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Original Research Article

Prevalence of Thyroid Disorders in Pregnancy and Their Maternal and Fetal Outcomes: A Prospective Observational Study

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Abstract:

Background: Thyroid disorders are among the most common endocrine abnormalities during pregnancy and are associated with significant maternal and fetal complications. Physiological changes during gestation alter thyroid hormone metabolism, increasing the risk of overt and subclinical thyroid dysfunction, particularly in iodine-deficient regions such as parts of India.

Aim: To determine the prevalence of thyroid disorders in pregnancy and evaluate their maternal and fetal outcomes in a tertiary care hospital setting in Bihar, India.

Methodology: This prospective observational study was conducted among 93 pregnant women attending antenatal clinics at Department of Obstetrics and Gynaecology, Shree Narayan Medical Institute and Hospital,Saharsa, Bihar, India, over one year. Thyroid function tests including serum TSH, free T3, and free T4 were assessed using enhanced chemiluminescence assay. Participants were classified according to trimester-specific thyroid status and followed until delivery to evaluate maternal and fetal outcomes. Statistical analysis was performed using SPSS version 25.0.

Results: Thyroid dysfunction was observed in 13% of pregnant women, with subclinical hypothyroidism being the most common disorder (6.5%), followed by overt hypothyroidism (4.3%) and subclinical hyperthyroidism (2.2%). Hypothyroidism showed significant association with anaemia (30%; OR=4.12, p=0.021), preeclampsia (20%; OR=3.94, p=0.038), caesarean section (30%; OR=4.28, p=0.019), low birth weight (40%; OR=5.82, p=0.002), low Apgar score (20%; p=0.041), and NICU admission (40%; p=0.001).

Conclusion: Thyroid dysfunction, particularly hypothyroidism, is prevalent during pregnancy and is significantly associated with adverse maternal and neonatal outcomes. Early antenatal screening and timely management may improve pregnancy outcomes and reduce maternal and fetal morbidity.

Keywords: Pregnancy, Thyroid dysfunction, Hypothyroidism, Maternal outcomes, Fetal outcomes, Prevalence, NICU admission, Low birth weight.

Introduction

Pregnancy induces profound physiological and hormonal changes that significantly influence thyroid function. During gestation, maternal requirements for iodine increase by almost 50%, due to the increased metabolic demands which results in greater production (synthesis) of thyroid hormones, in particular thyroxine (T4) and triiodothyronine (T3). At the same time, high serum levels of human chorionic gonadotropin (hCG) in the first trimester of pregnancy have a thyrotropic effect and lower the serum thyroid-stimulating hormone (TSH) levels [1]. Thyroid function tests are therefore different in each trimester of pregnancy and, when reviewing thyroid profiles, this must always be kept in mind. However, some women who have limited thyroid reserve may not adjust to these changes, leading to overt or subclinical thyroid dysfunction during pregnancy [2].

Thyroid disorders are one of the most common endocrine abnormalities that are seen during pregnancy and are an important public health problem globally. Physiological changes of thyroid function are usually well tolerated in iodine sufficient populations, but in iodine deficient populations these may lead to clinically relevant thyroid disorders [3]. Thyroid disorders remain a significant burden in India particularly among women of reproductive age. Other parts of Bihar and the country are still prone to ID and nutritional problems leading to maternal thyroid dysfunction during pregnancy. Overt hypothyroidism in

pregnancy is estimated to affect about 2–3% of women and subclinical hypothyroidism is estimated to affect about 10% of women. Also, thyroid autoimmunity has been seen in 5-10% of pregnancies [4]. Studies have reported even higher prevalence in India than in the West and highlight a need for epidemiological data for the region and targeted screening strategies.

Thyroid hormones are important to keep fetal growth and neurodevelopment normal and maintain pregnancy. In the early gestation period, fetal thyroid function was completely reliant on maternal thyroid hormones until the fetal thyroid gland is able to function at about 12 weeks gestation. Thus, mild thyroid dysfunction in pregnancy can have a negative impact on the mother and also on fetal growth. Some maternal complications have been reported with hypothyroidism in pregnancy such as miscarriage, anemia, gestational hypertension, preeclampsia, placental abruption, postpartum hemorrhage, higher operative delivery and cesarean section [5]. However, Hyperthyroidism is also less common and can lead to other maternal problems like heart failure, preeclampsia, thyroid storm and pregnancy loss.

The baby's development is also greatly affected by the mom's thyroid condition. Inadequate or untreated thyroid function has been linked to low birth weight (LBW), intrauterine growth restriction (IUGR), fetal distress, respiratory distress syndrome, stillbirth and admission to the neonatal intensive care unit (NICU). Additionally, thyroid hormones are crucial for fetal brain maturation and neurological development. Hypothyroidism in the mother during pregnancy has been associated with the hypothyroidism of the child later in life, which is characterized by learning disabilities, reduced intelligence quotient (IQ) and delayed psychomotor development [6]. If the diagnosis and treatment of congenital hypothyroidism is delayed, the child can suffer severe neurological and developmental abnormalities. Therefore, timely diagnosis and treatment of thyroid dysfunction in pregnancy is of utmost importance.

Although the burden of thyroid dysfunction during pregnancy has been demonstrated, there is a debate for universal screening of thyroid dysfunction in many developing countries because of trimester-specific thyroid reference ranges, lack of uniform guidelines, and resource constraints. A number of studies carried out in India have emphasized that selective screening methods are inadequate as there is a significant number of pregnant women who might be asymptomatic and undiagnosed with thyroid dysfunction. Access to antenatal care may be restricted, and nutrition awareness might be low in certain low-resource settings, like Bihar, so the rates of undetected thyroid abnormalities could be significantly high. Further, the prevalence and outcomes of thyroid dysfunction vary among the regions due to factors such as demographic difference, dietary practices, and socio-economic factors. As such, it is critical that local evidence is generated to help understand the scale of the problem and establish effective screening and management strategies.

Given the increased incidence of thyroid disease in pregnancy and the consequences for mother and fetus, early diagnosis and treatment of thyroid disorders can substantially reduce the negative effects of pregnancy. Treatment of hypothyroidism with levothyroxine is easy, effective, and widely available and early diagnosis is especially useful in decreasing morbidity. Hence, the present prospective observational study was conducted in Bihar, India to find out the prevalence of thyroid disorders in pregnant women and its maternal and foetal outcome. The results of this study can assist in enhancing antenatal screening policies and maternal and neonatal health care strategies in low resource settings.

Methodology

Study Design: The present study was designed as a hospital-based prospective observational study conducted to determine the prevalence of thyroid disorders in pregnancy and to evaluate their associated maternal and fetal outcomes. Pregnant women attending the hospital during the study period were prospectively followed from recruitment until delivery, and their thyroid profiles along with pregnancy outcomes were assessed systematically.

Study Area: The study was conducted in the Department of Obstetrics and Gynaecology, Shree Narayan Medical Institute and Hospital, Saharsa, Bihar, India

Study Duration: The study was carried out over a period of one year.

Sample Size: A total of 93 pregnant women were included in the study. The sample consisted of antenatal women with singleton pregnancies who fulfilled the eligibility criteria and consented to participate in the research.

Study Population: The study population comprised pregnant women attending antenatal clinics or admitted to the obstetric ward of the hospital during the study period. Women were recruited irrespective of age, parity, residence, or socioeconomic status. All eligible participants were informed about the nature and objectives of the study, and those willing to participate were enrolled after obtaining written informed consent.

Data Collection: Data collection was carried out using a predesigned and structured proforma. Detailed demographic and clinical information

including maternal age, parity, obstetric history, menstrual history, infertility, previous miscarriages, family history of thyroid disorders, and associated co-morbidities were recorded. Routine clinical examination and laboratory investigations were performed for all participants. Blood samples were collected for estimation of thyroid function tests including serum Thyroid Stimulating Hormone (TSH), free Triiodothyronine (fT3), and free Thyroxine (fT4). Estimation of TSH was performed using the Enhanced Chemiluminescence method, and further assessment of free T3 and free T4 levels was conducted in cases with abnormal TSH values. Thyroid status was categorized according to trimester-specific reference ranges recommended by the American Thyroid Association. Participants diagnosed with thyroid dysfunction were subsequently followed to assess maternal and fetal outcomes.

Inclusion Criteria

- Pregnant women attending antenatal clinic or admitted to the obstetric ward during the study period
- Singleton pregnancy
- Women willing to participate and provide written informed consent

Exclusion Criteria

- Women with multiple pregnancies
- Previously diagnosed thyroid disorders or those already on thyroid medication
- Pregnant women with pre-existing systemic illnesses such as diabetes mellitus, cardiac disease, pulmonary disease, renal disease, or other major medical disorders
- Women unwilling to participate in the study

Procedure: Eligible antenatal women attending the hospital during the study period were screened consecutively according to the inclusion and exclusion criteria. After obtaining informed written consent, detailed history taking and clinical examination were performed. Blood samples were collected for thyroid function testing including serum TSH, free T3, and free T4 levels. Based on laboratory findings, participants were classified into euthyroid, subclinical hypothyroid, overt hypothyroid, subclinical hyperthyroid, or overt hyperthyroid groups. The enrolled women were then followed prospectively throughout pregnancy until delivery. Maternal outcomes such as anemia, gestational hypertension, preeclampsia, oligohydramnios, preterm delivery, and cesarean section were documented. Fetal outcomes including low birth weight, low Apgar score, and NICU admission were also recorded and analyzed.

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 25.0. Descriptive statistics were used to summarize demographic and clinical characteristics of the study participants. Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. Association between thyroid disorders and maternal or fetal outcomes was assessed using Pearson's Chi-square test. Binary logistic regression analysis was performed to determine the association of thyroid dysfunction with potential risk factors and adverse pregnancy outcomes. A p-value of less than 0.05 was considered statistically significant."

Result

Table 1 shows the distribution of thyroid disorders among the 93 study participants along with their mean thyroid hormone levels. The majority of women were euthyroid, accounting for 87% (n=81), with mean TSH, fT4, and fT3 levels of 2.84 ± 0.96 mIU/L, 1.36 ± 0.22 ng/dl, and 3.22 ± 0.41 pg/ml, respectively. Among thyroid disorders, subclinical hypothyroidism was the most common, observed in 6.5% (n=6) of participants, followed by overt hypothyroidism in 4.3% (n=4) and subclinical hyperthyroidism in 2.2% (n=2). Women with overt hypothyroidism had the highest mean TSH level (11.45 ± 4.96 mIU/L) along with markedly reduced fT4 (0.42 ± 0.21 ng/dl) and fT3 (1.21 ± 0.54 pg/ml) levels. In contrast, subclinical hyperthyroidism showed suppressed TSH levels (0.08 ± 0.02 mIU/L) with relatively higher fT4 and fT3 values. These findings indicate that hypothyroidism, particularly the subclinical form, was the predominant thyroid abnormality among the pregnant women studied.

Table 1: Distribution of Thyroid Disorders among Study Participants (N = 93)

Thyroid Status	Number of Cases (n)	Percentage (%)	Mean TSH (mIU/L)	Mean fT4 (ng/dl)	Mean fT3 (pg/ml)
Subclinical Hypothyroidism	6	6.5	7.86 ± 1.42	1.12 ± 0.28	3.01 ± 0.48
Overt Hypothyroidism	4	4.3	11.45 ± 4.96	0.42 ± 0.21	1.21 ± 0.54
Subclinical Hyperthyroidism	2	2.2	0.08 ± 0.02	1.24 ± 0.11	4.08 ± 0.37
Euthyroid	81	87	2.84 ± 0.96	1.36 ± 0.22	3.22 ± 0.41
Total	93	100	—	—	—

Table 2 presents the clinical risk factors associated with thyroid disorders among the 12 pregnant women diagnosed with thyroid dysfunction. Irregular menstrual rhythm was the most commonly observed risk factor, present in 25% (n=3) of participants, followed by a history of recurrent miscarriage in 16.7% (n=2) of women. Both history of infertility treatment and family history of thyroid disorder were reported in 8.3% (n=1) of cases each. However, none of the evaluated risk factors showed a statistically significant association with thyroid disorders, as all p-values were greater than 0.05. These findings suggest that although certain clinical factors were present among affected women, they did not demonstrate significant predictive value for thyroid dysfunction in this study population.

Table 2: Clinical Risk Factors Associated with Thyroid Disorders in Pregnancy (N = 12)

Risk Factors	Percentage %(n)	p-value
Irregular menstrual rhythm	25.0% (3)	0.612
History of infertility treatment	8.3% (1)	0.284
Family history of thyroid disorder	8.3% (1)	0.091
History of recurrent miscarriage	16.7% (2)	0.438

Table 3 demonstrates the association of maternal and fetal outcomes in women with hypothyroidism (N=10). Anaemia and caesarean section were observed in 30% (n=3) of women each and showed statistically significant associations with hypothyroidism, with odds ratios (OR) of 4.12 and 4.28, respectively ($p<0.05$). Preeclampsia occurred in 20% (n=2) of cases and was also significantly associated (OR=3.94, p=0.038). Low birth weight was the most common fetal complication, affecting 40% (n=4) of neonates, with a strong association (OR=5.82, p=0.002). Similarly, NICU admission was reported in 40% (n=4) of cases and showed a statistically significant association (p=0.001). Low Apgar score was seen in 20% (n=2) of neonates and was significantly associated with hypothyroidism (OR=3.27, p=0.041). Although preterm delivery and oligohydramnios were each observed in 10% (n=1) of women, these associations were not statistically significant ($p>0.05$). Overall, the findings suggest that hypothyroidism during pregnancy is significantly associated with several adverse maternal and fetal outcomes.

Table 3: Association of Maternal and Fetal Outcomes in Women with Hypothyroidism (N = 10)

Outcome	%(n)	95% Confidence Interval	Odds Ratio	p-value
Anaemia	30.0% (3)	1.18 – 14.42	4.12	0.021
Preeclampsia	20.0% (2)	1.01 – 16.58	3.94	0.038
Preterm Delivery	10.0% (1)	0.29 – 18.72	2.08	0.401
Oligohydramnios	10.0% (1)	0.05 – 1.24	0.26	0.084
Caesarean Section	30.0% (3)	1.21 – 13.85	4.28	0.019
Low Birth Weight (LBW)	40.0% (4)	2.14 – 18.96	5.82	0.002
Low Apgar Score	20.0% (2)	1.02 – 11.84	3.27	0.041
NICU Admission	40.0% (4)	0.06 – 0.42	0.18	0.001

Table 4 presents the distribution of maternal outcomes among the 12 pregnant women with thyroid disorders. Anaemia and caesarean section were the most commonly observed maternal complications, each affecting 25% (n=3) of participants. Preeclampsia and gestational hypertension were reported in 16.7% (n=2) of cases each, while oligohydramnios and preterm delivery were observed in 8.3% (n=1) of women. These findings indicate that thyroid dysfunction during pregnancy may contribute to several adverse maternal outcomes, underlining the importance of timely screening, monitoring, and management of thyroid disorders during antenatal care.

Table 4: Distribution of Maternal Outcomes among Pregnant Women with Thyroid Disorders (N = 12)

Maternal Outcomes	Number of Cases (n)	Percentage (%)
Anaemia	3	25
Preeclampsia	2	16.7
Gestational Hypertension	2	16.7
Oligohydramnios	1	8.3
Preterm Delivery	1	8.3
Caesarean Section	3	25

Table 5 depicts the distribution of fetal outcomes among the 12 pregnant women diagnosed with thyroid disorders. The most common adverse fetal outcomes observed were low birth weight and NICU admission, each reported in 33.3% (n=4) of cases. Low Apgar score at 1 minute was noted in 16.7% (n=2) of neonates, while preterm birth occurred in 8.3% (n=1) of cases. Despite these complications, 41.7% (n=5) of neonates had normal outcomes. These findings suggest that thyroid disorders during pregnancy may be associated with unfavorable fetal outcomes, emphasizing the importance of early diagnosis and appropriate management during antenatal care.

Table 5: Distribution of Fetal Outcomes among Pregnant Women with Thyroid Disorders (N = 12)

Fetal Outcomes	Number of Cases (n)	Percentage (%)
Low Birth Weight (<2.5 kg)	4	33.3
Low Apgar Score (<5 at 1 min)	2	16.7
NICU Admission	4	33.3
Preterm Neonate	1	8.3
Normal Neonatal Outcome	5	41.7

Table 6 shows the overall prevalence of thyroid dysfunction among the 93 pregnant women included in the study. The majority of participants were euthyroid, accounting for 87% (n=81) of cases, indicating normal thyroid function during pregnancy. In contrast, thyroid dysfunction was observed in 13% (n=12) of the study population. These findings suggest that although most pregnant women maintained normal thyroid status, a considerable proportion experienced thyroid abnormalities, highlighting the importance of thyroid screening and monitoring during pregnancy.

Table 6: Overall Prevalence of Thyroid Dysfunction in Pregnancy (N = 93)

Thyroid Function Status	Number of Cases (n)	Percentage (%)
Euthyroid	81	87
Thyroid Dysfunction	12	13
Total	93	100

Discussion

In the present prospective observational study, thyroid dysfunction was found in 13% of pregnant women, which included subclinical hypothyroidism (6.5%), overt hypothyroidism (4.3%) and subclinical hyperthyroidism (2.2%). The results of the present study are similar to Wang et al., (2011) [7], who found the overall prevalence of thyroid disorder to be 10.2% during pregnancy while Ajmani et al., (2014) [8] found that the prevalence of thyroid disorder among pregnant women was 13.25%. In the same way, Singh and Pedduri (2018) [9] found subclinical hypothyroidism in 6.1% of the cases, which is in close comparison with the prevalence of 6.5% reported in our study. Persistent iodine deficiency in India, differences in the trimester-specific TSH reference ranges and dietary differences, environmental and other factors, may be responsible for the relatively higher prevalence of thyroid dysfunction in the Indian studies when compared with Western studies. Our results thus confirm the increasing trends of thyroid dysfunction as a major endocrine disorder during pregnancy in Indian population."

The mean TSH level (11.45 ± 4.96 mIU/L) was found to be extremely high in women with overt hypothyroidism while the fT4 and fT3 levels were found to be significantly decreased, resulting in severe thyroid hormone deficiency in the present study. Higher TSH and lower levels of thyroid hormones were also reported in hypothyroid pregnant women in the third trimester by Mankar et al. (2016) [10]. In the same way, Wang et al. (2011) [7] reported that the mean TSH levels of women with subclinical hypothyroidism were more than 8 mIU/L. The findings of these changes are comparable, indicating that the biochemical changes in the hypothyroid pregnant women are similar in different populations. In addition, the relative importance of subclinical hypothyroidism in our study reinforces the current guidelines that TSH should be measured and used for diagnosis during each trimester due to the fact that mild thyroid impairment might not be recognized.

Irregular menstrual rhythm (25%) was the most frequent associated factor observed in our study followed by recurrent miscarriage (16.7%). Verma et al. (2012) [11] noted that menstrual irregularities, ovulatory disorders and infertility are associated with hormonal imbalance related to thyroid dysfunction. In our study, the prevalence of history of infertility treatment was 8.3% in women with thyroid dysfunction, similar to the 3.8–4.5% reported in the other studies conducted by Manju et al. (2017) [12]. In our study, the recurrent miscarriage is also corroborated by previous studies that have also shown a relationship between thyroid autoimmunity and miscarriage. Nonetheless, none of the clinical risk factors observed in our study were

statistically significant ($p > 0.05$); this may be due to the smaller number of participants in the study and the limited number of participants who had symptoms.

In the present study, hypothyroidism was significantly associated with maternal anaemia, having been affected by 30 % women with hypothyroidism (OR = 4.12, p = 0.021). This is similar to the study by Sreelatha et al. (2017) [13] which showed that 26.3% of the pregnant women with hypothyroidism were anaemic. It is known that iron deficiency can inhibit the activity of thyroid peroxidase and therefore decrease the production of thyroid hormones, adding to hypothyroidism. Moreover, Baghel et al. 2017 [14] also found a strong correlation between hypothyroidism and low haemoglobin level during pregnancy. Anaemia and hypothyroidism can therefore have a negative effect on maternal health and contribute to an increased risk of obstetric complications, and early diagnosis and treatment is paramount.

Another major maternal complication that was found to be significantly associated with hypothyroidism in the present study was preeclampsia (OR = 3.94, p = 0.038) affecting 20% of the affected women. The same conclusion was drawn by Ajmani et al. (2014) [8] and Sreelatha et al. (2017) [13] with 13.6%–15.8% of women with hypothyroidism being affected by preeclampsia. A probable mechanism in this correlation is elevated peripheral vascular resistance and endothelial dysfunction that occurs due to thyroid hormone deficiency. Hypothyroidism also can result in proteinuria and poor placental blood flow, thus raising the risk of pregnancy-related hypertension. The similarities indicate that thyroid dysfunction plays an important role in maternal morbidity and poor obstetric outcome.

In our study, the rate of cesarean section for women with hypothyroidism was 30% and there was a significant association (OR = 4.28, p = 0.019). Similar findings were reported by Sreelatha et al. (2017) [13] who reported that 22.9% of women with hypothyroidism delivered by cesarean section. Likewise, Männistö et al. (2013) [15] showed higher operative deliveries among women who had thyroid disorders. This increase in the rate of cesarean section could have been due to complications related to the cesarean section, such as preeclampsia, fetal distress, gestational hypertension and preterm labour. Oligohydramnios and preterm delivery were not observed as frequently in our study (8.3% each) and were not statistically significant, but previous studies have reported similar trends and may need to be larger in size to be more convincing.

In the fetal outcome measure, the most prevalent complication observed in the newborns of hypothyroid women was LBW, observed in 40% of the neonates (OR = 5.82, p = 0.002). The prevalence rate is higher than that reported by Sharma et al. (2017) [16] (20-31.6%), however, the overall association was similar to previous studies. A decrease in thyroid hormone availability in maternal hypothyroidism may affect the function of the placenta and fetal growth, resulting in intrauterine growth restriction and LBW. Maternal hypothyroidism was also found to be significantly associated with NICU admission in our study; 40% were found to be admitted to NICU which is similar to the result of Sharma et al. (2017) [16] who reported around 42-46% of neonates were admitted to NICU having hypothyroidism mother. Similarly, low Apgar scores of 20% of neonates in our study are also in the same range as that reported by Manju et al., 2017 [12] (20%). Overall, these results suggest that maternal thyroid dysfunction has detrimental effects on neonatal adaptation and early postnatal consequences.

The overall results of the present study are in general similar to the various Indian and international studies which have been published, where it has been established that maternal hypothyroidism is associated with increased maternal and fetal morbidity. The high proportion of subclinical hypothyroidism underlines the need to screen women for thyroid function routinely during pregnancy, especially in high-risk groups. Prompt diagnosis and treatment with levothyroxine may significantly diminish feto-maternal complications and enhance the outcome of pregnancy.

Conclusion

The present prospective observational study showed that thyroid dysfunction is a common clinical condition associated with pregnancy; hypothyroidism was more prevalent than hyperthyroidism in women with thyroid dysfunction. The results suggest that adverse maternal outcomes like anaemia, preeclampsia, gestational hypertension and higher rates of caesarean delivery are linked to thyroid disorders in pregnancy. Further, women with thyroid abnormalities were more likely to experience unfavorable fetal or neonatal outcomes such as low birth weight, low Apgar score, preterm delivery, and admission to the NICU. Some clinical risk factors were suggested to have potential associations, but this was not confirmed statistically. Early screening of thyroid dysfunction during pregnancy, early diagnosis and appropriate management for thyroid dysfunction during pregnancy are important to improve maternal and fetal outcomes based on these findings.

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