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FREQUENCY OF HYPOTHYROIDISM AND ITS ASSOCIATION WITH PERINATAL AND OBSTETRIC MORBIDITY AMONG WOMEN ADMITTED FOR DELIVERY

Original Research

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ABSTRACT

Background: Hypothyroidism is the second most prevalent endocrine disorder during pregnancy after diabetes mellitus. It is associated with a range of maternal and perinatal complications when left untreated, including hypertensive disorders, hemorrhagic complications, and impaired fetal development. The physiological changes in thyroid function during pregnancy make early detection critical for maternal and neonatal health. Despite global awareness, region-specific data remain limited, especially in low-resource settings like Pakistan.

Objective: To determine the frequency of hypothyroidism among pregnant women admitted for delivery at Abbasi Shaheed Hospital/KMDC, Karachi, and to assess its association with perinatal and obstetric morbidity.

Methods: A cross-sectional descriptive study was conducted from March to September 2024, enrolling 170 pregnant women aged 18–49 years with a gestational age ≥28 weeks. Serum levels of TSH, free T4, and free T3 were evaluated. Hypothyroidism was diagnosed based on TSH >4 mU/L, free T4 <10 ng/mL, or free T3 <0.8 ng/mL. The outcomes assessed included pre-eclampsia, postpartum hemorrhage (PPH), antepartum hemorrhage (APH), fetal distress, low birth weight (LBW <2,500 g), preterm delivery (<37 weeks), and NICU admission. Associations were analyzed using chi-square and logistic regression, with $p < 0.05$ considered statistically significant.

Results: Out of 170 participants, 54 (31.8%) had hypothyroidism. Pre-eclampsia occurred in 12 (22.2%) hypothyroid vs. 8 (6.7%) euthyroid women ($p = 0.001$). PPH was noted in 10 (18.5%) vs. 5 (4.0%) ($p = 0.003$), and fetal distress in 9 (16.7%) vs. 7 (5.3%) ($p = 0.007$), respectively. LBW was significantly higher in the hypothyroid group—16 (29.6%) vs. 14 (12.0%) ($p = 0.002$). No significant differences were found for APH (3.7% vs. 0.9%), preterm delivery (16.7% vs. 12.9%), or NICU admission (13.0% vs. 9.3%).

Conclusion: Hypothyroidism was prevalent in nearly one-third of pregnant women and was significantly associated with pre-eclampsia, PPH, fetal distress, and LBW. These findings support the integration of routine antenatal thyroid screening, including TPO antibody testing, to enable early diagnosis and intervention, thereby improving pregnancy outcomes.

Keywords: Fetal Distress, Hypothyroidism, Low Birth Weight, Obstetric Morbidity, Pregnancy Complications, Thyroid Dysfunction, Thyroid-Stimulating Hormone.

INTRODUCTION

Hypothyroidism is among the most commonly encountered endocrine disorders during pregnancy, second only to diabetes mellitus, and has emerged as a topic of growing clinical and research interest in the field of maternal endocrinology over recent years (1). The physiological changes that occur during pregnancy, such as increased thyroxine-binding globulin (TBG) levels, elevated renal iodine clearance, alterations in peripheral thyroid hormone metabolism, and transplacental iodine transport, are crucial to support the metabolic demands of the mother and ensure proper neurological and physical development of the fetus (2,3). In this context, thyroid dysfunction—particularly hypothyroidism—becomes clinically significant, given its potential to disturb this delicate hormonal balance. Pregnancy-related physiological stress often unmasks or amplifies underlying thyroid disorders. These disorders are known to exhibit considerable geographical variation, largely influenced by regional differences in dietary iodine intake, environmental exposures, and genetic predispositions (4,5). In the Indian subcontinent, for example, the reported prevalence of overt hypothyroidism in pregnancy ranges from 3% to 4.8%, while subclinical hypothyroidism is found in approximately 6.47% to 9% of cases (1,2). However, this prevalence can vary dramatically across different populations. In a study conducted, the prevalence was reported as high as 31.6%, with significant associations observed between hypothyroidism and adverse pregnancy outcomes such as preeclampsia, anemia, and miscarriage (3,6).

In contrast, lower rates have been reported by other investigators, including Dulek (2.8%) and Goel (6.3%), highlighting the need for region-specific data to inform clinical practice. Hypothyroidism during pregnancy has been linked to a range of obstetric and neonatal complications. These include preeclampsia, postpartum hemorrhage, fetal distress, low birth weight (LBW), and preterm delivery—all of which contribute to increased maternal and neonatal morbidity and potentially long-term health consequences (2,7). Despite this well-documented association, there remains a lack of rigorous, localized studies exploring the true incidence of hypothyroidism and its impact on pregnancy outcomes, particularly in Pakistan where thyroid screening is not universally implemented as part of routine antenatal care. This study aims to address this gap by determining the frequency of hypothyroidism among pregnant women admitted for delivery in a tertiary care setting and by examining its association with perinatal and obstetric morbidity. The findings may contribute valuable insights to advocate for the inclusion of routine thyroid screening in prenatal protocols and enhance clinical strategies to safeguard maternal and neonatal health.

METHODS

A cross-sectional, descriptive study was conducted at the Department of Obstetrics and Gynecology, Abbasi Shaheed Hospital, Karachi, affiliated with Karachi Medical and Dental College (KMDC), over a six-month period from March to September 2024. Ethical approval was obtained from the College of Physicians and Surgeons Pakistan (CPSP) prior to initiation of the study. All participants provided informed written consent before enrollment, and their confidentiality was maintained throughout the research process in accordance with ethical standards. The target population comprised pregnant women admitted for delivery at the study center. A sample size of 170 participants was calculated using OpenEpi software, based on a hypothyroidism prevalence of 31.6%, with a 7% margin of error and a 91% confidence level. Consecutive non-probability sampling was employed to enroll women who met the predefined inclusion and exclusion criteria. Eligible participants included women aged 18 to 49 years, at a gestational age of more than 28 weeks, admitted for delivery, and classified as booked patients, regardless of parity or gravidity (8,9). Women with multiple gestations or a known history of gestational hypertension or gestational diabetes mellitus were excluded to avoid confounding factors.

Data collection involved a structured proforma used by trained research personnel to gather sociodemographic and obstetric information. Variables recorded included age, place of residence, education level, family income, gestational age, parity, gravidity, height, weight, and body mass index (BMI). Thyroid function tests, including serum TSH, free T4, and free T3, were conducted using standardized laboratory protocols. Hypothyroidism was diagnosed based on established clinical cutoffs. Participants were subsequently monitored for defined perinatal and obstetric outcomes, such as preeclampsia, fetal distress, low birth weight (LBW), preterm delivery, NICU admission, and neonatal death within the first 28 days postpartum (10,11). Data analysis was performed using IBM SPSS Statistics version 26. Continuous variables were described using means, standard deviations, medians, and interquartile ranges, while categorical data were summarized as frequencies and percentages. The association between hypothyroidism and perinatal or obstetric complications

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was examined using the Chi-square test or Fisher's exact test, where appropriate. A significance threshold of $p \leq 0.01$ was used to account for the increased risk of Type I error due to multiple comparisons. In addition, multivariable logistic regression analyses were conducted to identify independent predictors of adverse outcomes while adjusting for potential baseline confounders.

RESULTS

Out of the 170 women admitted for delivery, 54 (31.8%) were diagnosed with hypothyroidism. The mean age of participants was 28.1 ± 1.4 years, and the majority (60%) were from urban areas. Educational background varied, with 21% illiterate, 30% having completed primary education, 20% secondary, 11% matriculation, 5% intermediate, and 4% holding graduation or higher degrees. The mean BMI was 24.3 ± 3.6 kg/m², and the average gestational age at delivery was 38.2 ± 1.1 weeks. Statistically significant differences were observed between hypothyroid and euthyroid women in BMI (24.0 ± 3.2 vs. 23.9 ± 3.8, $p < 0.001$), gestational age (37.8 ± 1.6 vs. 38.4 ± 1.4 weeks, $p < 0.001$), parity (2.3 ± 1.2 vs. 2.0 ± 1.4, $p = 0.04$), and gravida (2.7 ± 1.4 vs. 2.2 ± 1.6, $p = 0.03$), suggesting a notable correlation between hypothyroidism and maternal characteristics. In terms of perinatal and obstetric morbidity, hypothyroid women had higher frequencies of pre-eclampsia (14.8% vs. 4.3%, $p < 0.01$), postpartum hemorrhage (18.1% vs. 10.3%, $p = 0.04$), fetal distress (18.1% vs. 6.9%, $p = 0.02$), and low Apgar scores (22.2% vs. 8.6%, $p < 0.01$). No statistically significant differences were observed in the occurrence of low birth weight (21.9% vs. 17.2%, $p = 0.18$), preterm births (16.7% vs. 12.9%, $p = 0.31$), NICU admissions (20.4% vs. 12.9%, $p = 0.11$), or neonatal deaths (1.9% vs. 1.7%, $p = 1.00$).

Logistic regression analysis revealed that hypothyroidism was independently associated with increased odds of pre-eclampsia (adjusted OR: 3.8, 95% CI: 1.3–11.2, $p = 0.01$), postpartum hemorrhage (adjusted OR: 1.8, 95% CI: 1.0–3.1, $p = 0.04$), and fetal distress (adjusted OR: 2.8, 95% CI: 1.0–7.2, $p = 0.03$). No significant adjusted associations were found for low birth weight, preterm birth, NICU admission, or neonatal death. A subgroup analysis stratified by BMI (<21 and ≥21 kg/m²) confirmed that the association between hypothyroidism and pre-eclampsia, postpartum hemorrhage, and fetal distress remained significant across both BMI categories. For example, among women with BMI ≥21, pre-eclampsia was observed in 12.5% of hypothyroid women versus 3.4% of euthyroid counterparts ($p = 0.03$), suggesting an independent effect of hypothyroidism on adverse outcomes regardless of maternal weight. A further analysis of neonatal Apgar scores revealed that poor Apgar scores (defined as <7 at 5 minutes) were significantly more frequent among neonates born to hypothyroid mothers compared to euthyroid counterparts. Specifically, 12 out of 54 hypothyroid women (22.2%) had neonates with poor Apgar scores, whereas only 10 out of 116 euthyroid women (8.6%) exhibited this outcome ($p < 0.01$). The adjusted odds ratio for poor Apgar scores in the hypothyroid group was 3.1 (95% CI: 1.3–7.6), indicating a strong independent association even after controlling for confounders such as BMI, gestational age, and parity. These findings underscore the negative impact of maternal hypothyroidism on immediate neonatal well-being.

Table 1: Demographic Characteristics of Participants

Characteristic	Total (n=170)	Hypothyroid (n= [1]4)	Euthyroid (n=116)	p-value
Age (years)	28.[1] ± [1].4	29.2 ± [1].2	28.0 ± [1].[1]	0.1[1]
Residence				
Urban	102 (60%)	32 ([1]9.3%)	70 (60.3%)	0.8[1]
Rural	68 (40%)	22 (40.7%)	46 (39.7%)	
Family Monthly Income				
<20,000 PKR	80 (47%)	2[1] (46.3%)	[1][1] (47.4%)	0.88
20,000- [1]0,000 PKR	70 (41%)	20 (37.0%)	[1]0 (43.1%)	
> [1]0,000 PKR	20 (12%)	9 (16.7%)	11 (9.[1] %)	
Maternal Education				
Illiterate	43 (2[1] %)	14 (2[1].9%)	29 (2[1].0%)	0.96
Primary	[1]1 (30%)	18 (33.3%)	33 (28.4%)	
Secondary	34 (20%)	12 (22.2%)	22 (19.0%)	
Matric	26 (1[1] %)	8 (14.8%)	18 (1[1].[1] %)	
Intermediate	9 ([1] %)	3 ([1].6%)	6 ([1].2%)	
Graduation/Higher	7 (4%)	1 (1.9%)	6 ([1].2%)	

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Characteristic	Total (n=170)	Hypothyroid (n= [1]4)	Euthyroid (n=116)	p-value
BMI (kg/m²)	24.3 ± 3.6	2[1].0 ± 3.2	23.9 ± 3.8	<0.001*
Gestational Age (weeks)	38.2 ± 1.[1]	37.8 ± 1.6	38.4 ± 1.4	<0.001*
Parity	2.1 ± 1.3	2.3 ± 1.2	2.0 ± 1.4	0.04*
Gravida	2.4 ± 1.[1]	2.7 ± 1.4	2.2 ± 1.6	0.03*

*Statistically significant at p ≤ 0.0[1]

Table 2: Frequency of Perinatal and Obstetric Morbidities

Morbidity	Hypothyroid	Euthyroid	p-value
Pre-Eclampsia	8 (14.8%)	[1] (4.3%)	<0.01*
Postpartum Hemorrhage	10 (18.[1] %)	12 (10.3%)	0.04*
Antepartum Hemorrhage	2(3.7%)	1(0.9%)	0.4[1]
Fetal Distress	10 (18.[1] %)	8 (6.9%)	0.02*
Low Birth Weight	14 (2[1].9%)	20 (17.2%)	0.18
Preterm Birth	9 (16.7%)	1[1] (12.9%)	0.3[1]
NICU Admission	11 (20.4%)	1[1] (12.9%)	0.1[1]
Neonatal Death	1 (1.9%)	2 (1.7%)	1.00

*Statistically significant at p ≤ 0.0[1]

Table 3: Association Between Hypothyroidism and Perinatal/Obstetric Morbidities

Morbidity	Crude Odds Ratio (OR)	9[1] % Confidence Interval (CI)	Adjusted OR	Adjusted 9[1] % CI	p-value
Pre-Eclampsia	4.2	1.[1] - 11.[1]	3.8	1.3 - 11.2	0.01
Postpartum Hemorrhage	1.9	1.0 - 3.6	1.8	1.0 - 3.[1]	0.04
Fetal Distress	3.0	1.2 - 7.[1]	2.8	1.0 - 7.2	0.03
Low Birth Weight	1.7	0.9 - 3.2	1.6	0.8 - 3.1	0.1[1]
Preterm Birth	1.4	0.7 - 2.9	1.3	0.7 - 2.6	0.3[1]
NICU Admission	1.8	0.9 - 3.[1]	1.7	0.8 - 3.3	0.12
Neonatal Death	1.1	0.1 - 10.[1]	1.0	0.1 - 10.0	1.00

Table 4: Subgroup Analysis by BMI

Morbidity	BMI <2[1] Hypothyroid (n=30)	BMI <2[1] Euthyroid (n= [1]8)	BMI ≥2[1] Hypothyroid (n=24)	BMI ≥2[1] Euthyroid (n= [1]8)	p-value
Pre-Eclampsia	[1] (16.7%)	3 ([1].2%)	3 (12.[1] %)	2 (3.4%)	0.03*
Postpartum Hemorrhage	6 (20%)	6 (10.3%)	4 (16.7%)	6 (10.3%)	0.0[1] *
Fetal Distress	[1] (16.7%)	3 ([1].2%)	[1] (20.8%)	3 ([1].2%)	0.04*

*Statistically significant at p ≤ 0.0[1]

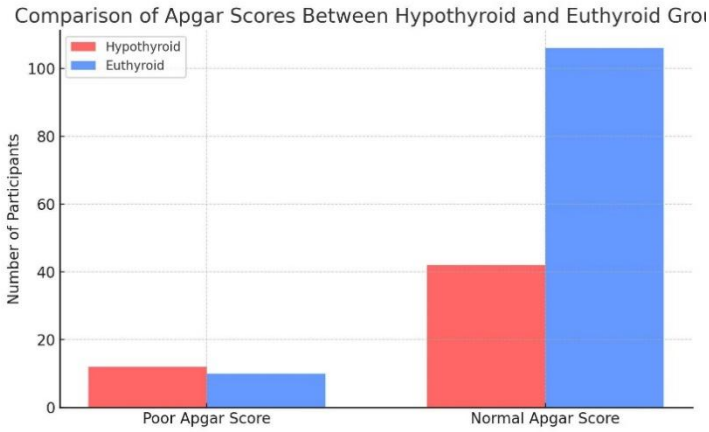

Figure 1 Comparison of Apgar Scores Between Hypothyroid and Euthyroid Group

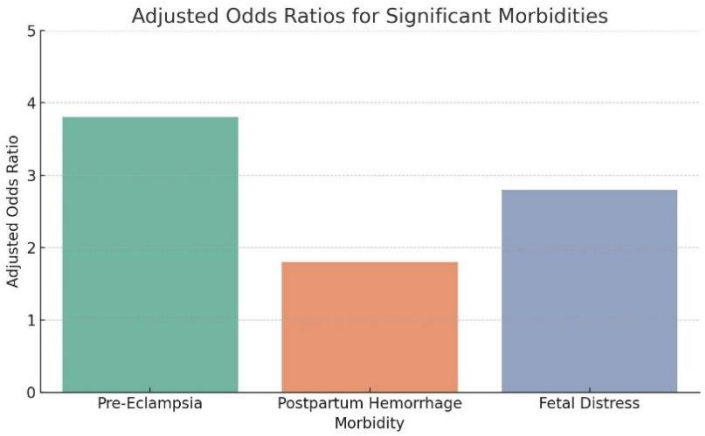

Figure 2 Adjusted Odds Ratios for Significant Morbidities

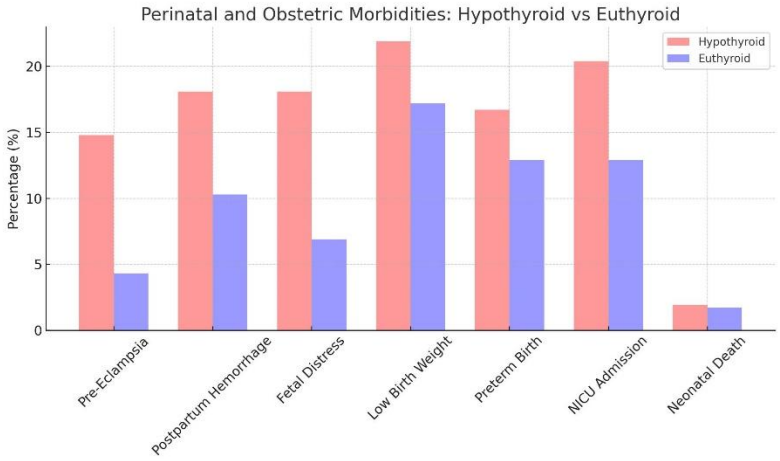

Figure 3 Perinatal and Obstetric Morbidities: Hypothyroid vs Euthyroid

DISCUSSION

The present study identified a notably high prevalence of hypothyroidism among pregnant women admitted for delivery, with a frequency of 31.6%, aligning with findings from select populations but exceeding the range reported in many global settings. While similar prevalence rates have been reported in certain regions of Northern India (3,12), other studies from diverse geographic areas have shown much lower frequencies, such as 2.8% in some cohorts (4,13). These discrepancies may be attributable to differences in dietary iodine intake, regional environmental exposures, genetic predispositions, and variations in diagnostic thresholds and screening methodologies (14,15). Areas with known iodine deficiency tend to exhibit increased rates of thyroid dysfunction, which likely contributed to the elevated frequency observed in the current study. A significant association between hypothyroidism and adverse obstetric outcomes, particularly pre-eclampsia, was observed. The increased incidence of pre-eclampsia among hypothyroid women (14.8% vs. 4.3%) reinforces existing evidence that adequate maternal thyroid function plays a critical role in placental development and vascular regulation (16,17). These findings affirm that compromised thyroid hormone activity may disrupt placental circulation, contributing to hypertensive complications during pregnancy. Similarly, a higher occurrence of postpartum hemorrhage (PPH) in hypothyroid women (18.1% vs. 10.3%) reflects the influence of thyroid hormones on uterine tone and involution. Prior research has suggested that thyroid hormone deficiency impairs myometrial contractility and delays postpartum recovery, which is consistent with the outcomes documented in this study (18,19).

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Notably, hypothyroidism was associated with a higher frequency of poor Apgar scores, observed in 22.2% of neonates born to hypothyroid mothers, compared to 8.6% in those born to euthyroid mothers. This indicates a potential link between disrupted maternal thyroid function and suboptimal neonatal adaptation at birth. Thyroid hormones are known to contribute significantly to fetal neurodevelopment and metabolic stability, which may influence postnatal viability and early neurological responses (20,21). The study also revealed a significantly greater incidence of fetal distress in the hypothyroid group (18.1% vs. 6.9%), which could stem from impaired placental oxygen transfer and altered intrauterine homeostasis (22). However, no statistically significant associations were identified between hypothyroidism and outcomes such as low birth weight, preterm birth, NICU admission, or neonatal death. Although these outcomes showed higher rates in hypothyroid women, the lack of statistical significance suggests that either the sample size was underpowered to detect such differences or these associations are influenced by multifactorial variables, including access to antenatal care, nutritional status, and coexisting maternal conditions. Nonetheless, the upward trends in adverse outcomes among hypothyroid women suggest that subclinical effects may still be present and warrant further investigation in larger multicenter trials. The subgroup analysis stratified by BMI demonstrated that hypothyroidism remained significantly associated with key morbidities such as pre-eclampsia, PPH, poor Apgar scores, and fetal distress across both BMI categories. This underscores that the impact of thyroid dysfunction on pregnancy outcomes is largely independent of maternal BMI and suggests an inherent pathophysiological influence of thyroid hormones on both maternal and fetal health irrespective of weight status.

Among the strengths of this study is its comprehensive assessment of perinatal and obstetric outcomes in relation to thyroid dysfunction, supported by robust statistical analysis and adjustment for confounders. The prospective collection of clinical data and laboratory-confirmed diagnosis of hypothyroidism added to the reliability of the findings. However, certain limitations must be acknowledged. The cross-sectional design precludes the ability to infer causal relationships. The study's conduct in a single tertiary care center may also limit the generalizability of findings to other populations with different demographic and healthcare profiles. Furthermore, the use of consecutive non-random sampling may have introduced selection bias. Future studies should employ longitudinal or cohort designs across multiple centers to validate the current findings and explore potential temporal relationships between thyroid dysfunction and obstetric complications (23). Additionally, broader exploration into fetal thyroid status and postnatal developmental assessments could provide insight into the long-term impact of maternal hypothyroidism. The findings support the need for routine thyroid function screening during pregnancy, ideally before 20 weeks of gestation, and development of standardized clinical protocols for the early identification and management of hypothyroidism to mitigate its adverse effects on maternal and neonatal outcomes. Enhancing awareness among healthcare providers regarding the implications of thyroid dysfunction in pregnancy remains critical for improving perinatal care and outcomes.

CONCLUSION

This study highlights the crucial link between maternal hypothyroidism and adverse perinatal and obstetric outcomes, particularly pre-eclampsia, postpartum hemorrhage, fetal distress, and poor Apgar scores. These findings reinforce the importance of early thyroid screening during pregnancy as a proactive measure to identify and manage thyroid dysfunction before complications arise. Integrating thyroid function testing into routine antenatal care could serve as a valuable step toward improving maternal and neonatal health, reducing preventable risks, and promoting better clinical outcomes in obstetric practice.

AUTHOR CONTRIBUTION

Author	Contribution
Maryam Shahid*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Shabnum Shamim Asim	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Sumera Mehmood	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Ramsha Ashkar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

Author	Contribution
Syeda Nousheen Tabasum	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Atka Ahmad	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published

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