

# A Review On: Recent Advances in The Treatment of Thyroid Disorder

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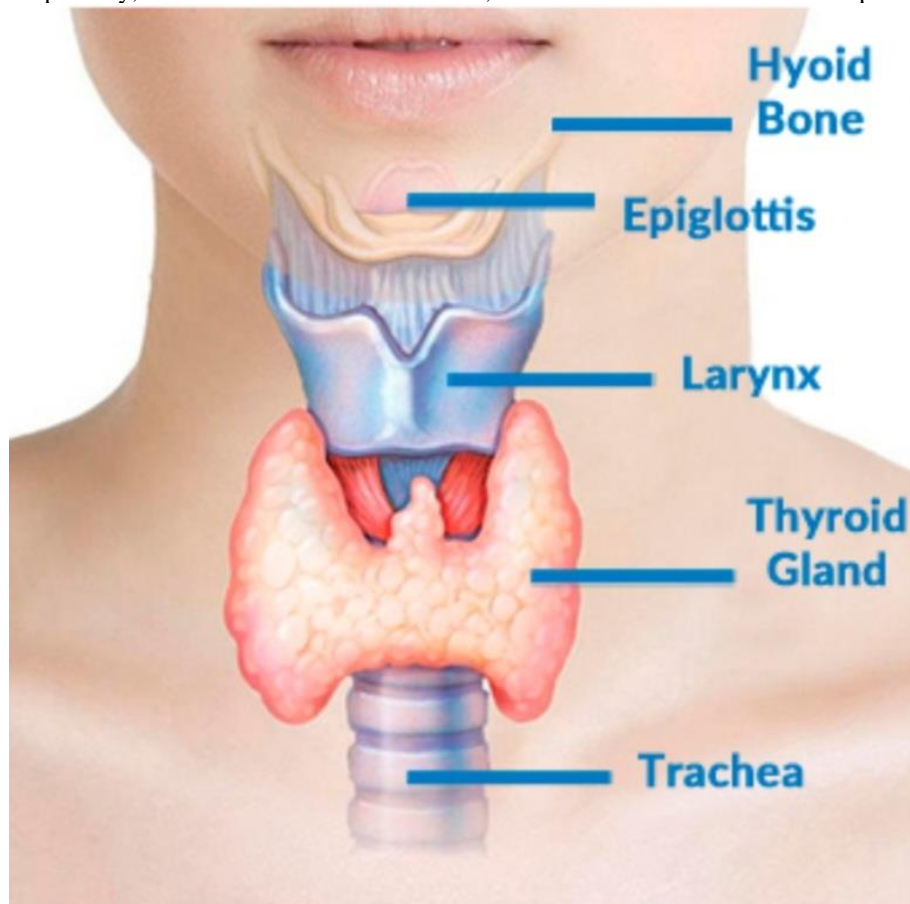
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**ABSTRACT:** Thyroid disorder is a medical condition that affects the functions of the thyroid gland. The thyroid gland is located at the in front of the neck and produces thyroid hormones that travel through the blood to help regulate many other organs that is endocrine organ. Thyroid hormones affects the all organ systems excess can cause increased metabolic rate, heart rate, ventricle contractility, and gastrointestinal motility as well as muscle and central nervous system (CNS). The thyroid hormones control the metabolism of cells, which is their speed of activity. The thyroid hormones normally act in the body to regulate energy use, infant development, and childhood development. In patient features of hypothyroidism or hyperthyroidism thyroid function tests only confirm the diagnosis. Though TSH is widely used as a screening test in suspicion with thyroid disorder, many times TSH alone may be misleading. TSH along with T3 and T4 should be performed with will resolve the problems. Discordant results between TSH, T3 and T4 may be because of various conditions like Subclinical hypo-or hyperthyroidism, non-thyroidal illness, drugs etc. In pregnancy lower TSH reference ranges have to be considered and thyroid function should be monitored throughout pregnancy to avoid harm to the foetus caused by maternal thyroid dysfunction.

**KEYWORDS:** Thyroid disorder, Hypothyroidism, Hyperthyroidism, TSH, Pregnancy.

## INTRODUCTION:

Thyroid diseases are among the most prevalent of medical conditions. The patient may present with obvious features of hypothyroidism or hyperthyroidism. In these conditions thyroid hormone (TH) concentration only confirm the diagnosis. However, in many patients the signs or symptoms can be nonspecific, vague or mild, especially in females. In these conditions, clinicians have to rely on the laboratory for assistance in the diagnosis of thyroid disorders.<sup>(1)</sup> All organ systems are affected by thyroid hormones. Thyroid hormones increase metabolic rate, heart rate, and ventricle contractility, as well as muscle and central nervous system (CNS) excitability. Two major types of thyroid hormones are) tri iodothyronine (T3) and thyroxin (T4) released in the ratio of 20:1, respectively. Peripherally, T3 is converted to the active T4, which is three to four times more potent than T4.<sup>(2)</sup>

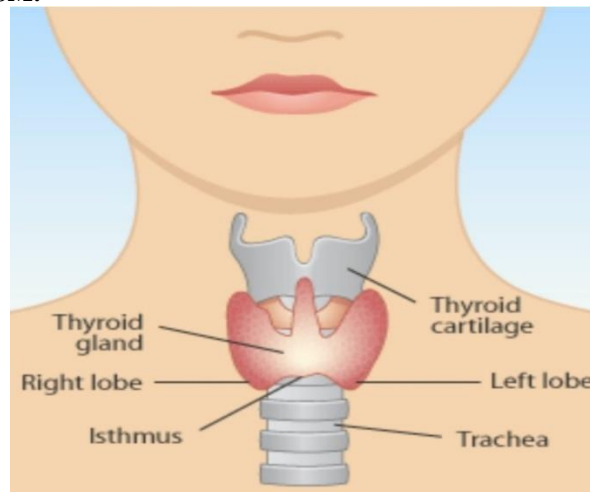


**Picture of thyroid disorder:**

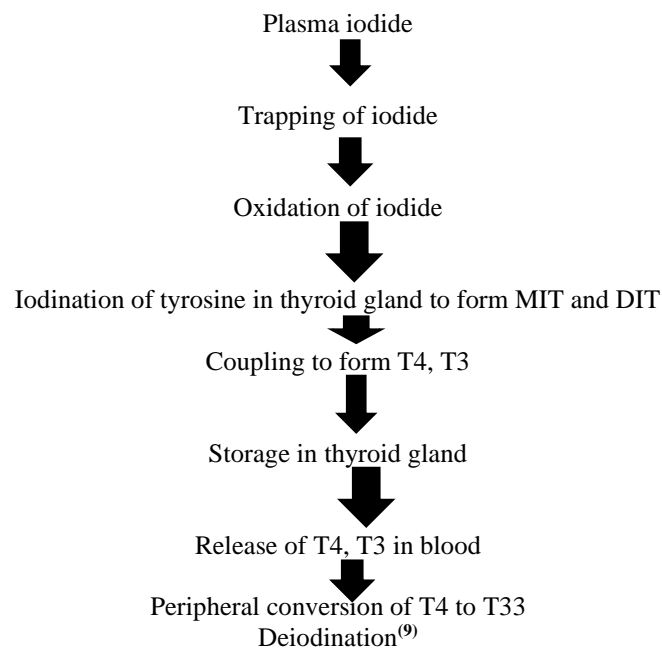
Thyroid disorders are the second most common endocrinopathies found in pregnancy. Significant thyroid disease complicates about 0.8% of all pregnancies approximately 0.2% hyperthyroid and 0.6% hypothyroid. Disease of the thyroid is generally much more prevalent in females than in the males and with marked preference for women in the reproductive age group, of which 5 - 15% may be affected.<sup>(3)</sup> The prevalence of thyroid disease in pregnancy is however less than expected for the age-related population because thyroid diseases significantly affect fertility rate and autoimmune thyroid disease tend to remit during pregnancy. Thyroid dysfunction during pregnancy had been an important research area in clinical endocrinology due to the fact that thyroid dysfunction has immense impact on maternal and fetal outcomes. More importantly, children born to hypothyroid mothers have poor intellectual function during later part of their life. There has been a wide geographic variation in prevalence of hypothyroidism during pregnancy. It varies from 2.5% from the West to 11% from India.<sup>(4)</sup>

**CLASSIFICATION OF THYROID DISORDER:****HYPOTHYROIDISM:**

Hypothyroidism is a clinical syndrome resulting from a deficiency of thyroid hormones. There is a generalized slowing down of metabolic process. Most common cause of hypothyroidism is excess iodine can transiently inhibit iodine organification and thyroid hormones synthesis.<sup>(5)</sup> Hypothyroidism is by a lack of thyroid hormones. It is a common endocrine disorder caused by autoimmune thyroiditis [Hashimoto thyroiditis], iodine deficiency or following surgery or radioiodine therapy. In Primary hypothyroidism TSH will be elevated and fT4 and fT3 are decreased.<sup>(6)</sup> Primary hypothyroidism is caused by

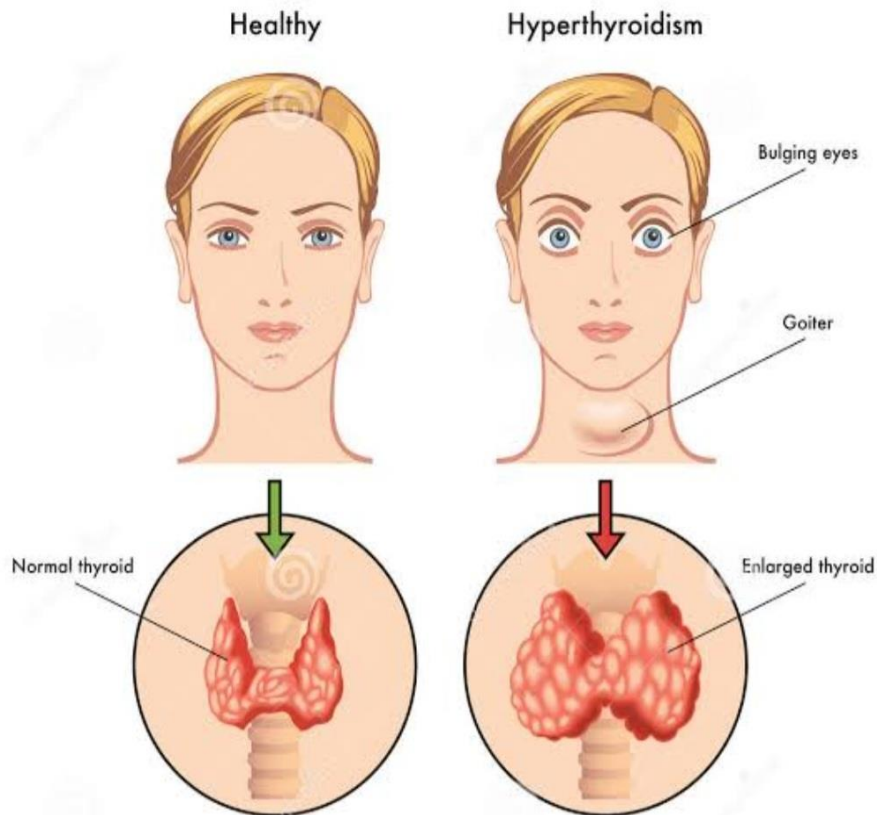
**PICTURE OF HYPOTHYROIDISM:**

Conditions namely Graves' disease, multinodular goitre, or toxic nodule in which TSH is usually very low Further clinical features help to separate these three conditions. Similarly, features of hypothyroidism may be seen in patient getting treatment for hyperthyroidism, patient who had undergone total thyroidectomy along with patient who had history of radiation. Rare conditions like congenital condition when thyroid tissue is absent, thyroid dysgenesis, iodine transport defect, intake of goitrogens (broccoli, cabbage) may also lead to hypothyroidism.<sup>(7,8)</sup>

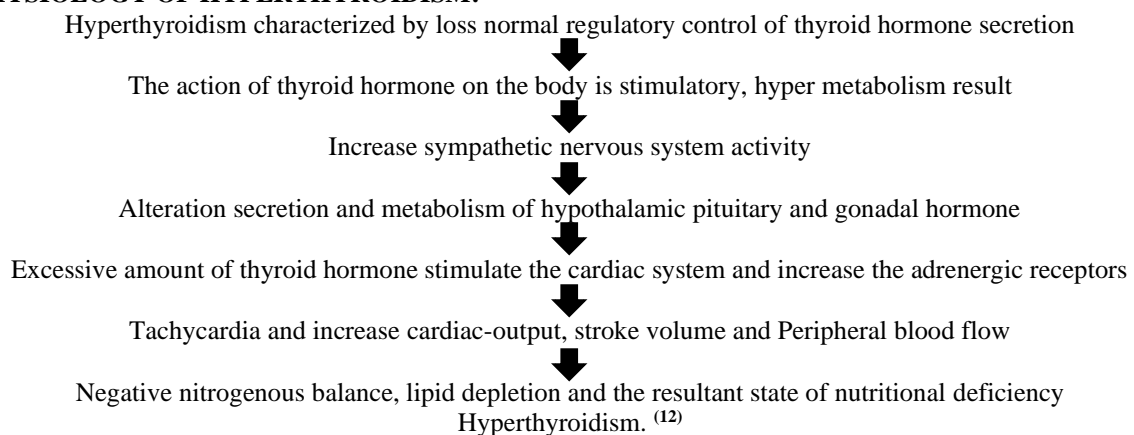
**PATHOPHYSIOLOGY OF HYPOTHYROIDISM:****Synthesis of thyroid hormones:**

**HYPERTHYROIDISM:**

Hyperthyroidism is hyperactivity of the thyroid gland with sustained increase in synthesis and release of thyroid hormones. Hyperthyroidism is sometimes called thyrotoxicosis, the technical term for too much thyroid hormone in the blood. Hyperthyroidism [overactive thyroid] occurs when your thyroid gland produces too much of the hormone thyroxin. Hyperthyroidism can accelerate your body's metabolism, causing unintentional weight loss and a rapid or irregular heartbeat. <sup>(10)</sup>

**PICTURE OF HYPERTHYROIDISM**

In women with hyperthyroidism hormonal changes effecting reproductive system may occur. have reported that androstenedione and testosterone production increase in hyperthyroidism and subsequently this leads to elevation of estron and estradiol. Both this mechanism and decrease in metabolic clearance of estrogen lead to higher plasma estrogen levels in women with hyperthyroidism. Infertility incidence is about 5-8% in women with hyperthyroidism.<sup>(11)</sup>

**PATHOPHYSIOLOGY OF HYPERTHYROIDISM:****EPIDEMIOLOGY:**

The incidence of thyroid disorder in hospitalized patients in Japan is estimated to be 0.20 per 100,000per year with more than 10% mortality., overall incidence of hyperthyroidism is estimated to between 0.05% and 1.3%, with the majority of cases being subclinical in terms of presentation. Among hospitalized thyrotoxicosis patients, the incidence of thyroid storm has been noted to be <10%.The mortality of thyroid storm without treatment ranges between 80% and 100%; with treatment, this figure is between 10% and 50%.<sup>(13)</sup> Multiple organ failure was reported to be the most common cause of death in thyroid storm, followed by congestive heart failure, respiratory failure, arrhythmia, disseminated intravascular coagulation, gastrointestinal perforation,hypoxicbrain syndrome, and sepsis. The mortality rate in the group with a total bilirubin level >3mg/dL is significantly higher.

Incidence of women 66.4% and 33.6% in men, 15% of cases occur in patients older than 60 years of age. In India a large number of people suffer from thyroid disorders. Previous studies reveal that almost 42 million Indians suffer from thyroid disorders. Unfortunately, awareness about the disease is low. A recent study across 8 cities of India revealed 11% of the urban population with women being 3 times more prone to the disease than men.<sup>(14)</sup>

#### **CAUSES OF THYROID DISORDER:**

##### **Hypothyroidism:** <sup>(15)</sup>

- Autoimmune disease
- Iodine deficiency in the body
- Diabetes
- Pituitary disorder
- Surgery of thyroid
- Genetic or family history of thyroid
- Medications of certain diseases
- Pregnancy

##### **SYMPTOMS OF HYPOTHYROIDISM:**

- Fatigue and dizziness
- Sensitivity to heat
- Abdominal problems including constipation
- Dryness in skin
- Unwanted weight gain
- Weak muscle
- Thin hair
- Goitre
- Depression
- Slow heart rate <sup>(15)</sup>

##### **HYPERTHYROIDISM CAUSES:**<sup>(16)</sup>

- Autoimmune disorder
- High consumption of Iodine
- Pituitary gland malfunction
- Hereditary
- Thyroid nodule or lump in the thyroid
- Inflammation of thyroid gland

##### **SYMPTOMS OF HYPERTHYROIDISM:**

- Unwanted weight loss
- Rapid heart rate
- Increase in appetite
- Nervousness and anxiety
- Tremoring hands and fingers
- Severe sweating
- Menstrual changes in women
- Difficulty in sleeping or insomnia
- Fatigue and weakness
- Heat intolerance
- Excessive hunger
- Hair loss <sup>(16)</sup>


##### **DIAGNOSIS FOR HYPOTHYROIDISM:**

An enlarged thyroid (a goiter) is a typical but nonspecific finding of acquired thyroid disease (both hypothyroidism and hyperthyroidism). Visual inspection in the office setting should include 3 positions, and palpation can be performed from either side of the patient. For children with suspected hypothyroidism, serum thyrotropin and T4 samples should be obtained. Triiodothyronine (T3) and reverse T3 levels are rarely helpful in the diagnosis of hypothyroidism, and thus samples should not be obtained from the majority of patients. The levels of thyroid-binding proteins (thyroxine-binding globulin, transthyretin, and albumin) affect total T4 levels, so a freeT4 level is generally a better measure of thyroid hormone status.<sup>(17)</sup>


##### **PICTURE FOR HYPOTHYROIDISM DIAGNOSIS :**

It can actually be difficult to diagnose hypothyroidism because the symptoms can be easily confused with other conditions. The main way to diagnose hypothyroidism is a blood test called thyroid. They may also order blood tests for conditions like Hashimoto's disease. If the thyroid is enlarged, they may be able to feel it during a physical exam during an appointment.<sup>(18)</sup>


### Hypothyroidism Diagnosis




physical exam




medical history




TSH, Free T4, and TPO antibodies



MRI




ultrasound




verywell


### Hypothyroidism Diagnosis




physical exam




medical history




TSH, Free T4, and TPO antibodies



MRI



ultrasound



verywell

**DIAGNOSIS FOR HYPERTHYROIDISM:**

The physical examinations are taken place to check for any obvious symptoms of hyperthyroidism. In addition they may also run other tests including

- **BLOOD TESTS:**

Blood tests are performed that measure the levels of the thyroid hormones, T4 and T3, which must be high to make a diagnosis of hyperthyroidism. The level of thyroid stimulating hormone [TSH]. Also is measured with hyperthyroidism TSH is low while T4 and T3 levels are high.

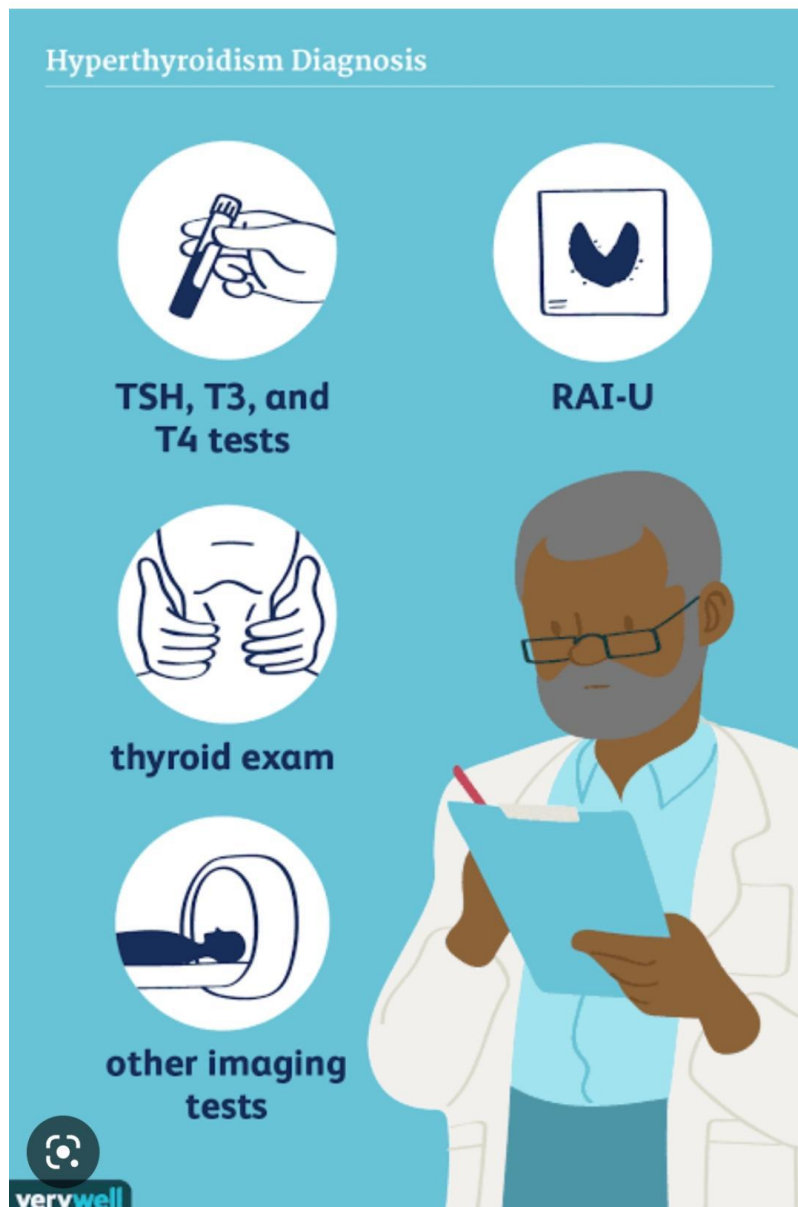
- **IODINE UPTAKE SCAN:**

This tests measures thyroid function by determining how much iodine is taken up by the thyroid gland. Patients are given a small dose of radioactive iodine that is taken on an empty stomach. The iodine is concentrated in the thyroid gland or excreted in the urine over the next few hours. The amount of iodine that goes into the thyroid gland is then measured.

- **THYROID SCAN:**

This test typically is performed at the same time as the iodine uptake test because it also requires that a patient take radioactive iodine, which then concentrates in the thyroid gland. Thyroid scans use the emissions of gamma rays from radioactive iodine to obtain a picture of the thyroid.<sup>(19)</sup>

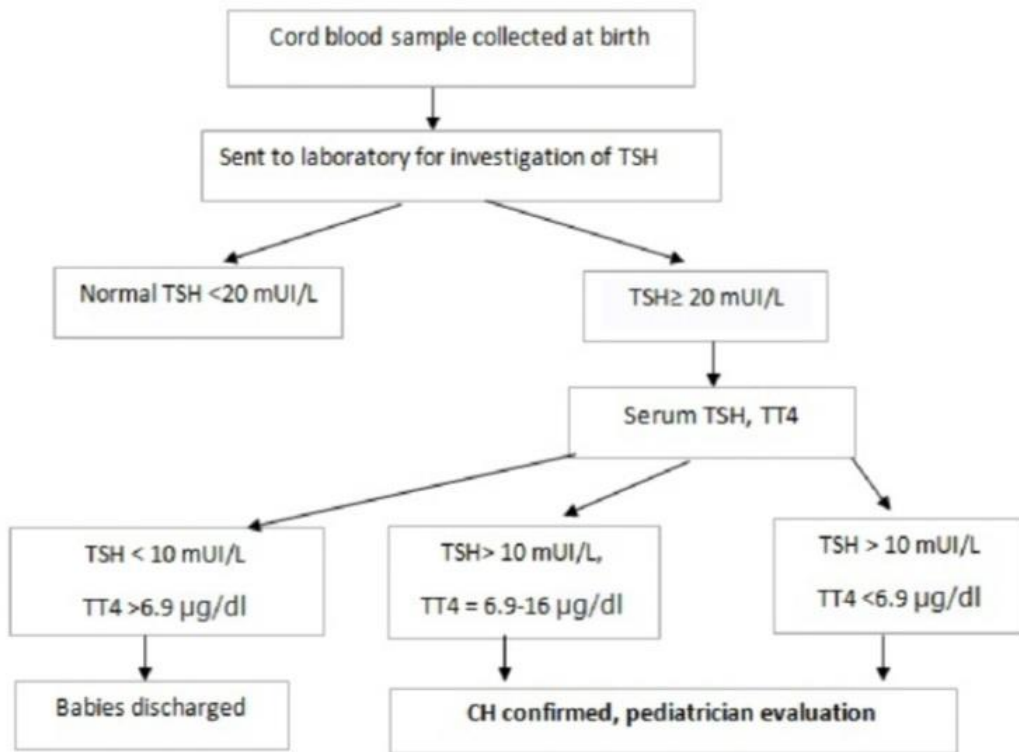
All patients suspected of having hyperthyroidism should have their levels of thyrotrophic, T4, T3, and thyroid antibodies (specifically or thyrotrophic receptor antibodies) measured. In Graves' disease, the thyrotrophic level is suppressed with elevated T3 and T4 levels. In contrast to the evaluation for hypothyroidism, obtaining a T3 level is essential because early Graves' disease may be associated with isolated elevation in T3 levels prior to increases in T4 levels. Thyrotrophic receptor antibodies may be substituted for TSIs because the newer assays have a high sensitivity, faster turnaround times for results, and are less expensive than the older assays. However, in contrast to TSI testing, thyrotrophic receptor antibody testing is not a functional assay and does not provide specific, quantitative data on the level of stimulatory antibodies. Ultrasonography and scintigraphy (using iodine 123 or sodium pertechnetate technetium Tc 99m) of the thyroid can aid in the diagnosis for small percentage of patients who are negative for thyrotrophic receptor antibodies and TSIs.<sup>(20)</sup>



**PICTURES OF HYPERTHYROIDISM DISORDER:  
TREATMENT OF THYROID DISORDER:  
HYPOTHYROIDISM:**

The approach to treatment of acquired hypothyroidism is similar to that of CH. Levothyroxine tablets are the treatment of choice, administered once daily, 15 to 30 minutes prior to food consumption, avoiding co - administration with calcium, iron, and soy products. Levothyroxine dosing is based on body surface area (100 µg/m<sup>2</sup>/d) or on age and weight following the general pattern: 4 to 6 µg/kg/d for patients 1 to 3 years of age, 3 to 5 µg/kg/d for patients 3 to 10 years of age, 2 to 4 µg/kg/d for patients 10 to 16 years of age, and 1.6 µg/kg/d for patients 17 years of age or older. Additional thyrotropin and T4 samples should be obtained 6 to 8 weeks after initiating therapy

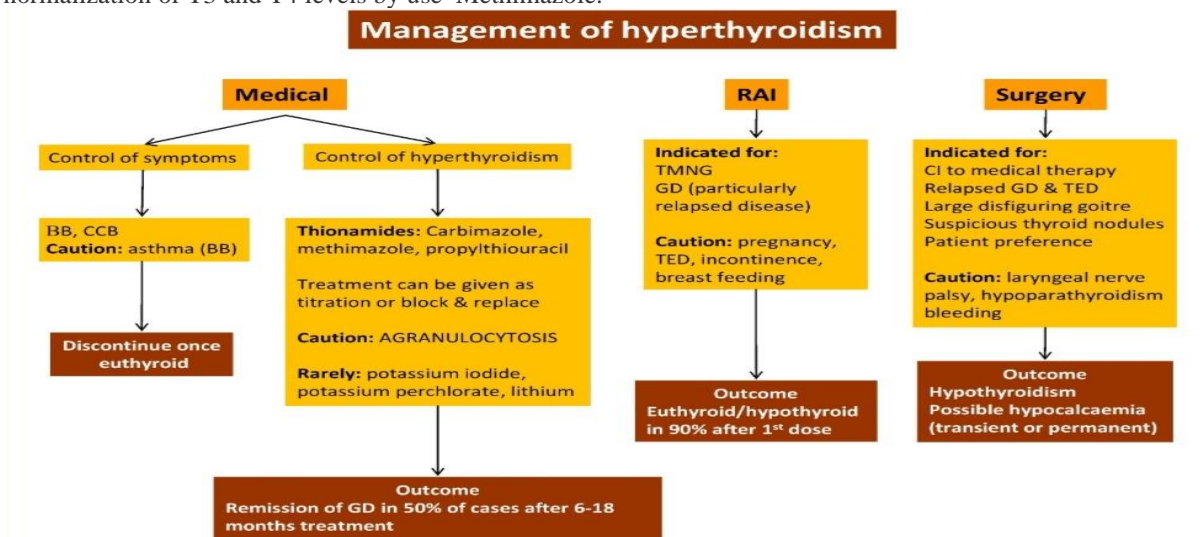
**Management of hypothyroidism :**



Once a therapeutic dose has been established, the clinician should check thyroid function every 4 to 6 months until the child achieves final height or every 6 to 8 weeks following a change in levothyroxine dose. The goals of treatment are to maintain clinical and biochemical euthyroidism and to ensure normal linear growth and development throughout childhood and adolescence.<sup>(21,22)</sup>

**HYPERTHYROIDISM:**

The majority of paediatric patients with Graves’ disease initially start anti thyroid drug therapy. Methimazole is the only anti thyroid drug approved for treatment of hyperthyroidism in children and adolescents in the United States after the US Food and Drug Administration issued a fatality against use to an increased risk of drug-induced fulminant hepatic necrosis in children and adolescents. Temporary use a selective beta-blocker should also be considered for patients with significant signs and symptoms pending normalization of T3 and T4 levels by use Methimazole.



The most common adverse effect Methimazole is rash, which in approximately 20% patients and the most severe adverse events is bone marrow suppression and liver toxicity, which occur in less than 1% of patients. Thus, any patient receiving Methimazole who presents with fever or sore throat should have his or her complete blood cell count checked for evaluation of neutropenia, and any patient with right upper quadrant abdominal pain should undergo a liver function test. Most adverse events from occur in the first 3 to 6 months of treatment; however, patients may experience adverse events more than 2 years after the start of anti-thyroid drug therapy.<sup>(23,24)</sup>

#### DRUGS ACTING ON THYROID DISORDER:

##### THYROX- 50 TABLETS:

Thyrox 50 tablet is a medicine used to treat an underachieving thyroid gland [Hypothyroidism]. It replaces the hormone which is not being produced by your thyroid gland in sufficient quantity and helps regulate your body's energy and metabolism.<sup>(25)</sup>

##### USES OF THYROX 50 TABLET:



- Thyroxin 50 tablet is to be taken empty stomach. Do not chew. It is crush and break.

##### SIDE EFFECT:

- vomiting
- Anxiety
- Diarrhoea
- Weight loss
- Nervousness
- Restlessness.<sup>(26)</sup>

##### THYRONORM 100 MCG TABLET:

It is used as a replacement therapy in the treatment of primary,[thyroidal], secondary[pituitary],and tertiary [hypothalamic] congenital or acquired hypothyroidism.



Should be taken in the morning on an empty stomach, at least 30-60<sup>3</sup>minutes before breakfast.<sup>(27)</sup>

##### SIDE EFFECTS:

- Skin rash
- Itching
- Mild leucopenia[ reduced white blood cell count]
- Hair loss.<sup>(28)</sup>



**CONCLUSION:**

Finally, an increase or a decrease in the thyroid hormones secretion leads to different clinical and pathological changes. Causes, pathogenetic mechanisms and the symptoms finding of hyperthyroidism and hypothyroidism. More research is needed to understand effects of treatment of subclinical thyroid dysfunction and screen-detected, undiagnosed overt thyroid disease.

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