Acquired Hypothyroidism in Children:

What is Hypothyroidism?

Hypothyroidism is a condition characterized by an underactive thyroid gland, meaning the thyroid gland does not produce enough thyroid hormones to meet the body's needs. The thyroid hormones, primarily thyroxine (T4) and triiodothyronine (T3), play crucial roles in regulating various bodily functions, including metabolism, heart rate, body temperature, and energy levels.

What Causes Acquired Hypothyroidism?

T*Hypothyroidism can develop due to various factors, including:*

*1. **Autoimmune Thyroiditis (Hashimoto's Thyroiditis)**: The most common cause of hypothyroidism in iodine-sufficient regions is Hashimoto's thyroiditis, an autoimmune disorder where the body's immune system mistakenly attacks the thyroid gland, leading to inflammation and eventual destruction of thyroid tissue.*

*2. **Thyroid Surgery or Radioactive Iodine Treatment**: Surgical removal of the thyroid gland or treatment with radioactive iodine for conditions such as hyperthyroidism (overactive thyroid) can result in hypothyroidism.*

*3. **Congenital Hypothyroidism**: Some individuals are born with an underactive thyroid gland due to abnormalities in thyroid development or hormone synthesis, leading to congenital hypothyroidism.*

*4. **Iodine Deficiency**: In regions with insufficient dietary iodine intake, hypothyroidism can develop due to inadequate production of thyroid hormones.*

*5. **Medications**: Certain medications, such as lithium (used to treat bipolar disorder) and amiodarone (used to treat heart rhythm problems), can interfere with thyroid function and lead to hypothyroidism.*

*6. **Pituitary or Hypothalamic Disorders**: Dysfunction of the pituitary gland or hypothalamus, which regulate thyroid hormone production, can result in secondary hypothyroidism.*

What Are the Signs and Symptoms of Hypothyroidism?

The signs and symptoms of hypothyroidism include:

- Tiredness
- Modest weight gain (no more than 2.5-5 kg)
- Feeling cold
- Dry skin
- Hair loss
- Constipation
- Poor growth

Often, your child's doctor will be able to palpate an enlarged thyroid gland in the neck. This is called a *goiter*.

How is Hypothyroidism Diagnosed?

Simple blood tests are used to diagnose hypothyroidism. These include the measurement of hormones produced by the thyroid and pituitary glands. Free T_4, total T_4, and TSH levels are usually measured. These tests are inexpensive and widely available at your regular doctor's office.

Primary hypothyroidism is diagnosed when the level of stimulating hormone from the pituitary gland (TSH) in the blood is high and the free T_4 level produced by the thyroid is low. Secondary hypothyroidism occurs if there is not enough TSH, both levels will be low.

Normal ranges for free T_4 and TSH are somewhat different in children than adults, so the diagnosis should be made in consultation with a pediatric endocrinologist.

How is Hypothyroidism Treated?

Treatment for hypothyroidism usually involves lifelong thyroid hormone replacement therapy with synthetic thyroxine (levothyroxine) to normalize hormone levels and alleviate symptoms. Regular monitoring of thyroid function is necessary to ensure that hormone levels remain within the target range.

There is no cure for hypothyroidism; however, hormone replacement is safe and effective. With once-daily medication and close follow-up with your pediatric endocrinologist, your child can live a normal, healthy life.

Hyperthyroidism:

What is Hyperthyroidism?

Hyperthyroidism is a medical condition characterized by an overactive thyroid gland, which leads to excessive production of thyroid hormones. The thyroid gland, located in the front of the neck, produces hormones that regulate various bodily functions, including metabolism, heart rate, and body temperature.

When someone has hyperthyroidism, their thyroid gland produces an excess amount of thyroxine (T4) and triiodothyronine (T3) hormones. This surplus of thyroid hormones can speed up the body's metabolism, resulting in symptoms such as weight loss, rapid or irregular heartbeat, sweating, nervousness, irritability, fatigue, and heat intolerance.

What Are the Possible Signs and Symptoms of Hyperthyroidism?

- Enlargement of the thyroid gland (goiter); usually painless
- Weight loss, despite a typical or even an increased appetite
- Excessive sweating
- Feeling too warm when others are comfortable
- Rapid heart rate or heart palpitations
- Poor school performance
- Mood swings
- Difficulty sleeping
- Bulging or prominence of the eyes
- Tremors of the hands
- Hyperactivity or restlessness
- Increased frequency of bowel movements or diarrhea

What Causes Hyperthyroidism?

Hyperthyroidism can be caused by various factors, including:

1. Graves' disease: This is the most common cause of hyperthyroidism. It's an autoimmune disorder where the body's immune system mistakenly attacks the thyroid gland, causing it to produce too much thyroid hormone.
2. Thyroid nodules: These are lumps or growths on the thyroid gland that can become overactive and produce excess thyroid hormone independently of the body's regulatory mechanisms.
3. Thyroiditis: Inflammation of the thyroid gland due to viral infections or autoimmune conditions can cause temporary hyperthyroidism as

thyroid hormones stored in the gland are released into the bloodstream.
4. Excessive iodine intake: Consuming too much iodine, either through diet or medication, can lead to hyperthyroidism, especially in susceptible individuals.
5. Overstimulation of the thyroid gland: This can occur due to tumors of the pituitary gland or thyroid-stimulating hormone (TSH)-producing tumors elsewhere in the body, which prompt the thyroid gland to produce excess thyroid hormone.
6. Certain medications: Some medications, such as amiodarone, interferon-alpha, and lithium, can interfere with thyroid function and lead to hyperthyroidism.
7. Congenital conditions: Rarely, infants may be born with hyperthyroidism due to conditions such as neonatal Graves' disease, where antibodies from the mother affect the baby's thyroid function.

How is Hyperthyroidism Diagnosed?

Hyperthyroidism is typically diagnosed through a combination of medical history, physical examination, and laboratory tests. Here's an overview of the diagnostic process:

1. Medical history and physical examination: Your healthcare provider will ask about your symptoms, medical history, family history of thyroid disorders, and any medications you're taking. They will also perform a physical examination to check for signs such as an enlarged thyroid gland (goiter), rapid heartbeat, tremors, and eye changes (common in Graves' disease).
2. Blood tests: Blood tests are used to measure levels of thyroid hormones and thyroid-stimulating hormone (TSH) in the bloodstream. In hyperthyroidism, T4 (thyroxine) and T3 (triiodothyronine) levels are usually elevated, while TSH levels are low because the pituitary gland senses high thyroid hormone levels and reduces its production of TSH.
3. Thyroid ultrasound: An ultrasound of the thyroid gland may be performed to evaluate its size, structure, and the presence of nodules or other abnormalities.

4. Radioactive iodine uptake (RAIU) test: This test involves ingesting a small amount of radioactive iodine or a similar substance and then measuring the amount of iodine absorbed by the thyroid gland using a special scanner. Different patterns of iodine uptake can help differentiate between various causes of hyperthyroidism, such as Graves' disease or thyroid nodules.
5. Thyroid scan: A thyroid scan, often performed alongside the RAIU test, involves using a radioactive tracer to create images of the thyroid gland. This can help identify areas of increased or decreased activity within the gland.
6. Antibody tests: In cases where autoimmune thyroid disease, such as Graves' disease, is suspected, blood tests may be conducted to detect specific antibodies (such as thyroid-stimulating immunoglobulin or TSH receptor antibodies) that are characteristic of these conditions.

Once hyperthyroidism is diagnosed and the underlying cause is identified, appropriate treatment options can be discussed with the healthcare provider.

How is Hyperthyroidism Treated?

There are 3 main ways to treat hyperthyroidism: antithyroid medications, radioactive iodine ablation, and surgery. Sometimes, medications called beta (β)-blockers are used initially to help relieve the symptoms of hyperthyroidism, but they do not reduce thyroid hormone levels. Optimal treatment will depend on the underlying cause of hyperthyroidism.

- *Antithyroid medications*. *Methimazole* or *carbimazole* is the first-line medical therapy in children. It is generally well tolerated. Potential side effects include hives, and rarely joint aches, high liver enzymes, and low white blood cell counts. (Propylthiouracil, a drug related to methimazole, is used less often in children because of a higher risk of serious liver side effects.)

Approximately 1 out of every 3 children or adolescents who take methimazole for Graves’ disease will be able to stop after 2 years. Some may never need to restart treatment; others may experience hyperthyroidism again.

- *Radioactive iodine ablation*. Radioactive iodine is swallowed as a capsule or drink. It painlessly destroys the thyroid gland slowly over several months, so that the thyroid gland no longer makes thyroid hormone. The individual eventually has hypothyroidism (too little thyroid hormone) and must take a pill containing thyroid hormone every day.

This treatment is very well tolerated and safe in children. It should not be given to women of childbearing age without first ensuring that they are not pregnant.

- *Surgery*. Surgical removal of the thyroid gland causes a rapid decrease in thyroid hormone levels. Subsequently, the individual has hypothyroidism and must replace thyroid hormone by taking a pill each day.

Thyroid surgery is more risky than radioiodine and should be performed by an experienced surgeon. Possible risks include damage to the nearby parathyroid glands (which control blood calcium levels) and recurrent laryngeal nerve (which controls the voice).

- *β-Blockers*. In the early stage of treatment, β-blocker medicines, like propranolol or atenolol, are sometimes used to increase the comfort level of the young person with hyperthyroidism by decreasing the severity of symptoms caused by hyperthyroidism. Although these drugs will not affect the blood levels of thyroid hormones, they can help the patient feel better by decreasing symptoms such as palpitations, rapid heart rate, tremors, and anxiety.

Ask the pediatric endocrine doctors to explain these types of treatments. The doctors will help you to select the most appropriate treatment for your child.