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Evaluation of Thyroid Function During Pregnancy and Its Impact on Perinatal Outcomes

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ABSTRACT

Objectives: The aim of this study was to evaluate the thyroid profile in pregnant women and to compare perinatal outcomes between those with normal thyroid function (euthyroid) and those with thyroid dysfunction.

Methodology: This prospective, cross-sectional study included 150 pregnant women. Of these, 75 were healthy women with normal thyroid profiles (Group A), and 75 were pregnant women diagnosed with thyroid disorders (Group B).

Results: The most common thyroid disorder identified during pregnancy was subclinical hypothyroidism, accounting for 68% of cases. No significant difference in gestational age at delivery was found between the two groups. However, the rate of cesarean section was significantly higher in Group B (48%) compared to Group A (24%) ($p < 0.05$). Intrauterine fetal demise (IUD) occurred in 2.67% of cases in Group A and 6.67% of cases in Group B. The mean birth weight of newborns in Group B (2.57 ± 0.50 kg) was significantly lower than that of Group A (2.92 ± 0.60 kg) ($p < 0.001$). Additionally, a lower APGAR score (≤6) at 1 and 5 minutes was observed more frequently in Group B (30.43% and 18.84%) compared to Group A (8.22% and 4.11%), showing a statistically significant difference ($p < 0.01$).

Conclusion: The findings indicate a significant association between thyroid disorders during pregnancy and adverse perinatal outcomes.

Keywords: *Pregnancy, thyroid function, perinatal outcomes.*

1. INTRODUCTION

Thyroid disorders are among the most common endocrine conditions affecting women of reproductive age and are known to impact pregnancy outcomes adversely. Studies estimate that the prevalence of thyroid dysfunction during pregnancy ranges between 2.3% and 3.8% [1]. Among these, maternal hypothyroidism is the most frequently encountered disorder, with overt hypothyroidism occurring in approximately 0.2% of pregnancies and subclinical hypothyroidism in about 2.3% [2]. When left unmanaged, thyroid disorders during pregnancy have been linked to various complications, including placental abruption, preeclampsia, preterm delivery, fetal loss, impaired intellectual development in offspring, and low birth weight [3].

Pregnancy itself leads to several physiological changes that significantly influence thyroid function, with thyroid hormone production increasing by 40–100% to accommodate the demands of both mother and fetus [4]. Key adaptations during pregnancy include thyroid gland enlargement, altered iodine metabolism, elevated levels of thyroid-binding proteins, and the influence of placental thyroid-stimulating factors. However, due to the nonspecific nature of symptoms and the hypermetabolic state associated with pregnancy, thyroid dysfunction is often overlooked. Given the potential risks associated with maternal thyroid abnormalities and the well-established benefits of timely treatment, expert committees have recommended universal thyroid function screening for all pregnant women.

In this context, the present study aims to assess thyroid profiles in pregnant women and compare perinatal outcomes between those with normal (euthyroid) and abnormal thyroid profiles.

2. METHODOLOGY

This cross-sectional study was conducted in the Department of Obstetrics and Gynaecology at NC Medical College, Israna, Panipat, over a period from 1st March 2024 to 30th March 2025. Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement.

The study population comprised two groups: 75 healthy, euthyroid pregnant women (Group A) and 75 pregnant women diagnosed with thyroid disorders (Group B). Both groups were matched based on maternal age, gravidity, parity, and locality to minimize potential confounding factors. Participants were selected randomly from the antenatal outpatient department (ANOPD), antenatal ward, and labour room during their first antenatal visit.

Women with multiple gestation, major obstetric complications (such as antepartum haemorrhage, malnutrition, or hydramnios), systemic illnesses (including cardiac, renal, or hepatic disease), or those on medications known to affect thyroid function (such as steroids, amiodarone, methadone, or dopamine) were excluded from the study.

Women in Group B (thyroid disorder group) were managed appropriately, receiving thyroid-related treatment as per clinical need. After obtaining informed written consent, relevant demographic and clinical data were collected using a structured proforma. Peripheral blood samples were obtained from all participants for thyroid hormone assessment. Quantitative estimations of T3, T4, and TSH levels were performed using RIAK-4/4A, RIAK-5/5A, and IRMAK-9 kits, respectively.

Thyroid dysfunction was defined based on specific hormone level criteria:

- **Hyperthyroidism**: Low TSH with normal-to-high T3 and T4 levels.
- **Hypothyroidism**: High TSH with normal-to-low T3 and T4 levels.

Further classifications included:

- **Overt hypothyroidism**: High TSH with low T4 and low/normal T3.
- **Overt hyperthyroidism**: Low TSH with high T4.
- **Subclinical hypothyroidism**: High TSH with normal T4.
- **Subclinical hyperthyroidism**: Low TSH with normal T4.

Normal reference ranges for thyroid hormones were established based on published guidelines [5,6,7].

Table 1: Normal Thyroid Levels

Category	Non-pregnant Adult	First Trimester	Second Trimester	Third Trimester
TSH (µIU/ml)	0.34–4.25	0.1–4.40	0.4–5.0	0.23–4.4
T4 (µg/dl)	5.4–11.7	3.6–9.0	4.0–8.9	3.5–8.6
T3 (ng/dl)	77–135	71–175	84–195	97–182

TSH: Thyroid Stimulating Hormone; T4: Total Thyroxine; T3: Total Triiodothyronine

Data were analyzed using appropriate statistical tests, including the chi-square (χ^2) test and t-test. Results were presented as counts, percentages, or mean ± standard deviation (SD). A p-value of less than 0.05 was considered statistically significant.

3. RESULTS

The most prevalent thyroid disorder identified during pregnancy was subclinical hypothyroidism, accounting for 68% of cases. There was no statistically significant difference in the gestational age at delivery between the euthyroid group (Group A) and the thyroid disorder group (Group B). However, within Group B, hypothyroid women showed a higher proportion of preterm births (19.4%) compared to 12.5% among hyperthyroid cases.

Although vaginal delivery was the most common mode of delivery in both groups, the rate of caesarean section was significantly higher in Group B (48%) compared to Group A (24%), with the difference being statistically significant ($p < 0.05$).

As shown in Table 2, intrauterine fetal demise (IUD) occurred in 2 cases (2.67%) in Group A and 5 cases (6.67%) in Group B, all of which belonged to the hypothyroid subgroup. However, this difference was not statistically significant (Fisher's exact test $p = 0.25$).

Table 2: Modes of Delivery, Foetal Outcome, and Birth Weight

Category	GroupA (N=75)	Group B Total (N=75)	Hypothyroidism (N=67)	Hyperthyroidism (N=8)
Modes of Delivery				
Vaginal delivery	57 (76%)	39 (52%)	33 (49.25%)	6 (75%)
Caesarean delivery	18 (24%)	36 (48%)	34 (50.75%)	2 (25%)
Total	75 (100%)	75 (100%)	67 (100%)	8 (100%)
Outcome of Foetus				
Live	72 (96%)	68 (90.67%)	61 (91.04%)	7 (87.5%)
Intra uterine death (IUD)	2 (2.67%)	5 (6.67%)	5 (7.46%)	0
Neonatal death	1 (1.33%)	2 (2.66%)	1 (1.50%)	1 (12.5%)
Perinatal Outcome (Birth Weight)				
≥ 2.5 kg	56 (74.67%)	40 (53.33%)	35 (52.24%)	5 (62.5%)
2 - <2.5 kg	12 (16%)	26 (34.67%)	24 (35.82%)	2 (25%)
1.5 - <2 kg	6 (8%)	6 (8%)	6 (8.96%)	0
<1.5 kg	1 (1.33%)	3 (4%)	2 (2.98%)	1 (12.5%)
Total	75 (100%)	75 (100%)	67 (100%)	8 (100%)
Mean Birth Weight	2.92 ± 0.60 kg	2.57 ± 0.50 kg		

Regarding birth weight, 74.67% of Group A and 53.33% of Group B had babies with normal birth weight. A higher proportion of low birth weight was observed in Group B, which was statistically significant ($p < 0.01$). The mean birth weight in Group B (2.57 ± 0.50 kg) was significantly lower than that in Group A (2.92 ± 0.60 kg) ($p < 0.001$).

A lower APGAR score (≤6) at 1 minute was noted in 30.43% of newborns from Group B, compared to 8.22% in Group A, which was statistically significant ($p < 0.01$). Similarly, at 5 minutes, 18.84% of newborns in Group B had an APGAR score ≤6, compared to 4.11% in Group A ($p < 0.01$). Most cases of low APGAR scores at both 1 and 5 minutes in Group B were associated with hypothyroid mothers.

Table 3: Perinatal Outcome According to APGAR Score at 1 and 5 Minutes

APGAR Score	Group A (No & %)		Group B (No & %)		Hypothyroidism (No & %)		Hyperthyroidism (No & %)	
	1 min	**5 min**	**1 min**	**5 min**	**1 min**	**5 min**	**1 min**	**5 min**
≥ 7	67 (91.78%)	70 (95.89%)	48 (69.57%)	56 (81.16%)	43 (69.36%)	49 (79.03%)	5 (71.43%)	7 (100%)
4 – 6	5 (6.85%)	2 (2.74%)	20 (28.98%)	13 (18.84%)	18 (29.03%)	13 (20.97%)	2 (28.57%)	-
≤ 3	1 (1.37%)	1 (1.37%)	1 (1.45%)	-	1 (1.61%)	-	-	-
Total	73 (100%)	73 (100%)	69 (100%)	69 (100%)	62 (100%)	62 (100%)	7 (100%)	7 (100%)

4. DISCUSSION

This study comprised 150 participants, with 75 normal pregnant women (Group A) and an equal number of pregnant women diagnosed with thyroid disorders (Group B). Both groups were comparable in terms of age, locality, gravidity, and parity.

In the current study, 12.5% of hyperthyroid and 19.4% of hypothyroid pregnant women experienced preterm delivery. These findings are consistent with previous studies, such as Rao et al. (11.1%) [8] and Thanuja et al. (16.67%) [9]. However, Das et al. (2014) reported a higher incidence, where 43.6% of 500 pregnant women in their first trimester were diagnosed with hypothyroidism, with a mean TSH level of 4.69 ± 7.24 mIU/ml [10].

In this study, the rate of cesarean section was significantly higher in the thyroid disorder group (Group B) at 48%, compared to 24% in the euthyroid group (Group A), with the difference being statistically significant ($p<0.05$). Similar trends were observed in the study by Sahu et al., where 56% of thyroid disorder patients underwent cesarean delivery [11].

Additionally, 6.67% of hypothyroid pregnancies in Group B resulted in intrauterine fetal death (IUD). Allan et al. (1999) found that 2.9% of cases with TSH levels between 6-9.99 mU/l and 8.1% of cases with TSH ≥10 mU/l experienced fetal death ($p<0.001$) [12].

Low birth weight was observed in 47.76% of hypothyroid cases in Group B, which is higher than reported in studies by Roti et al. (31%) [13] and Goel et al. (13.3%). The mean birth weight in Group B was 2.57±0.50 kg, significantly lower than 2.92±0.60 kg in Group A ($p<0.001$). The higher incidence of low birth weight in this study may be attributed to factors such as lower socio-economic status, anemia, a history of low birth weight babies, inadequate nutrition, and insufficient perinatal care, as most participants were from tea garden laborer communities with limited resources.

APGAR scores were also impacted. In Group A, 91.78% of newborns had a 1-minute APGAR score ≥7, compared to 69.57% in Group B. Conversely, 30.43% of newborns in Group B had a 1-minute APGAR score ≤6, significantly higher than 8.22% in Group A ($p<0.01$). At 5 minutes, 95.89% of newborns in Group A had APGAR scores ≥7, while only 81.16% in Group B reached this benchmark. Furthermore, 18.84% of newborns in Group B had 5-minute APGAR scores ≤6, compared to just 4.11% in Group A ($p<0.01$). These findings align with the study by Glioner et al. [16], who also reported lower APGAR scores in newborns of mothers with thyroid disorders.

Regarding neonatal intensive care unit (NICU) admissions, 22.67% of newborns from Group B required NICU care compared to 10.67% from Group A, although this difference was not statistically significant ($p>0.05$).

5. CONCLUSION

Thyroid disorders, if left undiagnosed or missed during pregnancy—often due to the physiological changes that mask their symptoms—can lead to complications affecting both the pregnancy and the perinatal outcomes. This study highlights a significant association between thyroid disorders in pregnancy and adverse perinatal outcomes.

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