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*Original Research Article.*

# Evaluation of Maternal Thyroid Function and its Correlation to Duration of First Stage of Labor: An Institutional Based Study

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## ABSTRACT

**Background:** Thyroid disorders are commonly observed during both pregnancy and the postpartum phase. A common scenario involves a woman in the early stages of pregnancy, specifically during the first trimester, who is referred due to an elevated TSH level, while her free thyroid hormone levels remain within the low normal range or indicate overt hypothyroidism. Hence; the present study was conducted to evaluate maternal thyroid function and its correlation to duration of first stage of labor.

**Materials & Methods:** A total of 100 pregnancy subjects were enrolled. Only those subjects were enrolled which were scheduled for vaginal delivery and were all not receiving treatment with thyroid hormone replacement or anti-thyroid medications. Complete demographic and clinical details of all the patients was obtained. Obstetricians diagnosed pregnancy-related complications, including thyroid dysfunction, in accordance with established guidelines. Maternal serum samples were collected during the first trimester (up to 13 weeks of gestation), the second trimester (13 to 26 weeks of gestation), and the third trimester (from 27 weeks of gestation), with thyroid levels being documented. All findings were recorded in a Microsoft Excel spreadsheet and subsequently analyzed statistically using SPSS software.

**Results:** Mean age of the patients was 32.3 years. Gestational diabetes was seen in 33 percent of the patients. Preeclampsia was seen in 2 percent of the patients. 78 percent of the patients were of Primigravida. Mean gestational age was 39.1 weeks. Spontaneous labour was seen in 69 percent of the patients. Maternal FT4, FT3 and TSH, levels showed significant correlations with the length of the first stage of labor.

**Conclusion:** Thyroid disorders are identified with a prevalence that is four to five times higher in women than in men, especially during the reproductive years. Consequently, it is common to find abnormalities in thyroid function during standard laboratory assessments conducted for pregnant individuals. Maternal levels of FT4, TSH, and TPOAb were found to be associated with the duration of the initial stage of labor.

**Key words:** Thyroid, Pregnancy, Labor.

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## INTRODUCTION

Thyroid disorders are commonly observed during both pregnancy and the postpartum phase. Following diabetes, thyroid disease ranks as the second most prevalent endocrine disorder among women of reproductive age. Many of these conditions are manageable, yet if left unassessed and untreated, they can have detrimental effects on both the mother and the fetus.[1] Pregnancy induces a series of intricate hormonal adjustments. In women with normal thyroid function, there is an elevation in the production of thyroxine (T4) and triiodothyronine (T3), leading to a suppression of thyroid-stimulating hormone (TSH) during the first trimester. This suppression is attributed to elevated levels of human chorionic gonadotropin (hCG), which activates the TSH receptor due to its partial structural resemblance.[2]

Additionally, the increased plasma volume, altered distribution of thyroid hormones, enhanced metabolism of thyroid hormones, augmented renal clearance of iodide, and elevated hepatic synthesis of thyroxine-binding globulin (TBG) during the hyperestrogenic state of pregnancy contribute to the heightened demand for thyroxine. It is crucial to note that the assessment of thyroid function should focus on free thyroid hormones, as total hormone measurements may inaccurately suggest elevated levels in euthyroid patients.[3, 4] A common scenario involves a woman in the early stages of pregnancy, specifically during the first trimester, who is referred due to an elevated TSH level, while her free thyroid hormone levels remain within the low normal range or indicate overt hypothyroidism. In some cases, patients may

present with biochemical euthyroxinemia alongside positive TPO antibodies. Research has demonstrated that the presence of thyroid antibodies, even in patients who are euthyroid, correlates with a higher incidence of miscarriage, perinatal mortality, postpartum complications, and diminished motor and cognitive development in their children. However, to date, the presence of positive antibodies in the context of biochemically normal thyroid function does not warrant the initiation of thyroxine supplementation.[5- 7] Hence; the present study was conducted to evaluate maternal thyroid function and its correlation to duration of first stage of labor.

## MATERIALS & METHODS

A total of 100 pregnancy subjects were enrolled. Only those subjects were enrolled which were scheduled for vaginal delivery and were all not receiving treatment with thyroid hormone replacement or anti-thyroid medications.

Complete demographic and clinical details of all the patients were obtained. The subsequent details were extracted from medical records supplied by obstetricians, encompassing gestational age at delivery, maternal age, ethnic background during gestation, marital status, medical insurance coverage, parity, delivery method, type of labor, fetal positioning, duration of the first and second stages of labor, birth weight and length, infant gender, Apgar score, and delivery mode. Obstetricians diagnosed pregnancy-related complications, including thyroid dysfunction, in accordance with established guidelines. Maternal serum samples were collected during the first trimester (up to 13 weeks of gestation), the second trimester (13 to 26 weeks of gestation), and the third trimester (from 27 weeks of gestation), with thyroid levels being documented. All findings were recorded in a Microsoft Excel spreadsheet and subsequently analyzed statistically using SPSS software.

## RESULTS

The mean age of the patients was 32.3 years. Gestational diabetes was seen in 33 percent of the patients. Preeclampsia was seen in 2 percent of the patients. 78 percent of the patients were of Primigravida. Mean gestational age was 39.1 weeks. Spontaneous labour was seen in 69 percent of the patients. Maternal FT4, FT3 and TSH, levels showed significant correlations with the length of the first stage of labor.

**Table 1: Demographic data**

| Variable | | Number | Percentage |
|---|---|---|---|
| **Mean age (years)** | | 32.3 years | |
| **Gestational diabetes** | **Present** | 33 | 33 |
| | **Absent** | 67 | 67 |
| **Preeclampsia** | **Present** | 2 | 2 |
| | **Absent** | 98 | 98 |
| **Gravida** | **Primigravida** | 78 | 78 |
| | **Multigravida** | 22 | 22 |
| **Mean gestational age (weeks)** | | 39.1 weeks | |
| **Type of labour** | **Spontaneous** | 69 | 69 |
| | **Induced** | 31 | 31 |
| **APGAR score at 5 mins** | **<7** | 2 | 2 |
| | **≥7** | 98 | 98 |

**Table 2: Correlation of Maternal thyroid function to duration of the first stage of labor**

| Variable | First stage of labour | |
|---|---|---|
| | **r-value** | **p-value** |
| **fT3** | 1.223 | 0.001 (Significant) |
| **fT4** | 1.840 | 0.004 (Significant) |
| **TSH** | 2.339 | 0.000 (Significant) |

## DISCUSSION

Thyroid disorders frequently arise during pregnancy and are linked to various complications for both the mother and the fetus. Hyperthyroidism is observed in approximately 0.1–0.4% of pregnant individuals. In contrast, around 2–3% of pregnant women experience hypothyroidism, with 0.3–0.5% exhibiting overt hypothyroidism and 2–2.5% presenting with subclinical hypothyroidism. A significant proportion, estimated at 5–10%, of women test positive for thyroid antibodies, which correlates with an elevated risk of developing some level of thyroid insufficiency throughout pregnancy. Pregnancy exerts a notable influence on thyroid function, and any dysfunction can lead to increased morbidity for both the mother and the fetus. The implications of subclinical hypothyroidism on maternal and fetal complications remain ambiguous.[5- 7] Conversely, subclinical hyperthyroidism does not appear to be linked to negative outcomes. Additionally, thyroid autoimmunity has been associated with a heightened risk of miscarriage and preterm birth. The likelihood of decreasing the

incidence of adverse events is clearly established for overt thyroid disease; however, this is less certain for subclinical cases. Notably, the long-term advantages of treatment are linked to the possibility of reducing the risk of cognitive impairment in offspring resulting from undiagnosed and untreated maternal hypothyroidism. The potential drawbacks of a screening approach primarily stem from the possibility of identifying abnormal results. Additionally, there is a concern regarding the risk of healthy individuals being inappropriately treated with anti-thyroid medications by clinicians lacking experience.[8- 10] Hence; the present study was conducted to evaluate maternal thyroid function and its correlation to duration of first stage of labor.

Mean age of the patients was 32.3 years. Gestational diabetes was seen in 33 percent of the patients. Preeclampsia was seen in 2 percent of the patients. 78 percent of the patients were of Primigravida. Mean gestational age was 39.1 weeks. Spontaneous labour was seen in 69 percent of the patients. Maternal FT4, FT3 and TSH, levels showed significant correlations with the length of the first stage of labor. Henrichs J et al studied associations of maternal hypothyroxinemia and of early pregnancy maternal TSH and free T4 (FT4) levels across the entire range with cognitive functioning in early childhood. Participants included 3659 children and their mothers. In pregnant women with normal TSH levels at 13 wk gestation (sd = 1.7), mild and severe maternal hypothyroxinemia were defined as FT4 concentrations below the 10th and 5th percentile, respectively. Children's expressive vocabulary at 18 months was reported by mothers using the MacArthur Communicative Development Inventory. At 30 months, mothers completed the Language Development Survey and the Parent Report of Children's Abilities measuring verbal and nonverbal cognitive functioning. Maternal TSH was not related to the cognitive outcomes. An increase in maternal FT4 predicted a lower risk of expressive language delay at 30 months only. However, both mild and severe maternal hypothyroxinemia was associated with a higher risk of expressive language delay across all ages [odds ratio (OR) = 1.44; 95% confidence interval (CI) = 1.09–1.91; P = 0.010 and OR = 1.80; 95% CI = 1.24–2.61; P = 0.002, respectively]. Severe maternal hypothyroxinemia also predicted a higher risk of nonverbal cognitive delay (OR = 2.03; 95% CI = 1.22–3.39; P = 0.007). Maternal hypothyroxinemia is a risk factor for cognitive delay in early childhood.[11] Ghassabian, A et al investigated the association of maternal thyroid function during the first half of pregnancy with parent-reported problem behavior of the offspring up to age of 3 y. In the Generation R study, a population-based cohort of 3736 children and their mothers, data on maternal thyroid function and child's behavior were examined. The degree of internalizing and externalizing problems in the children were assessed with the Child Behavior Checklist at ages 1½ and 3 y. Higher levels of maternal TSH during pregnancy predicted a higher externalizing scores in children at 1½ and 3 y (B = 0.22 per SD of TSH; 95% CI: 0.04, 0.40; B = 0.10 per SD for internalizing scores; 95% CI: −0.01, 0.21). Maternal free thyroxine (T4) and total T4 were not associated with internalizing or externalizing scores of children. The linear relationship with more externalizing scores was across the range of TSH; this implies that subtle impairments of maternal thyroid function may affect the child. The results suggest that thyroid function is crucial for fetal brain development, which determines problem behavior later in life.[12]

## CONCLUSION

Thyroid disorders are identified with a prevalence that is four to five times higher in women than in men, especially during the reproductive years. Consequently, it is common to find abnormalities in thyroid function during standard laboratory assessments conducted for pregnant individuals. Maternal levels of FT4, TSH, and TPOAb were found to be associated with the duration of the initial stage of labor.

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