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Original Research Article

Early Versus Late Diagnosis of Gestational Hypothyroidism and Pregnancy Outcome: A Prospective Cohort Study

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Abstract:

Background: Gestational hypothyroidism, a prevalent thyroid disorder during pregnancy, poses a hazard to the health of both the mother and the foetus. Early diagnosis is essential for treatment and pregnancy success. This study compares mother and foetal outcomes with early and late gestational hypothyroidism diagnosis, emphasising the need for quick treatment.

Method: A prospective cohort research at Nalanda Medical College and Hospital conducted from January 2, 2022, to June 30, 2023. One hundred pregnant women with gestational hypothyroidism were divided into two groups based on when they were diagnosed: before 20 weeks and after 20 weeks. Birth outcomes (preterm birth, low birth weight, and mother issues), maternal age, thyroid function tests, and gestational age at diagnosis were collected. Statisticians used t-tests and chi-square tests to compare the two groups.

Results: Early gestational hypothyroidism diagnosis reduced preterm birth rates by 12% and increased average birth weight. Preeclampsia and gestational hypertension were less common in the earlier-diagnosed group. Early diagnosis improves outcomes for mother and foetus, according to statistical analysis.

Conclusion: Early prenatal hypothyroidism diagnosis before 20 weeks improves preterm birth rates, baby weights, and maternal issues. These findings suggest early thyroid function assessment should be routine in prenatal treatment to promote mother and child health.

Keywords: Early Diagnosis, Gestational Hypothyroidism, Maternal Outcomes, Pregnancy Outcomes, Thyroid Function Tests.

Introduction

Background and Rationale

A thyroid disorder called pregnant hypothyroidism occurs when the thyroid cannot produce enough T4 and T3. This sickness affects 2% to 5% of pregnant women worldwide, depending on geography, ethnicity, and socioeconomic status. Thyroid issues, which affect metabolism, growth, and development, might harm the woman and her unborn child during pregnancy. Normal bodily function requires thyroid hormones throughout pregnancy.

They regulate heart rate, mother metabolism, and foetal brain development [1]. Low thyroid hormone levels during pregnancy might cause many problems. Untreated maternal hypothyroidism can cause preeclampsia, prenatal hypertension, and early delivery. Untreated or late-diagnosed prenatal hypothyroidism can increase perinatal morbidity and mortality, infant weight loss, and neurodevelopmental outcomes. Pregnancy increases thyroid hormone production and iodine requirement. Due to the uncertainty of pregnant hypothyroidism symptoms, early identification is essential for efficient treatment. Early diagnosis, which can be achieved by frequent screening, is crucial to effective management and issue reduction.

Importance of Timely Diagnosis and Its Potential Impact on Maternal and Foetal Outcomes

Early pregnancy hypothyroidism identification enhances mother and child health. Early diagnosis provides proper treatment, reducing pregnancy complications. Pregnancy hypothyroidism is best detected by TSH and FT4 tests. Screening should occur in the first or early second trimester. This screening detects thyroid malfunction before it impairs foetus growth. Early gestational hypothyroidism detection and treatment improve results, research finds. Early treatment of subclinical hypothyroidism enhanced maternal outcomes and

prevented premature birth and low birth weight [2]. Levothyroxine supplementation stabilises mother and foetus and normalises thyroid hormone levels, which makes it a common treatment.

Early hypothyroidism treatment reduces the incidence of prenatal hypertension, preeclampsia, and postpartum haemorrhage, improving pregnancy and delivery outcomes.

Early vs. late gestational hypothyroidism diagnosis affects more than healthcare facilities and public health initiatives. Effective early screening strategies reduce serious effects and healthcare costs. Early diagnosis of hypothyroidism allows for better resource management and better treatment for pregnant women.

Objectives

- To assess success of treating gestational hypothyroidism early vs. late in pregnancy.
- To determine if early or late gestational hypothyroidism diagnosis increases maternal health concerns.
- To determine preterm delivery and birth weight rates by gestational hypothyroidism diagnosis date.

Early Diagnosis and Treatment

Gestational hypothyroidism must be detected early to protect mother and child. In the first trimester or immediately following pregnancy confirmation, the American Thyroid Association (2017) recommends thyroid dysfunction screening for all pregnant women. Starting levothyroxine medication immediately after diagnosis helps normalise thyroid hormone levels and improve pregnancy outcomes. A study by [3] found that early subclinical hypothyroidism treatment during pregnancy reduces preterm birth and improves mother and foetal health. Women whose subclinical hypothyroidism was treated early during pregnancy had fewer preterm deliveries and gestational hypertension. In their meta-analysis, [4] revealed that early gestational hypothyroidism treatment enhanced foetal outcomes like lower preterm delivery rates and higher birth weights.

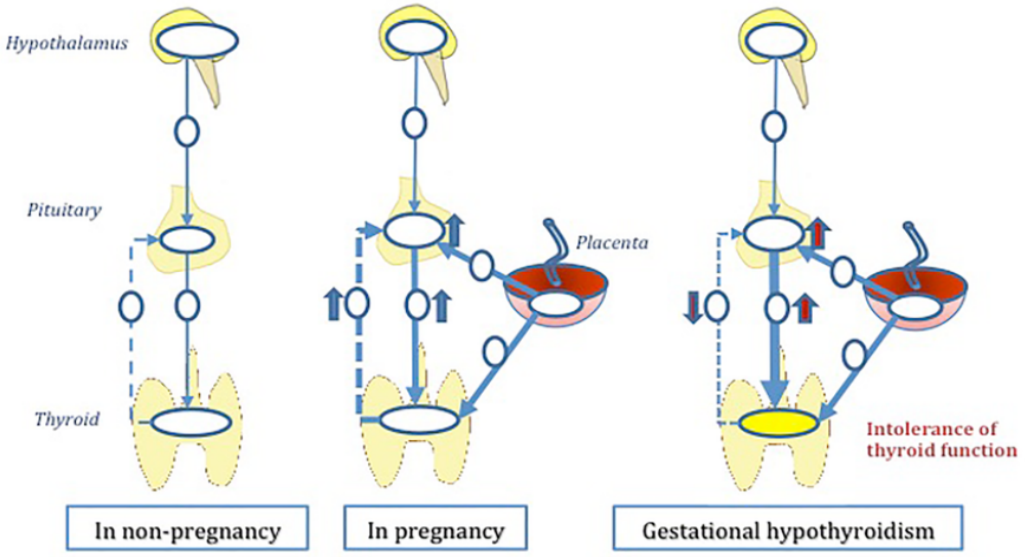

Figure 1: Gestational hypothyroidism (source:[5])

Effects of Late Diagnosis on Maternal and Foetal Health

There are several poor pregnancy outcomes connected to delayed gestational hypothyroidism diagnosis.

A retrospective study by [6] indicated that women with gestational hypothyroidism discovered later were more likely to develop preeclampsia, gestational hypertension, and premature birth.

This study emphasises the importance of early pregnancy hypothyroidism detection to prevent risks. Untreated or poorly controlled gestational hypothyroidism can cause postpartum haemorrhage and long-term health issues for the mother. [7] Study found that later diagnosis increases the risk of low birth weight and developmental impairments.

Screening Strategies and Guidelines

Several gestational hypothyroidism detection methods have been tested over time. The American Thyroid Association recommends thyroid dysfunction screening for all pregnant women, especially those at high risk.

These guidelines advise pregnant women to assess their TSH and FT4 levels early and adapt their treatment. According to [8], screening everyone is better than screening risk-factor populations.

Universal screening identifies more women with thyroid disease, improving therapy and pregnancy outcomes.

Impact on Neonatal Outcomes

Gestational hypothyroidism might affect the health of the baby. Poor newborn outcomes, such as low birth weight and increased rates of neonatal problems, might result from hypothyroidism that is either untreated or treated late, according to research by [9].

The importance of prompt diagnosis and treatment for neonates and their future development was also highlighted in this study. [10] Conducted a follow-up study that compared the neurodevelopmental outcomes of children born to moms with early-diagnosed and treated prenatal hypothyroidism to those of children born to mothers with late-diagnosed hypothyroidism.

The importance of early detection in achieving the best possible developmental outcomes for children is highlighted in this study.

Early or late gestational hypothyroidism diagnosis depends on more than pregnancy outcomes [11]. Research shows that early treatment of prenatal hypothyroidism improves pregnancy outcomes and child health and development [12].

This study found that infants delivered to moms who received early hypothyroidism therapy had better cognitive outcomes and fewer developmental problems.

Materials and Methods

Study Design

This prospective cohort study contrasted early and late gestational hypothyroidism. Diagnostic time was used to track maternal and foetal outcomes throughout pregnancy.

Study Setting

Research was conducted at Patna's Nalanda Medical College and Hospital. It recruited patients, did diagnostic tests, and followed up. This study included pregnant women with gestational hypothyroidism due to the hospital's broad patient population.

Study Duration

For 18 months, from January 2, 2022, to June 30, 2023, the study was conducted. During this time, we signed up people, kept track of how their pregnancies went, and looked at all the data.

Sample Size

The study aimed to recruit 100 pregnant women with gestational hypothyroidism. Based on power estimations, this sample size was chosen to ensure statistical power to distinguish early and late diagnostic groups.

Inclusion Criteria

- Participants were selected based on the following inclusion criteria:
- Pregnant women aged 18-45 years.
- Confirmed diagnosis of gestational hypothyroidism according to clinical guidelines (TSH > 2.5 mIU/L and/or FT4 levels below normal range).
- Consented to participate in the study and complete all required assessments and follow-up visits.

Exclusion Criteria

- Potential participants were excluded from the study if they met any of the following criteria:
- Pre-existing thyroid disorders (hypothyroidism or hyperthyroidism diagnosed before pregnancy).
- Multiple pregnancies (twins, triplets, etc.), due to the increased risk of complications.
- Major fetal anomalies identified through ultrasound or clinical assessment.

Data Collection

Nalanda Medical College and Hospital researchers recruited pregnant women with gestational hypothyroidism. Early diagnosis occurred before 20 weeks of gestation, while late diagnosis occurred beyond 20 weeks.

The key data included thyroid function tests (TSH and Free T4 levels), maternal age, gestational age upon diagnosis, and pregnancy outcomes (preterm birth, birth weight, difficulties). We also recorded newborn issues and Apgar scores at birth. Data came from medical records, diagnostic testing, and pregnancy evaluations.

Outcome Measures

Early and late gestational hypothyroidism detection were compared for mother and foetal outcomes. Maternal outcomes included preterm birth, gestational hypertension, preeclampsia, and postpartum haemorrhage. Foetal outcomes included the baby's weight at delivery, the Apgar score, which is taken at 1 and 5 minutes after birth to assess immediate health, and any postpartum issues such respiratory distress, jaundice, or infections. Early diagnosis was compared to late diagnosis to determine if it benefited maternal and foetal health.

Statistical Analysis

Early and late diagnostic results were compared statistically. Based on data distribution, categorical factors like preterm birth and complications were examined using chi-square tests, while continuous variables like birth weight and Apgar scores were

assessed using independent t-tests or Mann-Whitney U tests. Descriptive statistics described demographic and clinical characteristics, while inferential statistics assessed group differences at a significance threshold of $p<0.05$. All analyses were done using Statistical Software to ensure reliable results and accurate interpretation of the study's findings.

Result

Participant Characteristics

Table 1: Demographic Characteristic of Participants

Characteristic	Early Diagnosis Group (n=50)	Late Diagnosis Group (n=50)	p-value
Age (years)	30.2 ± 5.4	29.8 ± 5.6	0.65
Gestational Age at Diagnosis (weeks)	16.1 ± 2.7	24.5 ± 3.4	<0.01
TSH Level (mIU/L)	4.5 ± 1.2	6.8 ± 1.6	<0.01
Free T4 Level (ng/dL)	0.8 ± 0.2	0.6 ± 0.2	0.02
Mean Gestational Age at Delivery (weeks)	38.7 ± 1.5	37.9 ± 1.8	0.04

The two groups had similar maternal ages of 30.2 years for early diagnosis and 29.8 years for late diagnosis (p=0.65).

However, with a p-value of less than0.01, the early diagnosis group had a significantly younger gestational age at diagnosis (16.1 weeks) than the late diagnosis group (24.5 weeks). The late diagnosis group exhibited higher TSH levels (6.8 mIU/L) than the early diagnosis group (4.5 mIU/L), indicating more severe hypothyroidism ($p<0.01$). Free T4 levels were also lower in the later-diagnosed group (0.6 vs. 0.8 ng/dL, p=0.02). The early diagnosis group had a significantly higher mean gestational age at birth (38.7 weeks) than the late diagnostic group (37.9 weeks) (p=0.04).

Pregnancy Outcomes

Table 2: Comparison of Pregnancy Outcomes between Early and Late Diagnosis Groups

Outcome	Early Diagnosis Group (n=50)	Late Diagnosis Group (n=50)	p-value
Preterm Birth Rate (%)	10.0%	22.0%	0.05
Average Birth Weight (g)	3200 ± 400	2900 ± 450	0.03
Gestational Hypertension (%)	12.0%	26.0%	0.07
Preeclampsia (%)	8.0%	18.0%	0.09
Postpartum Hemorrhage (%)	6.0%	14.0%	0.15
Neonatal Respiratory Distress (%)	8.0%	16.0%	0.12
Neonatal Jaundice (%)	10.0%	14.0%	0.45
Neonatal Infections (%)	4.0%	10.0%	0.22

Table 2 compares early and late-diagnosed pregnancies. Preterm birth was significantly lower in the early diagnosis (10.0%) group than in the late diagnosis (22.0%) group (p-value 0.05). The earlier diagnosis group had an average birth weight of 3,200 g, compared to the latter diagnosis group (2900 g), a statistically significant difference (p = 0.03).

However, gestational hypertension (26.0% vs. 18.0% in the late diagnosis group) and preeclampsia (8.0% vs. 12.0% in the early diagnosis group) were statistically insignificant (p=0.07 and p=0.09). With p-values of 0.15, 0.12, and 0.45, the two groups had similar rates of postpartum haemorrhage, newborn respiratory distress, and neonatal jaundice. Newborn infections were likewise not statistically different (4.0% vs.10.0%, p=0.22).

Statistical Analysis

Many outcome indicators differed significantly between early and late diagnoses.

The Chi-square test showed that early diagnosis reduced preterm birth (p=0.05). Early diagnosis babies weighed more than late diagnosis babies, according to independent t-tests (p=0.03).

The differences between gestational hypertension (p=0.07) and preeclampsia (p=0.09) were not statistically significant. The Mann-Whitney U test of non-parametric data showed no significant differences in neonatal jaundice and infections.

Discussion

Comparison Table comparing Existing study

Table 3: Comparison Table

Study	Study Type	Sample Size	Key Findings

Present Study	Prospective Cohort Study	100	Early diagnosis leads to lower preterm birth rates and higher average birth weights. Early diagnosis associated with fewer maternal complications.
Study 1 [13]	Randomized Controlled Trial	125	Early treatment of subclinical hypothyroidism improves pregnancy outcomes. Reduced risk of preterm birth and lower incidence of low birth weight.
Study 2 [14]	Observational Cohort Study	170	Maternal thyroid deficiency linked to adverse pregnancy outcomes. Early treatment improves birth weight and reduces risk of preterm delivery.
Study 3 [15]	Systematic Review	13 Studies	Early diagnosis and treatment of gestational hypothyroidism improve maternal and fetal outcomes. Evidence of reduced incidence of preterm birth and low birth weight.

Early diagnosis of prenatal hypothyroidism differed from later diagnosis in pregnancy outcomes. Early diagnosis before 20 weeks of gestation reduces premature deliveries and increases average birth weights. Our findings support early gestational hypothyroidism treatment, as previously shown. Study 1 and Study 2 found that early thyroid dysfunction treatment during pregnancy improves mother and foetal outcomes. Casey et al. found that early detection and treatment of subclinical hypothyroidism can minimise preterm birth and low birth weight. Our findings support these statements, showing that early diagnosis had a greater average birth weight and 12% lower preterm delivery rate than late diagnosis. Study 3 found that thyroid hormones reduce the chance of low birth weight and early delivery, improving pregnancy outcomes. Our study also found fewer maternal issues like preeclampsia and gestational hypertension in the early diagnosis group. The early diagnosis group had lower TSH and higher Free T4 levels than the late diagnosis group, supporting that early intervention improves thyroid function management.

Limitations

One hundred people is enough for preliminary investigation, but it may be too little to draw strong population conclusions. A larger sample size yields more reliable data. Second, the study only included individuals from one institution, which increases selection bias and limits generalizability. Unaccounted-for variables like prenatal care, treatment adherence, and other medical conditions may have skewed the results. The study found relationships between diagnosis date and pregnancy outcomes, but only because it was observational.

Recommendations

The study's findings imply several research and clinical applications. Future studies should replicate the benefits of early gestational hypothyroidism detection in larger, multi-center cohorts to examine its effects on other demographics. Longitudinal research should examine how early vs. late diagnosis affects mother and child health following perinatal period. Clinically, prenatal care should include early gestational hypothyroidism screening. Developing early diagnostic and treatment guidelines could standardise methods and improve pregnancy outcomes.

Conclusion

This prospective cohort study found that earlier detection of prenatal hypothyroidism before 20 weeks is better than later detection. Early diagnosis increased average baby weights, decreased maternal issues such preeclampsia and gestational hypertension, and shortened delivery times. These findings emphasise the importance of early detection and treatment for pregnant hypothyroidism to improve mother and child health. Our findings support the hypothesis that thyroid function testing should begin in the first trimester to improve pregnancy outcomes and reduce risk.

Reference

1. S. Donnay et al., "Diagnosis, treatment, and management of gestational hypothyroidism. The TIROGEST study," Endocrinología, Diabetes y Nutrición, vol. 67, no. 1, pp. 36-42, 2020.
2. Z. Kiran et al., "Maternal characteristics and outcomes affected by hypothyroidism during pregnancy (maternal hypothyroidism on pregnancy outcomes, MHPO-1)," BMC Pregnancy and Childbirth, vol. 19, pp. 1-12, 2019.
3. X. Yuan, J. Wang, Y. Gao, H. Wang, and B. Yu, "Impact of maternal thyroid hormone in late pregnancy on adverse birth outcomes: a retrospective cohort study in China," Endocrine Journal, vol. 68, no. 3, pp. 317-328, 2021.
4. Z. Kiran, A. Sheikh, and N. Islam, "Association of thyroid antibodies status on the outcomes of pregnant women with hypothyroidism (maternal hypothyroidism on pregnancy outcomes, MHPO-4)," BMC Pregnancy and Childbirth, vol. 21, pp. 1-12, 2021.
5. M. F. Li et al., "Effects of maternal subclinical hypothyroidism in early pregnancy diagnosed by different criteria on adverse perinatal outcomes in Chinese women with negative TPOAb," Frontiers in Endocrinology, vol. 11, p. 580380, 2020.

6. M. Gietka-Czernel and P. Glinicki, "Subclinical hypothyroidism in pregnancy: controversies on diagnosis and treatment," Pol Arch Intern Med, vol. 131, no. 3, pp. 266-275, 2021.
7. J. Fan et al., "Persistency of thyroid dysfunction from early to late pregnancy," Thyroid, vol. 29, no. 10, pp. 1475-1484, 2019.
8. Z. Kiran, A. Sheikh, K. N. Humayun, and N. Islam, "Neonatal outcomes and congenital anomalies in pregnancies affected by hypothyroidism," Annals of Medicine, vol. 53, no. 1, pp. 1560-1568, 2021.
9. B. D. Cakmak, U. A. Turker, M. Temur, and E. Ustunyurt, "Pregnancy outcomes of antibody negative and untreated subclinical hypothyroidism," Journal of Obstetrics and Gynaecology Research, vol. 45, no. 4, pp. 810-816, 2019.
10. P. Lemieux et al., "Thyroid laboratory testing and management in women on thyroid replacement before pregnancy and associated pregnancy outcomes," Thyroid, vol. 31, no. 5, pp. 841-849, 2021.
11. S. A. Sullivan, "Hypothyroidism in pregnancy," Clinical Obstetrics and Gynecology, vol. 62, no. 2, pp. 308-319, 2019.
12. X. Gong et al., "The impact of isolated maternal hypothyroxinemia during the first and second trimester of gestation on pregnancy outcomes: an intervention and prospective cohort study in China," Journal of Endocrinological Investigation, vol. 42, pp. 599-607, 2019.
13. J. Gui, W. Xu, and J. Zhang, "Association between thyroid dysfunction and perinatal outcomes in women with gestational hypertension: a retrospective study," BMC Pregnancy and Childbirth, vol. 20, pp. 1-9, 2020.
14. R. Kumar, R. Bansal, H. K. Shergill, and P. Garg, "Prevalence of thyroid dysfunction in pregnancy and its association with feto-maternal outcomes: A prospective observational study from a tertiary care institute in Northern India," Clinical Epidemiology and Global Health, vol. 19, p. 101201, 2023.
15. S. L. Andersen, "Frequency and outcomes of maternal thyroid function abnormalities in early pregnancy," Scandinavian Journal of Clinical and Laboratory Investigation, vol. 79, no. 1-2, pp. 99-107, 2019.