

# A Review on Thyroid Dysfunction and Hypertensive Disorder in Pregnant Women

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DOI: <https://doi.org/10.52403/ijhsr.20230809>

## ABSTRACT

Negative pregnancy outcomes have been linked to hypothyroidism that is not appropriately managed. Pregnancy increases the need for thyroid hormone, and many women with pre-existing hypothyroidism require higher thyroid hormone dosages in the 1<sup>st</sup> trimester. A primary cause of maternal and fetal morbidity, hypertension affects 5 to 10% of all pregnancies and is more severe when it results into preeclampsia. We have aimed for a comprehensive study of hypothyroidism and hypertension. With the objectives, highlighting the most developed disorder, complications and risk factors. Finally focus on management approach.

**Key words:** Gestational hypertension, gestational hypothyroidism, pre-eclampsia, eclampsia, thyroxine (T4) and triiodothyronine (T3).

## INTRODUCTION

Raised blood pressure during maternity is a condition known as gestational hypertension (GH), which, if not treated effectively, can result in fatal consequences such as preeclampsia, eclampsia, and mortality<sup>[1]</sup>.

It is estimated that 10% to 17% of all pregnancies are impacted by hypertension, a multisystemic illness. The mechanisms underlying the pathogenesis of GH have not yet been fully elucidated, despite the fact that they play a significant role in maternal and perinatal morbidity and mortality. However, hypothyroidism can seriously disrupt the cardiovascular system by altering left ventricular function, lowering cardiac output, and increasing systemic vascular resistance. However, a number of things have been proposed as contributing mechanisms to the increase in blood pressure during pregnancy. These include up to 40% increase in total plasma volume and a 25% rise in red blood cell mass<sup>[2]</sup>.

Thyroid linked endocrinopathies are the second most prevalent endocrine illness in women overall, after diabetes mellitus. In individuals of reproductive age, these illnesses are 4-5 times more common, and they may also be more common in individuals with co-morbid illnesses such as pregnancy hypertension<sup>[3]</sup>. Studies have indicated that people with subclinical hypothyroidism have reduced endothelium-associated vasodilation, which raises the possibility that this condition increases the risk of hypertensive problems during pregnancy<sup>[4]</sup>.

Levothyroxine administration during gestation is correlated to other comorbidities and a 1.5-times increased risk for preeclampsia<sup>[5]</sup>. The most frequent instance of thyroid malfunction during gestation is an increase in TSH levels with normal FT3 and FT4 levels<sup>[6]</sup>. Tests presently in use to determine thyroid activity TSH, triiodothyronine (T3), and thyroxine (T4) are occasionally inadequate to definitively

establish the illness because T3 and T4 levels are influenced by so many additional non-specific illnesses [7].

### **Hypothyroidism:**

The second most common hormonal disorder that impacts women of reproductive age is hypothyroidism [8]. An elevated serum TSH level is regarded as a sign of pregnancy-related hypothyroidism. Additionally, it is divided into undisguised (decreased levels of free T4) and Sub-clinical thyroid dysfunction depending on free T4 levels (typical levels of free T4) [9, 10]. Untreated undisguised hypothyroidism during pregnancy is linked to pregnancy complications such as prenatal hypertension, abruption placenta, anemia, gestational diabetes, and postpartum hemorrhage. Negative birth outcomes are more likely in people with overt hypothyroidism. Unplanned abortion, reduced birth weight, early birth, fetal discomfort, perinatal mortality, and stillbirth are often observed birth outcomes [11, 12, 13].

Maternity does have an impact on hypothyroidism, which would be linked to mother and fetus wellbeing [14]. Human chorionic gonadotropin (HCG) stimulates a temporary increase in the amount of free thyroxine (FT4) with in mother's blood during the initial period of pregnancy. This is represented by a decline in thyroid stimulating hormone (TSH) levels; during that same trimester, the mother's blood levels of TSH are substantially lower than they were before conception. Later this, FT4 sera levels drop by 10%, and maternal TSH levels eventually return to normal levels. Furthermore, the second and third trimesters of pregnancy experience a considerable increase in both total thyroxine (T4) and triiodothyronine (T3) as a result of a semi spike in serum levels of thyroxine binding globulin (TBG) [15, 16].

The normal physiological effects of pregnancy can mask the signs and symptoms of thyroid disease, making the diagnosis of maternal thyroid dysfunction challenging. This means that all thyroid

function tests performed on pregnant women must be interpreted differently from tests performed on women who are not pregnant [17, 18]. Numerous hypothyroidism symptoms resemble those of pregnancy. For instance, both have symptoms of exhaustion, gaining weight, and abnormal menstrual cycles. Low thyroid hormone levels may potentially make it difficult to conceive or result in miscarriage [16].

### **Causes:**

Iodine deficiency is the main cause of hypothyroidism during pregnancy, while in places with enough iodine, thyroiditis with autoimmunity is the most frequent cause [19]. Other common causes include rifampicin and phenytoin use, thyroid surgery, radioiodine therapy, congenital hypothyroidism, radioiodine therapy, along with any hypothalamic-pituitary problem [20].

### **Pathophysiology:**

Pregnancy causes physiological changes in the thyroid, including a mild expansion of the gland and a higher vascularization. Because of its anatomical resemblance to thyroid-stimulating hormone (TSH), beta-human chorionic gonadotropin (HCG) stimulates the thyroid since the first trimester. Pregnant women have lower blood TSH concentrations than women who are not pregnant due to the thyrotrophic activity of -HCG during the first trimester [21]. Additionally, estrogen stimulation raises the levels of thyroid-binding globulin (TBG) in the blood. Conversely, fetal ingestion and metabolism of the placenta cause a relative fall in the availability of iodide due to the increased renal clearance [22].

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TBG levels in the blood rise as a result of enhanced hepatic production and estrogen-

mediated extension of the half-life of TBG from 15 minutes to 3 days, and it peaks near the middle of pregnancy [23]. Early in pregnancy, thyroxine (T4) and triiodothyronine (T3) total concentrations rise and then plateau, reaching a value that is 30–100% higher than pre-pregnancy, mostly in response to the increase in TBG [24].

### Signs and symptoms:

There may be signs of psychosis, depression, anxiety, or cognitive problems, memory loss, rarely: ascites, rhabdomyolysis, pericardial effusion, carpal tunnel syndrome, sleep apnea, hyponatremia, hypercholesterolemia, congestive heart failure, and a prolonged QT interval might also be present in patients [25].

### Treatment:

Thyroxine (LT4), a synthetic TH that is equivalent to natural T4 and is used to treat hypothyroidism, is synthesized TH. To maintain adequate thyroid gland function, pregnant women with pre-existing hypothyroidism will need to increase their pre-pregnancy T4 dose. Every six to eight weeks throughout pregnancy, thyroid gland function should be checked. If the mother has hypothyroidism, synthetic T4 is secure and required for the fetus' wellbeing [12].

Treatment with levothyroxine (LT4) to avoid foetal loss (incidence of 4% in group receiving appropriate substitute treatment vs. 31% in group receiving inadequate treatment). The preferred medication for treating hypothyroidism is LT4. It is advised to change the dose in women who were already pregnant to achieve a pre-pregnancy TSH level less than 2.5 m IU/L, maintain that level throughout the first trimester, and keep it below 3.0 mIU/L during the second and third trimesters [25].

As soon as possible, hypothyroidism should be treated. Levothyroxine should be started at a dose of 1-2 g/kg/day and increased every 4 weeks. Pregnant women who are affected their dosage should be roughly 30%

to 50%. As the pregnancy proceeds, there will be a greater need for levothyroxine due to both the increased demand for T4 and the insufficient intestinal absorption of T4 brought on by the replacement of ferrous sulphate [9].

### Gestational hypertension:

Pregnancy-induced hypertension (PIH) is a disorder that causes pregnant women's blood pressure to increase after 20 weeks of pregnancy. Early clinical symptoms include anemia, dizziness, proteinuria, elevated blood pressure, and, in extreme cases, coma and convulsions [26].

It is estimated that 7.7% of women in reproductive age have hypertension [27]. Up to 10% of pregnancies can become complicated by hypertensive disorders of pregnancy, which include preexisting and gestational hypertension, preeclampsia, and eclampsia. These conditions are a major source of death rate & sickness among pregnant women and newborns [8].

Three types of pregnancy-related hypertension exist [8]:

1. Before 20 weeks of pregnancy or before a woman becomes pregnant, chronic hypertension is identified.
2. The onset of gestational hypertension occurs after 20 weeks.
3. After 20 weeks of pregnancy, preeclampsia is identified and can coexist with persistent hypertension. Preeclampsia affects about 25% of women with persistent hypertension.

Preeclampsia with or without severe symptoms, prenatal hypertension, HELLP syndrome, chronic hypertension with or without superimposed pre-eclampsia/eclampsia, and eclampsia all carry a considerable risk of morbidity for both the mother and the fetus. Even while preeclampsia morbidity and mortality have decreased as a result of proper prenatal care, thorough monitoring to spot the symptoms, and quick delivery to lessen or avoid negative effects, they are still a problem. While pregnancy-related hypertension itself raises certain concerns, the main issue is the

negative consequences of pre- or eclampsia developing [28, 29].

### **Complications:**

Epileptic fits intracranial bleeding, respiratory problems, edoema, kidney failure, coagulopathy, hemolysis, liver damage, thrombocytopenia, limit on intrauterine growth, oligohydramnios, abrupt placentation uncomfortable fetal status, multiple diagnoses syndrome of antiphospholipid, the aortic arch, Cushing disease, eclampsia, glomerulonephritis, hybridized mole syndrome [30].

### **Pathophysiology:**

Preeclampsia can be caused by any pregnancy-related hypertension condition [31]. Up to 35% of pregnant women with hypertension and up to 25% of people with chronic hypertension experience it [32, 33]. It is unclear what causes this transition to, or superposition of, preeclampsia, although it is believed to be connected to a mechanism whereby decreased placental perfusion causes systemic vascular endothelial dysfunction [34]. This is brought on by a cytotrophoblastic invasion of the uterine spiral arteries that is less successful [35]. Placental hypoxia that results from this causes a series of aggravating circumstances, upsets the balance of angiogenic factors, and causes platelet aggregation, all of which lead to endothelial dysfunction, which is clinically expressed as the preeclampsia syndrome [35,36] reduced levels of angiogenic substances such vascular endothelial growth factor (VEGF) and placental growth factor (PIGF), as well as a rise in its antagonist, placental soluble fms-like tyrosine kinase 1, are angiogenic imbalances linked to the development of preeclampsia (sflt-1) [37,38] nitric oxide synthesis is decreased when VEGF and PIGF's ability to bind to their receptors is inhibited. Nitric oxide is an essential component of vascular remodeling and vasodilation, which can otherwise lessen placental ischemia [39].

While late-onset preeclampsia (LOPE), which develops at or after 34 weeks of gestation, is thought to be secondary to the placenta outgrowing its own circulation, early-onset preeclampsia (EOPE), which develops before 34 weeks, is thought to be primarily caused by the syncytiotrophoblast stress leading to poor placentation. 40 weeks due to a longer duration of placental malfunction, EOPE is more frequently than LOPE related with fetal growth restriction [40].

Up to 27.5% of new mothers may experience de novo hypertension at this time. This is caused by a number of things, such as the movement of fluid from the interstitial to the intravascular space, the administration of fluids, and the use of vasoactive substances. As a result of the fluid shift, the stroke volume and cardiac output increase by up to 80%. A compensatory mechanism of diuresis and vasodilation then occurs, which tempers the blood pressure increase [35].

### **Signs and symptoms:**

Elevated blood pressure, pee with too much protein (proteinuria), hands and face swelling. Although many vision or spot visibility, upper right abdominal pain. Difficulty in breathing, Eclampsia can also result in seizures, nausea, vomiting, and decreased urine production. Might also experience acute exhaustion, liver failure, and easy bleeding or bruising if you go on to develop HELLP syndrome.

### **Treatment:**

When there is one high-risk factor or two or more intermediate risk factors, prophylaxis with 81mg aspirin is advised. This preventive should begin between 12- and 28-weeks during pregnancy and continue until delivery. Greater risk factors include having had pre-eclampsia in the past, persistent hypertension, type 1 or type 2 diabetes, kidney problems, autoimmune disorder, especially systemic lupus erythematosus or antiphospholipid syndrome, or repeated pregnancies.

Nulliparity, a pregnancy interval of more than ten years, a BMI of 30 or higher, a poor socioeconomic standing, African American ancestry, advanced maternal age (35+ at delivery), IUGR, or a previous miscarriage are examples of moderate risk factors<sup>[8]</sup>.

Giving delivery is frequently used to treat preeclampsia. Before choosing a course of treatment, the doctor considers a number of factors. The severity of it, how many weeks you are pregnant, and any possible risks to the patient and unborn child are among them:

Doctor will likely want to deliver the baby if the patient is above 37 weeks pregnant and carefully watch the patient and unborn child if patient are less than 37 weeks pregnant. Patient will also be subjected to blood and urine tests. The infant is frequently monitored with ultrasound, heart rate monitoring, and growth evaluation. To manage the blood pressure and stop seizures, patient might need to take medication. Additionally, some mothers receive steroid injections to hasten the baby's lung development. If the preeclampsia is severe, doctor might advise an early delivery.

Usually, the symptoms disappear six weeks after delivery. In rare instances, symptoms could persist or might not appear until after birth (postpartum preeclampsia). This may be quite serious, and immediate treatment is required<sup>[41]</sup>.

## CONCLUSION

The incidence of severe hypertension appears to be cut in half when antihypertensive medication is used for pregnant hypertension of any kind. This is persuasive enough for some if not many people to demand a shift in practice towards stronger therapy. Negative obstetric, maternal, and neonatal outcomes are linked to maternal hypothyroidism, a frequent endocrine condition during pregnancy. Appropriate evaluation and strict adherence to management strategies for hypothyroidism and hypertension can provide enhanced patient outcomes.

## Declaration by Authors

**Ethical Approval:** Not Applicable

**Acknowledgement:** None

**Source of Funding:** None

**Conflict of Interest:** The authors declare no conflict of interest.

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- How to cite this article: T. Rama Rao, R. Srujana, J. Namratha, Rabia Basri. A review on thyroid dysfunction and hypertensive disorder in pregnant women. *Int J Health Sci Res*. 2023; 13(8):57-63. DOI: <https://doi.org/10.52403/ijhsr.20230809>

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