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Prevalence and Pattern of Subclinical Thyroid Dysfunction among Hypertensive and Normotensive Pregnant Women

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Abstract

***Background*:** Thyroid dysfunction during pregnancy is a common endocrine disorder with significant implications for maternal and fetal health, particularly in relation to hypertensive complications. The purpose of the study was to determine the prevalence and pattern of subclinical thyroid dysfunction in hypertensive compared to normotensive pregnant women. ***Methods*:** This cross-sectional, comparative study was conducted at the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital, Dhaka, Bangladesh, from February 2020 to March 2021, including 220 pregnant women (110 hypertensive, 110 normotensive). Socio-demographic and obstetric data were collected, blood pressure measured, and 5 mL venous blood samples analyzed for serum TSH and FT4 using chemiluminescent immunoassay. Subclinical thyroid disorders were defined by trimester-specific reference ranges, data were analyzed with SPSS v25 ($p < 0.05$). ***Results*:** In 220 pregnant women, hypertensive and normotensive groups were comparable in age, gestation, and parity. Subclinical hypothyroidism was higher in hypertensive women (46.4% vs 14.5%), euthyroidism predominated in normotensive women (83.6% vs 39.1%), and higher blood pressure was associated with increased thyroid dysfunction. Hypertensive women also had higher TSH (4.46 vs 2.28 µIU/mL) and lower FT4 (13.49 vs 15.78 pmol/L), both significant ($p = 0.001$). ***Conclusion*:** Hypertensive pregnant women have a higher prevalence of subclinical hypothyroidism and altered thyroid hormone levels compared to normotensive women, highlighting the need for early thyroid screening in this population.

Keywords: Prevalence, Thyroid Dysfunction, Hypertension.

INTRODUCTION

Thyroid disorders rank among the most prevalent endocrine abnormalities during pregnancy, second only to diabetes. In recent years, these conditions have become a major focus of clinical endocrinology research [1]. Evaluating thyroid function during pregnancy is crucial due to its well-established impact on maternal and fetal outcomes. From the moment conception occurs, thyroid physiology begins to change and continues throughout gestation, though these alterations are generally reversible after delivery [2]. Contributing factors include elevated levels of thyroxine-binding globulin (TBG), increased urinary iodine excretion, modifications in peripheral metabolism of thyroid hormones, and changes in the placental transfer of iodine [3]. These adaptations enable the maternal thyroid gland to meet the increased metabolic and physiological demands of pregnancy.

Among thyroid disorders in pregnancy, maternal hypothyroidism is the most common. Its prevalence shows considerable geographic variation, ranging from 2.5% to 11% [4]. Both untreated and subclinical hypothyroidism can elevate the risk of adverse maternal and fetal outcomes, including miscarriage, preeclampsia, anemia, fetal growth restriction, placental abruption, preterm delivery, low birth weight, small head circumference, and impaired

neuropsychological development [5]. Subclinical hypothyroidism, defined by an elevated serum thyroid-stimulating hormone (TSH) with normal free thyroxine (FT4), occurs in approximately 3%–5% of pregnant women. Hyperthyroidism, both overt and subclinical, is less common, affecting roughly 0.4%–1.7% and 0.4%–0.7% of pregnancies, respectively [6]. Studies have linked both overt and subclinical thyroid dysfunction to increased risks of abortion, anemia, preeclampsia, placental complications, intrauterine growth restriction (IUGR), stillbirth, preterm delivery, postpartum hemorrhage, and even maternal complications such as myopathy and congestive heart failure [7].

Hypertensive disorders represent a frequent medical challenge during pregnancy, affecting approximately 10% of pregnant women and contributing to significant maternal and fetal morbidity and hospitalization rates [8-9]. These disorders encompass a spectrum of conditions, including chronic hypertension, gestational hypertension, preeclampsia, and eclampsia [1]. Reported prevalence rates vary geographically, ranging from 10% to 21% among pregnant populations, with specific figures of 10% in Ibadan [10], 11.6% in Benin City [11], and 17% in Sokoto [12]. Gestational hypertension, defined as blood pressure ≥140/90 mmHg first detected during pregnancy in a previously normotensive woman, is a significant contributor to both maternal and perinatal morbidity and mortality, complicating approximately 5%–10% of pregnancies worldwide [13].

Thyroid abnormalities, including both hypothyroidism and hyperthyroidism, may exacerbate hypertensive conditions during pregnancy and increase the risk of adverse maternal and fetal outcomes. These complications include miscarriage, pregnancy-induced hypertension, preterm birth, placental abruption, low birth weight, and fetal mortality [14]. Hypothyroidism may act as an independent risk factor for preeclampsia and restricted fetal growth. Despite these associations, the exact mechanisms linking thyroid dysfunction to hypertensive disorders in pregnancy remain incompletely understood [15]. Recent research has increasingly focused on the role of endocrine disorders, particularly thyroid diseases, in the development and progression of hypertension during pregnancy [16-17]. Thyroid disease, notably overt and subclinical hypothyroidism, is frequently observed in hypertensive pregnancies [18-19]. However, there is a scarcity of cross-sectional studies exploring the prevalence and patterns of thyroid disorders among hypertensive pregnant women in India [20-22].

Despite the known associations between thyroid dysfunction and adverse pregnancy outcomes, there remains limited data on the prevalence and pattern of subclinical thyroid disorders specifically among hypertensive pregnant women, particularly in the local context. Most studies have focused on overt thyroid disease or have included mixed populations without distinguishing between hypertensive and normotensive pregnancies. Understanding the burden of subclinical thyroid dysfunction in hypertensive pregnancies is important, as early identification and management could potentially reduce maternal and fetal complications such as preeclampsia, preterm birth, and intrauterine growth restriction. Therefore, this study aims to fill this knowledge gap in the regional population. The purpose of the study is to determine the prevalence and pattern of subclinical thyroid dysfunction in hypertensive compared to normotensive pregnant women.

OBJECTIVE

- To determine the prevalence and pattern of subclinical thyroid dysfunction in hypertensive compared to normotensive pregnant women.

METHODOLOGY & MATERIALS

This cross-sectional, comparative study was conducted at the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital (DMCH), Dhaka, Bangladesh, between February 2020 and March 2021. A total of 220 pregnant women were enrolled, including 110 hypertensive and 110 normotensive participants, selected based on predefined inclusion and exclusion criteria to assess the prevalence and pattern of subclinical thyroid dysfunction in hypertensive versus normotensive pregnancies.

Inclusion Criteria:

- Pregnant women aged ≥18 years with hypertensive disorders.
- Pregnant women aged ≥18 years who were normotensive.

Exclusion Criteria:

- Pregnant women with a known thyroid disorder.
- Pregnant women taking medications affecting thyroid function, including thyroxine, anti-thyroid drugs, glucocorticoids, antiepileptics, or contraceptives.
- Pregnant women with diabetes mellitus treated with oral hypoglycemic agents or insulin.

Socio-demographic and obstetric data, including age, gestational age, and parity, were collected using a structured questionnaire through face-to-face interviews. Blood pressure was measured following standard procedures, with hypertension defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg based on the average of two readings taken at least 15 minutes apart. Hypertensive participants were further classified according to the severity of hypertension.

Venous blood samples (5 mL) were collected aseptically from each participant for measurement of

serum thyroid-stimulating hormone (TSH) and free thyroxine (FT4). Samples were centrifuged at 3000 rpm for 10 minutes, and the separated serum was stored at −20°C until analysis. Serum TSH and FT4 levels were measured using the Siemens ADVIA Centaur XP Immunoassay System with chemiluminescent immunoassay (CLIA) technology, and subclinical thyroid disorders were defined according to trimester-specific reference ranges recommended by the American Thyroid Association guidelines.

Collected data were checked, coded, and analyzed using SPSS version 25. Categorical variables were expressed as frequencies and percentages, and statistical significance was determined at a 95% confidence interval ($p < 0.05$). Ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College, and written informed consent was obtained from all participants after explaining the study purpose and procedures, ensuring confidentiality throughout the study.

RESULTS

Table 1: Baseline Characteristics of the Study Participants (n = 220)

Characteristic		Hypertensive Group (n=110)	%	Normotensive Group (n=110)	%	p-value
Age (years)	18–25	57	51.8	49	44.5	0.563
	26–30	28	25.5	37	33.6	
	31–35	20	18.2	18	16.4	
	36–40	5	4.5	6	5.5	
	Mean ± SD	25.95 ± 5.83		26.24 ± 5.74		0.728
Gestational Age (weeks)	12–28	7	6.4	12	10.9	0.458
	29–40	92	83.6	86	78.2	
	>40	11	10	12	10.9	
Parity	Nulliparous	94	85.5	92	83.6	0.709
	Multiparous	16	14.5	18	16.4	

Table 1 shows the distribution of the study participants according to age, gestational age, and parity. The highest frequency was observed in the 18–25 years age group (51.8% in hypertensive vs 44.5% in normotensive), followed by the 26–30 years age group (25.5% vs 33.6%). The mean age was 25.95 ± 5.83 years in the hypertensive group and 26.24 ± 5.74 years in the normotensive group, with no statistically significant difference (p=0.728). Most participants were between 29–40 weeks of gestation (83.6% vs 78.2%), and nulliparous women predominated in both groups (85.5% vs 83.6%). No significant differences were observed between groups for gestational age or parity (p>0.05).

Table 2: Distribution of Thyroid Status Among the Study Participants (n = 220)

Thyroid Status	Hypertensive Group (n=110)	%	Normotensive Group (n=110)	%	p-value
Euthyroid	43	39.1	92	83.6	0.001
Hypothyroid	15	13.6	1	0.9	
Subclinical Hypothyroidism	51	46.4	16	14.5	
Subclinical Hyperthyroidism	1	1.0	1	0.9	
Total	110	100.0	110	100.0	

Table 2 presents the prevalence and pattern of thyroid dysfunction in the study population. Euthyroidism was more common in normotensive participants (83.6%) compared to hypertensive participants (39.1%). Subclinical hypothyroidism was significantly higher in the hypertensive group (46.4% vs 14.5%, p=0.001). Hypothyroidism and subclinical hyperthyroidism were less frequent in both groups.

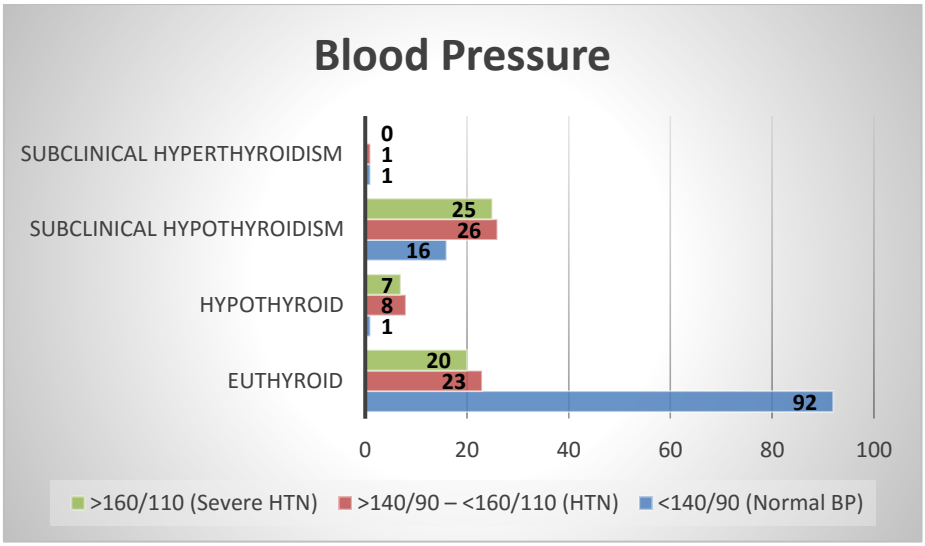

Figure 1: Distribution of Thyroid Status According to Blood Pressure Among the Study Participants (n = 220)

Figure 1 illustrates the relationship between blood pressure levels and thyroid status. Among participants with normal blood pressure (<140/90 mmHg), most were euthyroid (92/110), whereas the prevalence of subclinical hypothyroidism increased with higher blood pressure. In participants with severe hypertension (≥160/110 mmHg), 25 had subclinical hypothyroidism. The association between higher blood pressure and thyroid dysfunction was statistically significant (p=0.001).

Table 3: Comparison of Serum TSH and FT4 Levels Between the Study Participants (n = 220)

Thyroid Function Test	Hypertensive Group (n=110) Mean ± SD	Range (min–max)	Normotensive Group (n=110) Mean ± SD	Range (min–max)	p-value
S. TSH (µIU/mL)	4.46 ± 3.38	0.25–22.81	2.28 ± 1.31	0.1–7.14	0.001
FT4 (pmol/L)	13.49 ± 2.86	6.23–23.19	15.78 ± 2.86	8.5–23.94	0.001

Table 3 compares mean serum TSH and FT4 levels between the groups. The hypertensive group had significantly higher mean TSH (4.46 ± 3.38 µIU/mL) compared to the normotensive group (2.28 ± 1.31 µIU/mL), and lower mean FT4 (13.49 ± 2.86 pmol/L vs 15.78 ± 2.86 pmol/L), with both differences being statistically significant (p=0.001).

DISCUSSION

In this cross-sectional study conducted at the Department of Obstetrics & Gynaecology, Dhaka Medical College Hospital, a significantly higher prevalence of subclinical hypothyroidism was observed among hypertensive pregnant women compared to normotensive participants. Most normotensive women were euthyroid, while serum TSH levels were markedly higher and FT4 levels lower in the hypertensive group. These findings highlight a clear association between elevated blood pressure and thyroid dysfunction in pregnancy, emphasizing the importance of early thyroid function assessment in hypertensive pregnancies to potentially reduce adverse maternal and fetal outcomes.

In the present study, the baseline characteristics of hypertensive and normotensive pregnant women were comparable with respect to age, gestational age, and parity. The majority of participants were aged 18–25 years, with mean ages of 25.95 ± 5.83 years in the hypertensive group and 26.24 ± 5.74 years in the normotensive group, and this difference was not statistically significant (p = 0.728). Similarly, the distributions of gestational age and parity did not differ significantly between the groups (p > 0.05), with most women between 29–40 weeks of gestation and nulliparous. These findings are consistent with previous studies. Abdulslam *et al*. [23] reported no significant difference in mean maternal age between women with gestational hypertension and normotensive controls (27.7 ± 7.8 vs 26.9 ± 6.4 years). Roy *et al*. [24], in a cross-sectional study of 200 pregnant women, found that demographic characteristics including age and gestational age were similar between hypertensive and normotensive participants, and Singh *et al*. [25] observed closely matched mean ages between hypertensive and control groups, with maternal age not significantly associated with hypertensive disorders. Collectively, these results indicate that the two study groups were well-matched at baseline, supporting the validity of comparisons in analyses of thyroid function.

The present study demonstrated a significantly higher prevalence of subclinical hypothyroidism among hypertensive pregnant women (46.4%) compared to normotensive participants (14.5%, p = 0.001), whereas

euthyroidism predominated in the normotensive group (83.6% vs 39.1%). These findings are supported by previous research. Aravazhi *et al*. [26] reported that subclinical hypothyroidism was significantly more frequent in preeclamptic women (46%) compared to normotensive controls, with euthyroidism higher in the normotensive group (86%). Similarly, a systematic review and meta-analysis by Toloza *et al*. [27] demonstrated that subclinical hypothyroidism during pregnancy was associated with an increased risk of preeclampsia and hypertensive disorders, corroborating the observed relationship between hypertension and higher rates of subclinical hypothyroidism in this study. Hada *et al*. [28] also found that subclinical and overt hypothyroidism were more prevalent among preeclamptic women compared to normotensive participants (25% and 10% vs 8% and 3%), while euthyroidism was higher in the normotensive population. Collectively, these studies align with the current findings, indicating that hypertensive pregnant women are more likely to present with thyroid dysfunction, particularly subclinical hypothyroidism.

A clear association between blood pressure levels and thyroid status was observed in this study, with subclinical hypothyroidism becoming increasingly prevalent as blood pressure rose. Among participants with normal blood pressure (<140/90 mmHg), most were euthyroid (92/110). In contrast, in women with mild to moderate hypertension (>140/90–<160/110 mmHg) and severe hypertension (≥160/110 mmHg), the prevalence of subclinical hypothyroidism increased to 26 and 25 participants, respectively, indicating a significant trend ($p = 0.001$). These findings are consistent with prior evidence linking thyroid dysfunction to hypertensive disorders during pregnancy. Wilson *et al*. [29], in a large observational study of nearly 25,000 women, reported that subclinical hypothyroidism was significantly associated with an increased risk of severe preeclampsia, suggesting that thyroid abnormalities are more common in women with higher blood pressure. Likewise, Toloza *et al*. [27], in a meta-analysis of over 39,000 pregnant women, found that subclinical hypothyroidism during pregnancy was associated with a higher risk of preeclampsia, further supporting the positive relationship between thyroid dysfunction and the severity of hypertensive disorders. These findings reinforce the observation that hypertensive pregnant women, particularly those with elevated blood pressure, are at greater risk of subclinical hypothyroidism.

The present study also demonstrated that hypertensive pregnant women had significantly higher mean serum TSH levels (4.46 ± 3.38 µIU/mL) and lower FT4 levels (13.49 ± 2.86 pmol/L) compared to normotensive participants (TSH 2.28 ± 1.31 µIU/mL; FT4 15.78 ± 2.86 pmol/L), with both differences being statistically significant ($p = 0.001$). These results are consistent with previous studies reporting thyroid hormone abnormalities in hypertensive pregnancies. Singh *et al*. [15] observed higher mean TSH in hypertensive pregnant women (4.19 ± 2.95 µIU/mL) compared with normotensive controls (2.67 ± 1.71 µIU/mL), indicating an association between thyroid dysfunction and hypertensive disorders. Similarly, Sattar *et al*. [30] reported significantly elevated serum TSH in hypertensive pregnant women (6.71 ± 1.06 µIU/mL) compared to normotensive participants (3.28 ± 0.29 µIU/mL), reinforcing the link between hypertension in pregnancy and altered thyroid function. The lower FT4 levels observed in hypertensive women further support the concept that thyroid hormone imbalances, particularly subclinical hypothyroidism, are more prevalent among women with hypertensive disorders during pregnancy, underscoring the clinical relevance of thyroid monitoring in this population.

Limitations of the study

The study had a few limitations:

- The study employed a cross-sectional design without baseline thyroid function data from the pre-pregnancy period or first trimester, and no follow-up after delivery, limiting the ability to establish a causal relationship between subclinical thyroid dysfunction and hypertensive disorders of pregnancy.
- Anti-thyroid antibody testing, which is important for a comprehensive assessment of thyroid function during pregnancy, was not performed in this study.
- The study population was drawn from a single hospital in Dhaka, which may limit the generalizability of the findings to the wider population of the country.

CONCLUSION

Thyroid dysfunction is known to affect maternal and fetal outcomes, particularly in pregnancies complicated by hypertension. The study demonstrated that subclinical hypothyroidism is significantly more prevalent among hypertensive pregnant women compared to normotensive controls, with thyroid hormone imbalances becoming more pronounced as blood pressure increases. Baseline characteristics including age, gestational age, and parity were comparable between groups, confirming that the observed differences in thyroid status are likely associated with hypertensive disorders during pregnancy. These findings underscore the importance of early thyroid function screening in hypertensive pregnancies to facilitate timely diagnosis and management.

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