World Journal of Pharmaceutical and Life Sciences

www.wjpls.org

Impact Factor: 8.21 Coden USA: WJPLA7

A REVIEW ONIMPACT OF THYROID DISORDER ON WOMEN'S HEALTH

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DOI: https://doi.org/10.5281/zenodo.19885905

How to cite this Article: K. Kiranmayee*, Asma Tabassum, V. Yogeshwari, Mohammad Umar Farooq, Krishnaveni (2026). A Review Onimpact Of Thyroid Disorder On Women's Health. World Journal of Pharmaceutical and Life Sciences, 12(5), 108–115.

Article Received on 28/03/2026 **Article Revised on 18/04/2026** **Article Published on 01/05/2026**

ABSTRACT

Thyroid disorders are among the most prevalent endocrine diseases affecting women, with significant implications for reproductive, metabolic, psychological, and cardiovascular health. Women are disproportionately affected due to hormonal fluctuations across different life stages such as puberty, pregnancy, and menopause. This review explores the multifaceted impact of hypothyroidism, hyperthyroidism, and autoimmune thyroid diseases on women's health, emphasizing reproductive dysfunction, pregnancy complications, metabolic disturbances, and quality of life. Early diagnosis and appropriate management are essential to reduce morbidity and improve outcomes. During pregnancy, thyroid hormones play a critical role in foetal growth and neurodevelopment. Imbalances are linked to adverse maternal and foetal outcomes such as miscarriage, preterm birth, preeclampsia, and developmental abnormalities Beyond reproductive health, thyroid disorders significantly impact metabolic and cardiovascular systems, contributing to obesity, insulin resistance, dyslipidaemia, and increased cardiovascular risk. Recent systematic reviews highlight their broader role in influencing women's metabolic health and chronic disease.

KEYWORDS: Thyroid, Hashimoto's disease, Grave disease, Goitre, menopause, PCOS, Autoimmune thyroid disease Hyperthyroidism, Hyperthyroidism.

INTRODUCTION

Thyroid is a small butterfly shaped highly vascular flat structure located at the upper portion of trachea Just below larynx It is composed of two lateral lobes joining by an isthmus across the ventral surface. Thyroid gland plays a critical role in regulating metabolism, growth, and hormonal balance through the secretion of triiodothyronine (T3) and thyroxine (T4). Thyroid dysfunction—primarily hypothyroidism and hyperthyroidism—affects women more frequently than men due to hormonal and autoimmune factors.

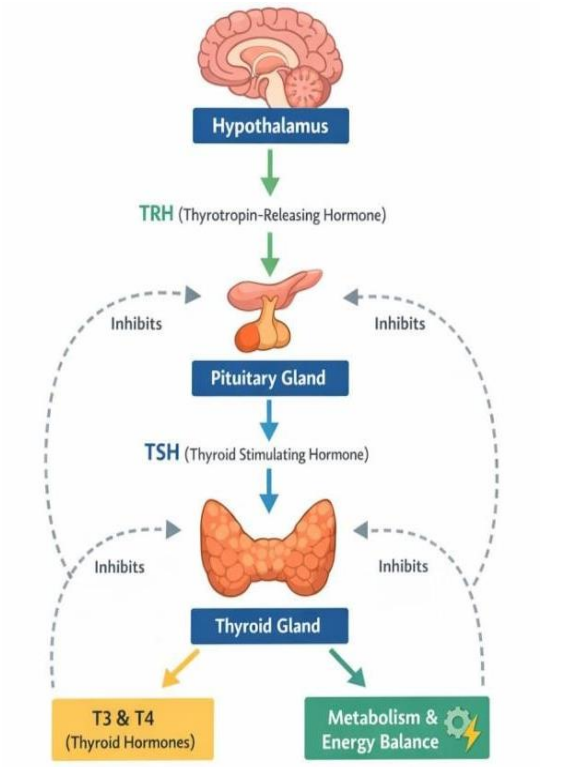
Both hormones are necessary for normal growth and development and control various functions. It is responsible for formation and secretion of thyroid hormones as well as iodine homeostasis within the human body.

Thyroid stimulating hormone

TSH is produced from the pituitary gland located at the base of the brain. TSH plays an essential role in controlling metabolism and energy levels.

- It contains 210 amino acids and two chain Glycoprotein with a molecular weight of 30000.
- TSH is made up of two sub-units:
- Alpha sub unit it is similar to HCG, LH and FSH
- Beta sub unit is only found in TSH.

The thyroid hormone that mainly act at the pituitary level and also in the hypothalamus which are responsible for inhibiting TSH secretion through a negative feedback mechanism. Hypothalamus regulated synthesis and release of TSH from pituitary gland through thyroid relaxing hormone. Triiodothyronine (T3) reduces TRH receptor on thyrotropes.



The thyroid disease is classified into following types.

- Hyperthyroidism
- Hypothyroidism

Hypothyroidism

Hypothyroidism is defined as clinical condition which is caused by insufficient production of thyroid hormone leading to generalized slow metabolic process. Hypothyroidism is caused by Hashimoto's thyroiditis. It is a chronic autoimmune disorder which is mediated by T-lymphocytes. Hypothyroidism produces antibodies against thyroid peroxides and thyroid globulin.

Symptoms

Due to low metabolic weight the symptoms include.

- Weight gain
- Body pains
- Slow speech and movement
- Laziness
- Swollen legs
- Hoarse voice
- Hair fall

Hyperthyroidism

Hyperthyroidism is a defined as excessive synthesis and release of thyroid hormones leads to increase in metabolic activity. It is caused by the Grave's disease. Grave's disease is autoimmune disorder which involves in the production of thyroid stimulating immunoglobulins.

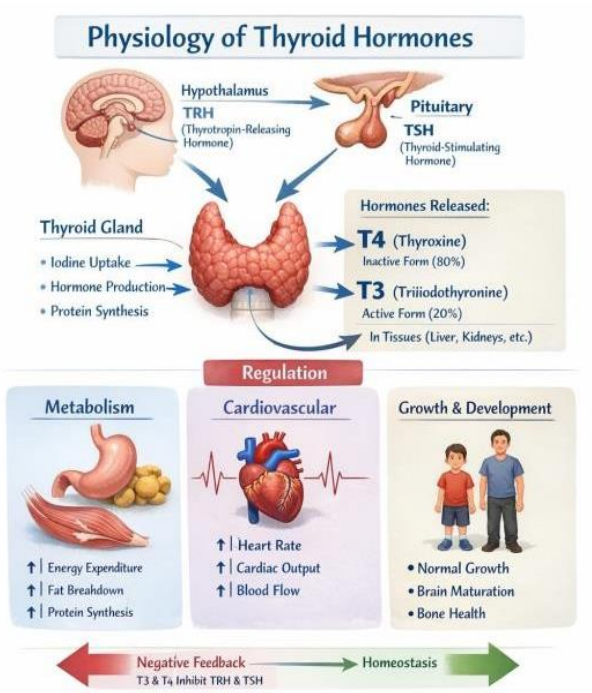
Symptoms

Due to the high metabolic process, symptoms the includes.

- Rapid heartbeat
- Weight loss
- Lack of sleep
- Anxiety
- Sweating and Shaking
- Bulging eyes
- Osteoporosis
- Goitre

It primarily affects women aged from 20 – 40 with risk including family history and stress. Treatment includes anti thyroid medication, surgery or radioactive iodine.

category	Hypothyroidism [under active thyroid]	Hyperthyroidism [overactive thyroid]
Basic Description	Reduced thyroid hormone production, often linked to autoimmune disorders.	Excess thyroid hormone production, commonly associated with grave's disease.
Common symptoms	Tiredness, weight gain, sensitivity to cold, low mood, hair thinning, constipation, dry skin.	Unintentional weight loss, fast heartbeat, sensitivity to heat, nervousness, irritability, shaking, excessive sweating.
Possible complications	Cardiovascular issues, difficulty in conceiving, severe condition called myxedema coma	Heart related issues, bone weakening, life threatening thyroid storm.

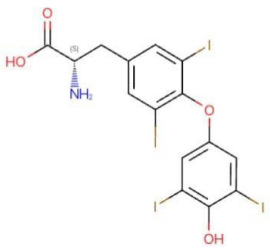


CLASSIFICATION OF THYROID DRUGS

1. **Thyroid hormone preparations**: Levothyroxine, Liothyronine, Liotrix
2. **Inhibit hormone synthesis**: PTU, methimazole, carbimazole, propyl thiouracil
3. **Inhibit iodide trapping inhibitors:** thiocyanates, perchlorates, nitrates
4. **Inhibit hormone release:** iodine, iodides of Na& K, organic iodide
5. **Destroy thyroid tissue**: Radioactive iodine 1-13

- **Some commonly used drugs**

1. Levothyroxine: Levothyroxine is a synthetic form of the natural thyroid hormone [T4]. It is widely used to treat conditions where the thyroid gland does not produce enough hormones [hypothyroidism]. This drug is a synthetic derivative and Levo-isomer of thyroxine. It normalizes the blood levels of TSH, T4 and T3.



3,5,3,5-tetraiodo-L- thyronine

Mechanism of action

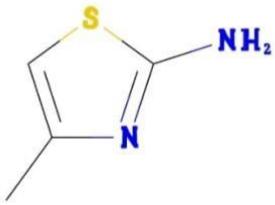
- Levothyroxine involved in conversion of active form of T3. After administration, levothyroxine[T4] undergoes enzymatic deiodination in peripheral tissues to form triiodothyronine [T3], which is the biologically active hormone.
- Levothyroxine[T4] and its active form enter target cells through the specific membrane transport proteins.
- It also involves in binding to the nuclear receptors by binding T3 to thyroid hormone receptors located in the nucleus
- Levothyroxine interacts with DNA by binding to specific DNA sequences called as thyroid response elements.
- This binding regulates gene transcription by either activating or repressing the genes.

Uses

- It is used in the treatment of hypothyroidism.
- Used in the treatment Goitre.
- Thyroid cancer management.
- Levothyroxine is also essential for babies with low thyroid function to ensure normal growth.

2. Methimazole

Methimazole involves in inhibiting hormone synthesis. Methimazole is a thioamide inhibitor of enzymes thyroid peroxidase. It is commonly used to reduce excessive production of the thyroid hormones.



2-Amino-4-methylthiazole

Mechanism of action

Methimazoles works by blocking enzymes thyroid peroxidase. It is essential for

- Oxidation for iodide to iodine.
- Iodination of tyrosine residues in thyroglobulin.
- Coupling iodotyrosine to produce T3 and T4.
- Methimazole decreases the production of thyroid hormones which leads to normalisation of metabolic activity.

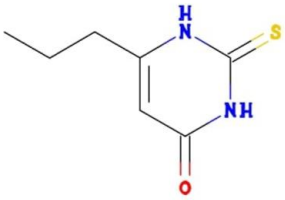
Uses

- Used in treatment of hyperthyroidism
- For preparing the patients before thyroid surgery.
- Used to control the thyroid hormone levels before the treatment of radioactive iodine therapy.

3. Propylthiouracil

Propylthiouracil is a antithyroid medication belonging to the class of thioamide class of drugs. It is primarily used in the treatment of hyperthyroidism, a condition characterized by the excess production of thyroid

hormones. The drugs also classified as Drug class D in pregnancy, class D signifies there is positive evidence of human foetal risk.



6- Propyl-2-thioxo-2,3dihydrophyimidin-4[1H]-one

Mechanism of action

- Propyl thiouracil plays a crucial role in reducing circulation levels of thyroid hormones by interfering with their synthesis and peripheral conversion
- involves in the inhibition of enzyme thyroid peroxidase which is essential for the oxidation of iodide and its incorporation into tyrosine

Uses

- Used to treat conditions with excess thyroid hormone production especially in grave's disease.
- Propylthiouracil is preferred over methimazole during early pregnancy.
- Used before thyroidectomy [to achieve euthyroid state].

Impact of thyroid disorder on women's health

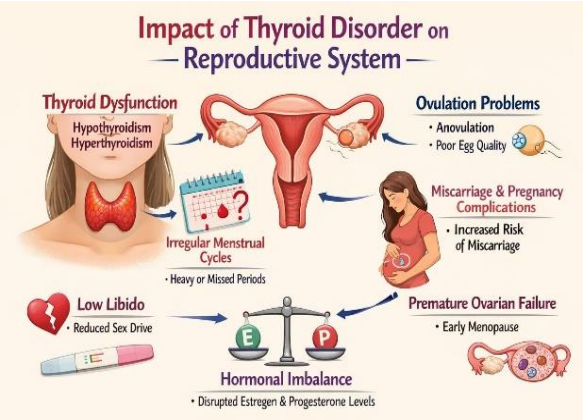
Thyroid disorders, including hypothyroidism and hyperthyroidism significantly influence the women's health due to their close interaction with hypothalamic-pituitary-ovarian [HPO] axis. These disorders affect hormonal balance, reproductive function, and overall metabolic health, making women more susceptible to complications across different life stages.

1. Impact on Reproductive System:

Thyroid hormones are essential for the regulation of reproductive hormones such as oestrogen, progesterone, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). Any imbalance in thyroid function can disrupt normal reproductive physiology.

Hypothyroidism may lead to an ovulation, decreased libido, and infertility due to insufficient hormonal stimulation. Hyperthyroidism, on the other hand, alters levels of sex hormone-binding globulin (SHBG), affecting ovarian function and hormonal availability. These disturbances can impair follicular development, ovulation, and implantation, thereby reducing fertility.

Furthermore, thyroid autoimmunity — particularly the presence of anti-thyroid peroxidase (anti-TPO) antibodies — has been linked to recurrent implantation failure even in women with normal thyroid hormone levels. This suggests that immune-mediated mechanisms, beyond hormone levels alone, may independently compromise reproductive outcomes. Women undergoing assisted reproductive technologies (ART) such as IVF are often screened for thyroid antibodies for this reason, as subclinical thyroid dysfunction can significantly reduce the success rates of such procedures.

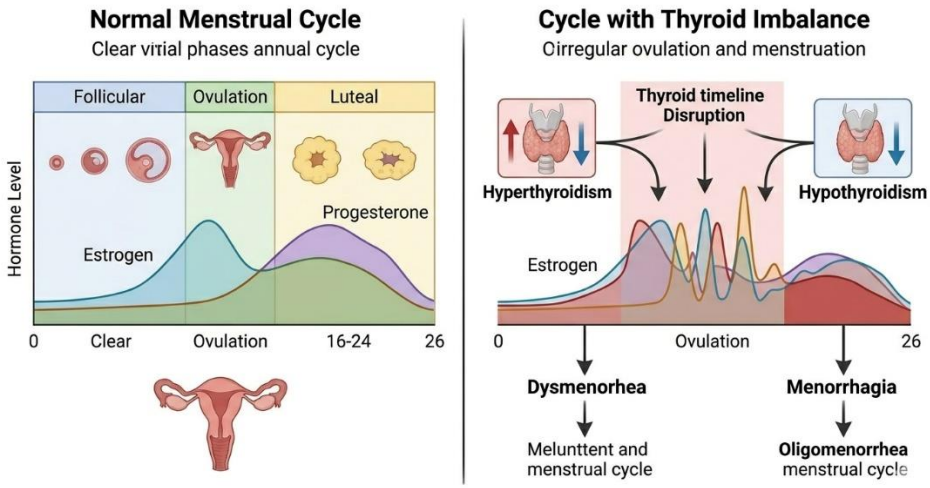


2. Impact on Menstruation

Thyroid dysfunction commonly leads to menstrual irregularities due to its effect on hormonal regulation. In hypothyroidism, women may experience menorrhagia (heavy menstrual bleeding), oligomenorrhea (infrequent cycles), or amenorrhea (absence of menstruation). These changes are often associated with increased prolactv in levels and altered gonadotropin secretion. Elevated prolactin, a condition known as hyperprolactinemia, can further suppress ovulation and contribute to luteal phase defects, thereby worsening reproductive outcomes.

In hyperthyroidism, menstrual cycles may become lighter (hypomenorrhea) and shorter. Hormonal imbalance in this condition disrupts the normal cyclic pattern of menstruation.

Both conditions, if left untreated, can lead to chronic menstrual dysfunction that affects a woman's quality of life, energy levels, and long-term reproductive health. It is important to note that menstrual irregularities are often among the earliest and most noticeable symptoms through which thyroid disorders first present in young women, making gynaecological evaluations an important gateway for thyroid screening.



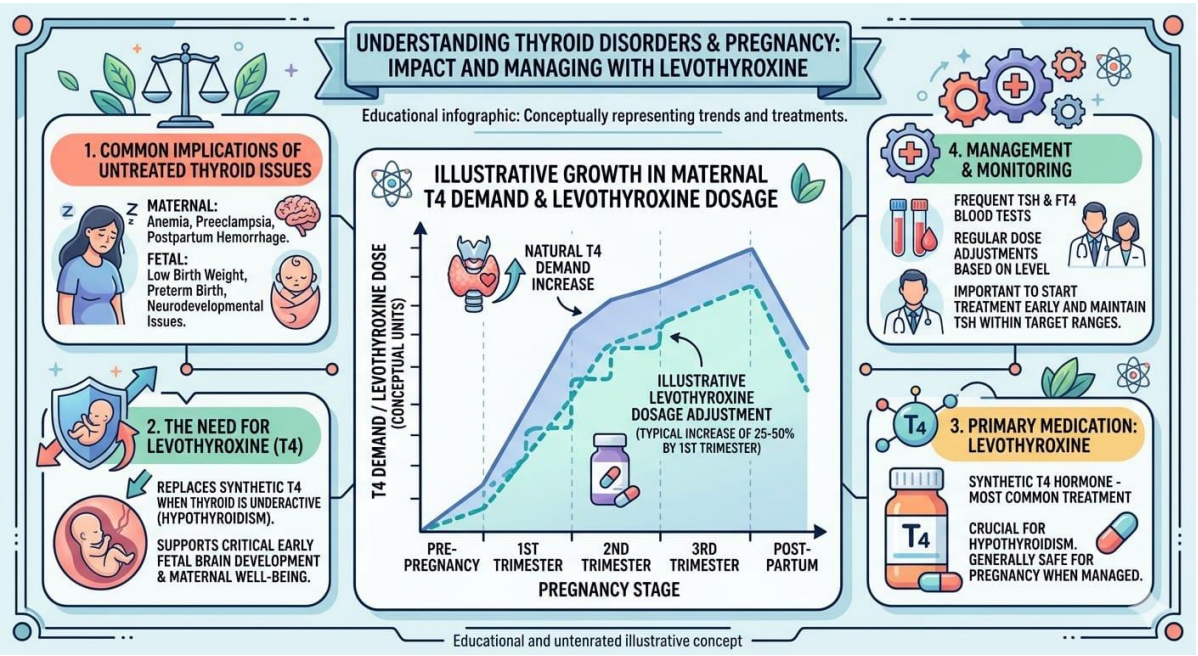
3. Impact on Pregnancy

Proper thyroid function is critical during pregnancy, as thyroid hormones support foetal growth and neurological development.

Hypothyroidism during pregnancy is associated with an increased risk of miscarriage, preterm delivery, and impaired foetal brain development. It may also contribute to maternal complications such as anaemia and hypertension. Since the foetal thyroid gland does not become fully functional until approximately 16–20 weeks of gestation, the developing foetus is entirely dependent on maternal thyroid hormones during the first trimester. Even subclinical hypothyroidism — where TSH levels are mildly elevated but T3/T4 remain within range — has been associated with lower cognitive scores and developmental delays in children.

Hyperthyroidism can lead to pregnancy-induced hypertension, low birth weight, and premature delivery. Uncontrolled thyroid dysfunction may adversely affect both maternal health and foetal outcomes. Graves' disease, the most common cause of hyperthyroidism, requires careful management during pregnancy as thyroid-stimulating immunoglobulins (TSI) can cross the placental barrier and affect the foetal thyroid, potentially causing neonatal hyperthyroidism.

Universal thyroid screening during the first antenatal visit is therefore recommended by many endocrinology and obstetric guidelines to ensure timely diagnosis and treatment.



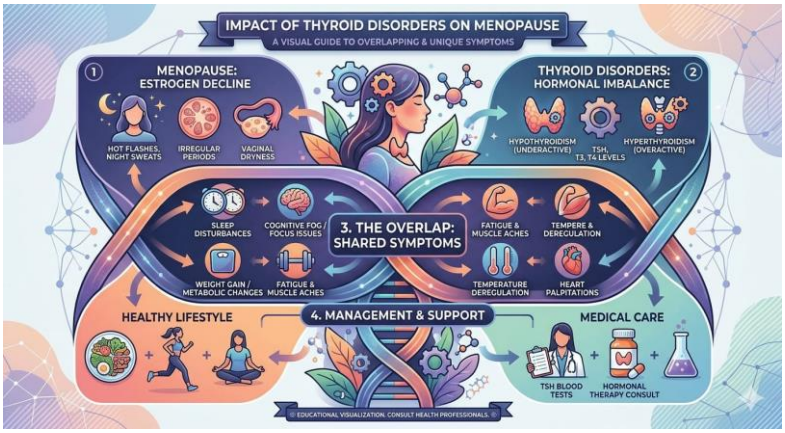
4. Impact on Menopause

Thyroid disorders can complicate the clinical presentation of menopause because of overlapping symptoms.

Common symptoms such as fatigue, mood swings, weight changes, and irregular periods may be seen in both menopause and thyroid dysfunction, making diagnosis challenging. Hypothyroidism may further slow metabolism in postmenopausal women, contributing to weight gain and lethargy.

Additionally, untreated thyroid disorders in postmenopausal women may increase the risk of osteoporosis and cardiovascular diseases. Subclinical hyperthyroidism, in particular, accelerates bone mineral density loss in postmenopausal women, as excess thyroid hormone stimulates osteoclast activity, leading to increased bone resorption. This significantly elevates the risk of fractures, especially in the hip and spine.

On the cardiovascular front, both overt and subclinical thyroid dysfunction are associated with dyslipidaemia, arterial stiffness, and altered cardiac function. Hypothyroidism raises LDL cholesterol levels, while hyperthyroidism increases heart rate and the risk of atrial fibrillation — both of which are particularly concerning in older postmenopausal women who already carry a higher baseline cardiovascular risk. Routine thyroid function testing in this demographic is therefore an important preventive health measure.

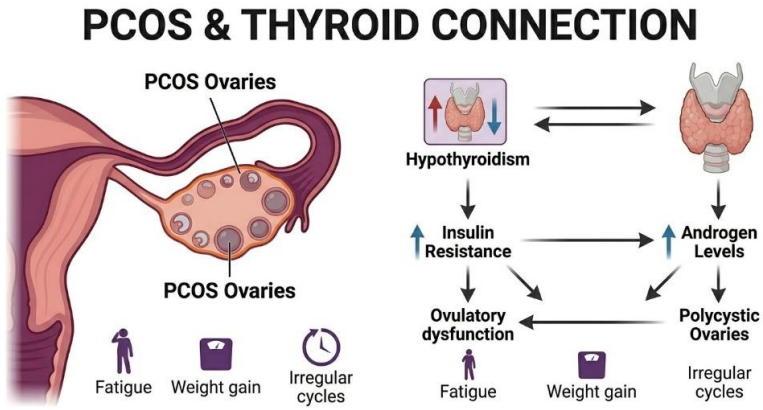


5. Impact on PCOS (Polycystic Ovary Syndrome)

Women with PCOS are more likely to develop thyroid dysfunction, particularly autoimmune thyroid conditions such as Hashimoto's thyroiditis. Both disorders share common features such as hormonal imbalance, irregular menstrual cycles, anovulation, and infertility.

Thyroid dysfunction may worsen the severity of PCOS symptoms, making management more complex and increasing reproductive complications. Hypothyroidism, for instance, can elevate insulin resistance — a hallmark feature of PCOS — thereby aggravating metabolic disturbances such as weight gain, dyslipidaemia, and glucose intolerance. Additionally, elevated TSH levels may stimulate ovarian cyst formation by acting on TSH receptors present in ovarian tissue, further compounding the follicular dysfunction already seen in PCOS.

The coexistence of PCOS and thyroid dysfunction also has mental health implications, as both conditions are independently associated with anxiety, depression, and reduced quality of life. A comprehensive management approach that addresses both conditions simultaneously — through hormonal therapy, thyroid medications, lifestyle modifications, and psychological support — is essential for improving patient outcomes.



6. Psychological and Mental Health Impact

Beyond the physical manifestations, thyroid disorders have a profound effect on women's mental and emotional well-being.

Hypothyroidism is commonly associated with depression, cognitive slowing, poor concentration, and memory difficulties — a cluster of symptoms sometimes referred to as "brain fog." Women with undiagnosed or undertreated hypothyroidism may be misdiagnosed with clinical depression or anxiety disorders, leading to inappropriate treatment.

Hyperthyroidism, conversely, often presents with nervousness, irritability, restlessness, and difficulty sleeping. In severe cases, it can mimic panic disorder or generalized anxiety. The psychological burden of living with a chronic thyroid condition, combined with its wide-ranging physical symptoms, can significantly impair a woman's social functioning, occupational performance, and interpersonal relationships. Integrated care models that include mental health support alongside endocrinological treatment are therefore increasingly recognized as vital for holistic women's health management.

CONCLUSION

Thyroid disorders exert a wide-ranging and multifaceted impact on women's health across all stages of life — from adolescence and reproductive years to pregnancy and menopause. Their ability to mimic or worsen other gynaecological and metabolic conditions makes early diagnosis particularly important. Routine thyroid function testing, increased awareness among healthcare providers, and individualized treatment plans are key to minimizing the long-term consequences of thyroid dysfunction on women's health, fertility, and overall quality of life.

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