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Original Research

To Study Thyroid Disorder Associated With Fetal Low Birth Weight

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Abstract

Background: Thyroid hormones play a crucial role in fetal growth and development, and numerous studies have linked maternal thyroid dysfunction to various pregnancy outcomes. Research indicates an elevated risk of preterm birth linked to both maternal hyperthyroidism and hypothyroidism. Regarding birth weight, maternal hyperthyroidism has been associated with a higher likelihood of low birth weight and small-for-gestational-age (SGA) infants.

Materials and methods- An observational, record based, cross-sectional study conducted at the Department of obstetrics and gynecology.All antenatal patient over a period of 1 year from august 2021 to august 2022 with informed consent were included. Thyroid profile was done in each trimester.According to recent American Thyroid Association (ATA) guidelines,the recommended reference ranges for TSH are 0.1 to2.5mIU/L in first trimester,0.2 to3.0mIU/L in the second trimester,0.3 to 3.0mIU/L in the third trimester. ATA guidelines recommend subclinical hypothyroidism should be treated in females with positive TPO antibodies and TSH greater than 2.5 mU/L.Reference range for fetal low birth weight is $\leq$2.5kg.

Results-During pregnancy, the prevalence of thyroid conditions is as follows: approximately 2% to 3% of women experience spontaneous hypothyroidism, 0.3% to 0.5% present with overt hypothyroidism, and 2% to 2.5% have subclinical hypothyroidism. The incidence of low birth weight in these cases is reported to be between 1.5% and 2%.

Conclusion: Maternal subclinical hypothyroidism in pregnancy is associated with higher risk of low birth weight as compared to euthyroidism

Keywords- Hypothyroidism, pregnancy, neonatal

Introduction

Thyroid hormones play a crucial role in fetal growth and development, and numerous studies have linked maternal thyroid dysfunction to various pregnancy outcomes. Critical indicators of neonatal health, such as gestational age at delivery and birth weight, are closely associated with neonatal mortality and morbidity. It has been suggested that some complications arising from maternal thyroid disease may be related to the occurrence of preterm birth.[1,2]

Research indicates an elevated risk of preterm birth linked to both maternal hyperthyroidism and hypothyroidism. Regarding birth weight, maternal hyperthyroidism has been associated with a higher likelihood of low birth weight and small-for-gestational-age (SGA) infants. In contrast, findings related to maternal hypothyroidism are more varied; some studies report an increased risk of low birth weight or SGA, while others show no significant association. Additionally, maternal isolated hypothyroxinemia during the first trimester has been connected to a greater risk of fetal macrosomia. In another investigation, mothers who tested positive for thyroid peroxidase antibodies were found to have more children classified as large-for-gestational-age (LGA).[3,4,5]

When examining whether a disease is linked to adverse pregnancy outcomes, one must consider several factors: the disease itself, the effects of treatment (or lack thereof), and the underlying causes or correlates of the disease. If genetic factors contribute to the condition, maternal diseases identified postpartum may influence pregnancy outcomes, and there could also be an association with paternal health issues. Similarly, if a subclinical form of a disease exists during pregnancy but only gets diagnosed afterward, it may also be associated with the resultant pregnancy outcomes.[6,7]

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Material and methods

An observational, record based, cross-sectional study conducted at the Department of obstetrics and gynecology All antenatal patient over a period of 1 year from august 2021 to august 2022 with informed consent were included. Thyroid profile was done in each trimester. According to recent American Thyroid Association (ATA) guidelines, the recommended reference ranges for TSH are 0.1 to2.5mIU/L in first trimester 0.2 to3.0mIU/L in the second trimester,0.3 to 3.0mIU/L in the third trimester. ATA guidelines recommend subclinical hypothyroidism should be treated in females with positive TPO antibodies and TSH greater than 2.5 mU/L.Reference range for fetal low birth weight was≤2.5kg.

Results

During pregnancy, the prevalence of thyroid conditions is as follows: approximately 2% to 3% of women experience spontaneous hypothyroidism, 0.3% to 0.5% present with overt hypothyroidism, and 2% to 2.5% have subclinical hypothyroidism. The incidence of low birth weight in these cases is reported to be between 1.5% and 2%.

Table 1: Prevalence of thyroid conditions in pregnancy

Condition	Prevalence
Spontaneous hypothyroidism	2%-3%
Overt hypothyroidism	0.3% - 0.5%
Subclinical hypothyroidism	2% - 2.5%

Table 2: Thyroid Conditions association with Low-Birth-Weight Rates

Condition	Associated with low birth weight
Spontaneous hypothyroidism	1.5% - 2%
Overt hypothyroidism	1.5% - 2%
Subclinical hypothyroidism	1.5% - 2%

Discussion

Thyroid disorders during pregnancy are significant health concerns that can adversely affect both maternal and fetal outcomes. Thyroid hormones play a crucial role in fetal development, particularly in brain development and growth. When maternal thyroid function is impaired—whether due to hypothyroidism, hyperthyroidism, or autoimmune thyroiditis—it can disrupt the delicate hormonal balance necessary for a healthy pregnancy. One of the potential complications associated with maternal thyroid dysfunction is fetal low birth weight (LBW). Low birth weight is a critical indicator of neonatal health and is linked to an increased risk of neonatal morbidity and mortality, as well as long-term developmental issues.[8,9]

In our study during pregnancy, the prevalence of thyroid conditions was approximately 2% to 3% of women experienced spontaneous hypothyroidism, 0.3% to 0.5% presented with overt hypothyroidism, and 2% to 2.5% had subclinical hypothyroidism. The incidence of low birth weight in these cases was reported to be between 1.5% and 2%.

In a previous study, the association between maternal thyroid dysfunction and the risk of low birth weight (LBW) in neonates was examined. This analysis, included 11 cohort studies with a total of 1,171,052 participants, investigated the effects of both overt and subclinical hyperthyroidism and hypothyroidism during pregnancy. The findings indicated that maternal hyperthyroidism was associated with an increased risk of LBW. However, no significant association was found between LBW and subclinical hyperthyroidism or either overt or subclinical hypothyroidism. These results suggest that while overt hyperthyroidism in pregnancy may increase the risk of delivering a low birth weight infant, subclinical thyroid dysfunctions do not appear to significantly impact birth weight outcomes.[10]

Also a study done among Chinese population explored the association of maternal thyroid function during early and late pregnancy with birth weight. It was indicated that higher TSH or FT4 concentrations, or lower T3 concentrations, during the first or third trimester were associated with lower birth weight. Additionally, maternal FT4 concentrations below the 2.5th percentile in both trimesters were associated with a 0.34 standard deviation (SD) higher birth weight, with more pronounced effects in the first trimester (0.23 SD) and the third trimester (0.17 SD). Furthermore, the associations of maternal TSH and FT4 levels with birth weight varied according to fetal sex. Persistently low FT4 concentrations throughout pregnancy were linked to higher birth weight and an increased risk of LGA, highlighting the importance of monitoring mildly altered thyroid hormone concentrations during pregnancy.[11] Derakhshan A et al analysed individual participant data using mixed-effects regression models adjusting for maternal age, body mass index, ethnicity, smoking, parity, gestational age at blood sampling, fetal sex and gestational age at birth. From 2,526 published reports, 36 cohorts met the inclusion criteria and were invited to participate of which 15 agreed and after addition of 5 unpublished datasets, a total of 20 cohorts were included. After exclusions, the study population comprised 48,145 mother-child pairs of whom 1,275 (3·1%) had subclinical hypothyroidism (increased TSH with normal FT4) and 929 (2·2%) had isolated hypothyroxinaemia (decreased FT4 with normal

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TSH). Maternal subclinical hypothyroidism was associated with a higher risk of SGA compared to euthyroidism and lower mean birth weight with a higher effect estimate for measurement in the 3rd trimester compared with the 1st or 2nd trimester. Isolated hypothyroxinaemia was associated with a lower risk of SGA compared to euthyroidism and higher mean birth weight. Each 1-SD higher maternal TSH concentration was associated with lower birth weight, with higher effect estimates in TPOAb-positive than TPO-negative women. Each 1-SD higher FT4 concentration was associated with lower birth weight, with a higher effect estimate for measurement in the 3rd trimester compared with the 1st or 2nd trimester. Maternal subclinical hypothyroidism in pregnancy is associated with a higher risk of SGA and lower birth weight, whereas isolated hypothyroxinaemia is associated with lower risk of SGA and higher birth weight. [12]

Conclusion

Maternal subclinical hypothyroidism in pregnancy is associated with higher risk of low birth weight as compared to euthyroidism

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