the development of lesions (nodules or tumours) in the endocrine system. These may or may not affect hormone levels.
- Excess hormones in the blood stream could be due to the fact that the feedback system is not sending the correct signals, or the body is not clearing them out of the blood stream correctly, the failure of a gland to stimulate another to release hormones (a problem with the hypothalamus could disrupt hormone production in the pituitary gland), congenital hypothyroidism causes malfunctioning of the thyroid gland, infection, injury to the gland, or a tumour of a gland.
- Most lumps on the gland are non-cancerous, and are unlikely to spread to the rest of the body, the fact that they exist on the gland could result in the malfunctioning of the gland.
- Diabetes is one of the most common endocrine disorders.
- Adrenal insufficiency leads to fatigue, stomach upset, dehydration and skin changes.
- Cushing's disease is a result of overproduction of the pituitary gland hormone, which may occur both in adults and children when they are on a high dosage of corticosteroid medication.
- Gigantism and other growth hormone problems. An excess amount of hormone generation by the pituitary gland results in a child's bone and body parts to grow excessively, and on the contrary if it is too low the child might stop growing in height.
- Hypopituitarism, this is a disease when the pituitary gland releases little or no hormones due to different diseases, resulting in a condition that a woman might stop getting her

periods.

- Multiple endocrine neoplasia, these are rare genetic conditions that are passed down causing tumours of the parathyroid, adrenal and thyroid glands leading to overproduction.
- Polycystic ovary syndrome (PCOS), this is a leading cause of infertility as it interferes with the development of eggs and their release from female ovaries.

### 5.1 Common Symptoms and their redressal

The earliest visible symptoms of an endocrine disorder are fatigue and weakness. Blood and urine tests are recommended by the doctor to check any malfunctioning of the endocrine gland. This may pinpoint a nodule or a tumour.

Treatment of endocrine disorders can be complicated as medication that is administered to correct the balance of one hormone may well interfere with the functioning of another gland. Regular and routine tests are recommended to adjust the dosage of the medicines.

### 5.2 Natural Prevention of a Hormonal Balance.

Lifestyle changes can go a long way in prevention of such imbalances. This could be achieved by:

- Maintaining a healthy weight
- Eating a balanced, healthy diet
- Exercising regularly
- Managing stress levels
- Quality sleep
- Avoid smoking
- Eating the required amount of proteins
- Low sugar intake

Medically this disorder could be treated by

- Medication to rebalance hormones and treat symptoms

- Chemotherapy and/or radiation therapy for patients with cancerous tumours of the endocrine gland
- Surgery to remove a tumour on a gland that is affecting hormone production.

Recent medical research has developed novel drugs that have developed as a consequence of better understanding of the pathophysiology of endocrine conditions.

The new discovery is based on the control of hormone hypersecretion and replacement of hormone deficiencies. The main aim is to reduce long term morbidity and mortality associated with hormone hypo-or hypersecretion as well as to improve the living lifestyle of the individual. Some common examples in curing for example Cushing's disease is the surgical removal of the adrenocorticotrophic hormone (ACTH) -secreting pituitary tumour.

Cabergoline, for the treatment of Dopamine (D)<sub>2</sub> receptors have been identified in corticotrope tumours.

Acromegaly, the first line of treatment for this malfunctioning is surgery.

Adrenal insufficiency requires hydrocortisone replacement dose, insufficiency is likely to result in cardiovascular disease and bone loss.

PCOS is a common cause of female infertility, clomiphene is found to be a superior medicine in achieving live birth in women suffering from PCOS.

The above are indicators on the extent of continuous research that is going on continuously in trying to limit the extent of damage that occurs when any of the endocrine gland's malfunction.

## **6. Conclusion**

The endocrine system of the human body is an extremely important wheel in the smooth functioning of the human system. The chemical impulses which are generated primarily by the pituitary gland generate important signals for the functioning of the rest of the body. Any malfunctioning of any of the glands can lead to a lot of stress on the body.

Research in managing these abnormalities have developed in leaps and bounds in recent years. There are lifestyle changes which can prevent the onset of the malfunctioning of the gland, besides this if the disease does come upon a person, then there are an adequate number of drugs that have been discovered which can control the secretion of hormones. Care should be taken in administering the dosage quantity of the drug so that it does not interfere with the normal functioning of other systems of the body.

Besides allopathic cure, there are alternative cures that are available that can help in prevention of the malfunctioning of the gland, this is found in the daily practice of yoga and meditation, which helps in maintaining a healthy and as far as possible a stress-free existence. It is extremely important to try as far as possible to prevent disease, but in case that is not always possible, timely addressal of the disease through medicines can always correct the problem.

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