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Original Research Article

Impact of thyroid dysfunction on recurrent pregnancy loss and maternal-fetal outcomes

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ABSTRACT

Background: Thyroid dysfunction, including hypothyroidism and hyperthyroidism, is a recognized risk factor for pregnancy complications. Both maternal thyroid disorders can adversely affect pregnancy outcomes, including recurrent pregnancy loss and maternal-fetal complications. This study aimed to investigate the impact of thyroid dysfunction on recurrent pregnancy loss and maternal-fetal outcomes in a cohort of Bangladeshi women.
Methods: This cross-sectional study was conducted from January 2024 to July 2024 at the Department of Obstetrics and Gynecology, Sheikh Fazilatuunnessa Mujib Memorial KPJ Specialized Hospital & Nursing College. A total of 100 pregnant women with a history of recurrent pregnancy loss were included. Participants underwent thyroid function testing, and maternal and fetal outcomes were recorded. Data were analyzed using SPSS software, and results were presented as frequencies and percentages.
Results: Among 100 participants, 31% had hypothyroidism, 19% had hyperthyroidism, and 50% were euthyroid. Pregnancy loss was most common in hypothyroid (68%) and hyperthyroid (74%) women, compared to euthyroid women (52%). Maternal complications such as anemia (29% in hypothyroid, 32% in hyperthyroid), hypertension (23% in hypothyroid, 26% in hyperthyroid), and preeclampsia (16% in hypothyroid, 21% in hyperthyroid) were more frequent in thyroid-dysfunctional pregnancies. Fetal complications, including intrauterine growth restriction, low birth weight, and preterm birth, were also higher in thyroid dysfunction cases.
Conclusions: Thyroid dysfunction is strongly associated with recurrent pregnancy loss, maternal complications, and adverse fetal outcomes. Early detection and appropriate management of thyroid disorders are crucial to improving pregnancy outcomes.

Keywords: Fetal outcomes, Hypothyroidism, Hyperthyroidism, Maternal complications, Pregnancy outcomes, Recurrent pregnancy loss, Thyroid dysfunction

INTRODUCTION

Thyroid dysfunction is one of the most common endocrine disorders in reproductive-aged women and has significant implications for pregnancy outcomes.[1] The thyroid gland regulates metabolism, growth, and development through the production of thyroid hormones, which are essential for normal fetal development and maternal well-being.[2] Any disturbance of thyroid function, either hypothyroidism or hyperthyroidism, can lead to adverse obstetric and neonatal outcomes, particularly recurrent pregnancy loss (RPL) and other maternal-fetal complications.[3] Despite the long-established influence of thyroid dysfunction on pregnancy, its role in recurrent

pregnancy loss and maternal-fetal outcomes remains the subject of ongoing study, especially among populations with limited access to healthcare.[4]

Recurrent pregnancy loss, or the occurrence of two or more consecutive miscarriages, is a vexing condition that occurs in approximately 1-5% of women of reproductive age.[5] The etiology of RPL is multifactorial and encompasses genetic, immunological, infectious, anatomical, and endocrine factors, among which thyroid dysfunction is being recognized as one of the important causes.[6] Thyroid hormones play an integral role in a successful pregnancy by the sustenance of fetal brain development, placental function, and maternal metabolic adaptations.[3] Hypothyroidism, or the low production of thyroid hormones, has been implicated in pregnancy loss at the initial phase, implantation failure, and placental insufficiency.[7] On the contrary, hyperthyroidism, or the excess production of thyroid hormones, has been implicated in increased risks for miscarriage, preterm labor, and fetal growth restriction.[8]

Maternal morbidity as a result of thyroid dysfunction is extensive and can have a devastating impact on maternal and fetal well-being.[5] Hypothyroidism in pregnancy is commonly associated with gestational hypertension, preeclampsia, anemia, and postpartum hemorrhage, increasing the risk of maternal morbidity and mortality.[9] Similarly, hyperthyroidism can result in preeclampsia, heart failure, and thyrotoxic crisis, leading to a life-threatening risk to maternal health. Besides this, uncontrolled or undertreated thyroid disease can also result in permanent neurodevelopmental damage to the offspring, and thus, early diagnosis along with proper treatment is required.[10]

Fetal outcome is also significantly affected by thyroid dysfunction in mothers. The neonates of women with untreated hypothyroidism are more apt to suffer from intrauterine growth restriction (IUGR), low birth weight, preterm labor, and neonatal respiratory distress.[7] Congenital hypothyroidism is another critical outcome, which, if undiagnosed, will lead to intellectual disability and retarded development. Hyperthyroidism during pregnancy is also associated with adverse perinatal outcomes, including fetal tachycardia, preterm labor, low birth weight, and stillbirth.[4] The additional risk of neonatal thyroid dysfunction due to the trans placental passage of maternal thyroid antibodies or excess maternal thyroid hormones also adds complexity to perinatal outcomes.[10]

Although thyroid function testing during pregnancy is done in the majority of clinical settings, universal screening policies are contentious, particularly in resource-limited environments.[11] In Bangladesh, where thyroid disease is common but mostly underdiagnosed due to limited awareness and access to healthcare, understanding how thyroid dysfunction impacts pregnancy outcomes is crucial to further improve maternal and neonatal health.[10] With the overwhelming burden of pregnancy complications in the area, there is a necessity for an evidence-based practice in thyroid function monitoring and management.[12,13]

The aim of this study was to determine the association of thyroid dysfunction with recurrent pregnancy loss and its implications for maternal complications and fetal outcomes. By studying the data of pregnant women in a tertiary care hospital, this study will contribute to knowledge about the role of thyroid dysfunction in adverse pregnancy outcomes. The findings of this study will help improve clinical practice regarding early screening, early intervention, and improved management strategies to optimize maternal and fetal well-being.

METHODS

This cross-sectional study was conducted at the Department of Obstetrics and Gynecology, Sheikh Fazilatuunnessa Mujib Memorial KPJ Specialized Hospital & Nursing College, from January 2024 to July 2024. A total of 100 pregnant women were enrolled to evaluate the impact of thyroid dysfunction on recurrent pregnancy loss and maternal-fetal outcomes. Participants were selected based on predefined inclusion and exclusion criteria. Thyroid function status was assessed using serum TSH, free T3, and free T4 levels, and patients were categorized into hypothyroid, hyperthyroid, and euthyroid groups. Clinical history, demographic characteristics, and detailed obstetric history, including previous miscarriages, were recorded. Pregnancy loss was classified based on the trimester of occurrence, and maternal complications such as gestational hypertension, preeclampsia, anemia, and postpartum hemorrhage were documented. Fetal outcomes, including intrauterine growth restriction, preterm birth, low birth weight, and neonatal complications, were evaluated. Standardized laboratory investigations, ultrasonography, and obstetric examinations were performed as part of routine clinical assessments. Data were collected using structured case report forms and entered into Statistical Package for the Social Sciences (SPSS) version 26 for analysis. Descriptive statistics were used to summarize categorical and continuous variables, while chi-square and t-tests were applied to assess associations between thyroid dysfunction and pregnancy outcomes.

RESULTS

Table 1 presents the demographic characteristics of the study participants (N = 100). The majority (49%) were aged between 25-35 years, while 21% were under 25 and 30% were over 35. Most participants (59%) had a normal BMI (18.5-24.9 kg/m²), while 35% were overweight or obese (BMI ≥25), and 6% were underweight (BMI <18.5). Regarding parity, 39% were nulliparous, 31% were primiparous, and 30% were multiparous. A history of miscarriage was reported by 61% of participants, highlighting the study's focus on recurrent pregnancy loss.

Table 1: Demographic characteristics of study participants (n=100).

Characteristic	N	Percentage
Age (years)		
<25	21	21
25-35	49	49
>35	30	30
BMI (kg/m²)		
<18.5	6	6
18.5 - 24.9	59	59
≥25	35	35
Parity		
Nulliparous	39	39
Primiparous	31	31
Multiparous	30	30
History of miscarriages		
Yes	61	61
No	39	39
Total	100	100

Table 2: Thyroid function status in study participants.

Thyroid status	N	Percentage
Hypothyroid	31	31
Hyperthyroid	19	19
Normal (Euthyroid)	50	50
Total	100	100

Table 2 shows the thyroid function status of the study participants (N=100). Among them, 31% had hypothyroidism, while 19% had hyperthyroidism. Half of the participants (50%) were euthyroid, indicating normal thyroid function.

Table 3: Pregnancy loss based on thyroid status.

Thyroid status	N	Percentage
Hypothyroid	21	68
Hyperthyroid	14	74
Normal (Euthyroid)	26	52
Total	61	61

Table 3 presents pregnancy loss based on thyroid status among participants with a history of miscarriage (N = 61). Pregnancy loss was highest among hyperthyroid individuals (74%), followed by hypothyroid individuals (68%). In comparison, 52% of euthyroid participants experienced pregnancy loss.

Table 4 illustrates maternal complications based on thyroid status among study participants. Anemia was the most common complication, affecting 29% of hypothyroid, 32% of hyperthyroid, and 20% of euthyroid individuals, with a total prevalence of 25%. High blood pressure was observed in 23% of hypothyroid, 26% of hyperthyroid, and 14% of euthyroid participants (19% overall). Preeclampsia was reported in 16% of hypothyroid, 21% of hyperthyroid, and 12% of euthyroid individuals, totaling 15%. Postpartum bleeding was least frequent, affecting 10% of hypothyroid, 10% of hyperthyroid, and 6% of euthyroid participants (8% overall).

Table 4: Maternal complications by thyroid status.

Complication	Hypothyroid (%)	Hyperthyroid (%)	Normal (%)	Total (%)
High blood pressure	7 (23)	5 (26)	7 (14)	19 (19)
Preeclampsia	5 (16)	4 (21)	6 (12)	15 (15)
Anemia	9 (29)	6 (32)	10 (20)	25 (25)
Postpartum bleeding	3 (10)	2 (10)	3 (6)	8 (8)

Table 5: Fetal outcomes based on thyroid status.

Fetal outcome	Hypothyroid (%)	Hyperthyroid (%)	Normal (%)	Total (%)
Growth Restriction (IUGR)	9 (29)	6 (32)	6 (12)	21 (21)
Preterm birth	6 (19)	5 (26)	5 (10)	16 (16)
Low birth weight	7 (23)	4 (21)	7 (14)	18 (18)
Neonatal complications	5 (16)	3 (16)	4 (8)	12 (12)

Table 5 presents fetal outcomes based on thyroid status among study participants. Intrauterine growth restriction (IUGR) was observed in 29% of hypothyroid, 32% of hyperthyroid, and 12% of euthyroid pregnancies, with an overall prevalence of 21%. Preterm birth occurred in 19% of hypothyroid, 26% of hyperthyroid, and 10% of euthyroid cases (16% total). Low birth weight was noted in 23% of hypothyroid, 21% of hyperthyroid, and 14% of euthyroid pregnancies, making up 18% of cases. Neonatal complications were least common, affecting 16% of hypothyroid, 16% of hyperthyroid, and 8% of euthyroid infants, totaling 12%.

DISCUSSION

Thyroid dysfunction is becoming one of the important factors influencing pregnancy outcomes, such as recurrent pregnancy loss and maternal-fetal complications. Our

research explored the influence of hypothyroidism and hyperthyroidism on pregnancy loss and poor maternal-fetal outcomes, offering an important understanding of the relationship between thyroid disorder and reproductive health.

Our results show a strong connection between thyroid dysfunction and recurrent pregnancy loss. In hypothyroid, 68% gave a history of pregnancy loss, while 74% of hyperthyroid patients gave a history of miscarriage. In euthyroid women, the figure was 52%, confirming impression that both hypo- and hyperthyroidism suggestive of a high risk for miscarriage. These findings are in agreement with previous studies showing untreated thyroid disease can cause failure of implantation, placental pathology, and immune dysregulation, resulting in pregnancy loss.[7,11] Alexander et al shown that hypothyroidism, even if subclinical, increases risk of miscarriage due to impaired availability of thyroid hormones, which have an important role in the development of the embryo in early phases.[14] Casey and Leveno also documented the role of hypothyroidism in pregnancy loss, emphasizing the need for adequate thyroid hormone levels.[15] Hyperthyroidism, on the other hand, can lead to a hypermetabolic state, later early pregnancy loss.[16]

A higher rate of maternal complications was noted in our study in patients with thyroid dysfunction. Anemia was the most common complication, seen in 29% of hypothyroid and 32% of hyperthyroid patients compared to 20% of euthyroid women. Korevaar et al conjectured that thyroid hormones play a significant part in erythropoiesis and that their lack or excess would cause anemia during pregnancy.[17] Moreover, hypertension and preeclampsia were also more frequent in thyroid dysfunction women, as 23% of hypothyroid and 26% of hyperthyroid patients developed hypertension. Lazarus clarified that the heightened risk of hypertensive disorders in thyroid dysfunction is likely due to endothelial dysfunction and defective vascular regulation.[18] Postpartum hemorrhage occurred more often in thyroid-dysfunctional pregnancies, a fact that can be attributed to impaired coagulation and uterine inertia as a result of thyroid hormone imbalance. The findings of the study emphasize the need for early diagnosis and treatment of thyroid dysfunction in order to reduce maternal complications.

Our study reaffirmed that fetal well-being is significantly compromised by thyroid dysfunction. Intrauterine growth restriction (IUGR) was seen in 29% of hypothyroid and 32% of hyperthyroid pregnancies but was noted in 12% of euthyroid pregnancies. This is in agreement with earlier studies, which have demonstrated that thyroid hormones play an important part in normal fetal growth and placental function. Mandel et al found subnormal thyroid hormone levels in pregnancy to be associated with impaired placental function, with an additional risk of fetal growth restriction.[19] Preterm delivery was also more frequent in the context of thyroid disease (19% in hypothyroid and 26% in hyperthyroid pregnancies), which can be explained by placental insufficiency, immune activation, and inflammatory processes in thyroid disease. Maraka et al also reported the same observation, adding that thyroid dysfunction can cause systemic inflammation and immune activation and thus preterm labor.[20]

Low birth weight and neonatal morbidity were also more common in the neonates of mothers with thyroid dysfunction. Low birth weight was seen in 23% of hypothyroid and 21% of hyperthyroid pregnancies as opposed to 14% of euthyroid pregnancies. Poppe and Velkeniers documented that maternal hypothyroidism leads to deranged fetal thyroid function and metabolism, intrauterine growth restriction, and low birth weight.[21] In the same way, hyperthyroidism was also linked with excessive fetal stress and preterm birth and thus the risk of neonatal complications. Our findings imply adequate control of thyroid diseases in pregnancy, which would decrease the incidence of adverse fetal outcomes.

Since thyroid dysfunction is strongly linked with poor pregnancy outcome, early diagnosis and treatment of thyroid disease in pregnancy are essential. Screening of thyroid function in high-risk women, especially those with recurrent miscarriage, infertility, or autoimmune disorder, should be routine. Universal screening for thyroid disease in pregnancy was recommended by Stagnaro-Green et al for the early detection of individuals at risk.[22] Thyroid hormone replacement in hypothyroid women has been shown to lead to improved pregnancy outcomes through reduced miscarriage and preterm delivery. Medici et al. have reported that levothyroxine treatment in pregnant women with hypothyroidism is associated with a significant reduction in pregnancy complications.[23] In pregnancy complicated by hyperthyroidism, strict monitoring along with appropriate antithyroid therapy is required to prevent fetal and maternal complications.

Also, our article emphasizes the need for inter-disciplinary management by endocrinologists, obstetricians, and neonatologists in achieving optimal outcomes in mother and infant. Appropriate maternal nutrition with appropriate iodine supplementation when necessary should also get its due importance as a part of a thyroid disease management protocol during pregnancy.

This study has few limitations. Our sample size was relatively small, which may limit the generalizability of the findings. Additionally, we did not analyze the impact of subclinical thyroid dysfunction, which has been shown to influence pregnancy outcomes. Future research with a larger population and a longer follow-up period could provide more detailed insights into the effects of mild thyroid abnormalities on maternal and fetal health.

CONCLUSION

Our study highlights the significant impact of thyroid dysfunction on recurrent pregnancy loss and adverse maternal-fetal outcomes. Women with hypothyroidism

and hyperthyroidism were found to have a higher risk of miscarriage, maternal complications (such as anemia, hypertension, and preeclampsia), and fetal complications (including IUGR, preterm birth, and low birth weight). These findings underscore the importance of early thyroid screening and appropriate management in pregnancy to improve maternal and fetal health outcomes. Further large-scale studies are needed to strengthen the evidence base and develop targeted interventions for pregnant women with thyroid disorders.

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