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Original Research Article

A Prospective Study on Relation of Subclinical Hypothyroidism During Pregnancy With its outcomes at SKMCH, Muzaffarpur, Bihar

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Abstract

Background: Both the mother and the foetus experience significant physiological stress throughout pregnancy. There is a significant risk of unfavourable outcomes for both the mother and the foetus when endocrine abnormalities like hypothyroidism are present during pregnancy. All pregnant women should be screened for subclinical hypothyroidism, especially in the Indian context where there is a higher risk of iodine deficit during pregnancy. Therefore, the purpose of this study was to determine how subclinical hypothyroidism affected the course of pregnancy.

Method: A prospective analytical study was conducted at SKMCH, Muzaffarpur, Bihar from April 2022 to September 2022. The sample size was made up of 73 expectant women who visited the prenatal OPD. During the initial appointment, a thyroid profile (serum TSH, FT3 and FT4) was performed. TSH >2.5mIU/L in the first trimester, >3mIU/L in the second trimester, and >3.5mIU/L in the third trimester were the cutoff values used by the SCH to assess the findings. Information was recorded about the participants' general characteristics. The participants checked in to assess the delivery method, the mother's and fetus's health, and any co-morbid conditions that might have developed. Women with SCH are treated as such.

Results: Thyroid screening was done on 73 pregnant women, and 24.7% of them showed subclinical hypothyroidism. In contrast to 72.3% of euthyroid women, 55.6% of SCH women were under the age of 25. For iodized salt consumption, food type, and BMI, there was no discernible difference between the SCH and euthyroid groups ($p>0.05$). SCH was linked to increased incidences of elevated blood pressure (27.8% vs 7.3%, $p=0.02$) and low birth weight (38.9% vs 14.5%, $p=0.03$) in infants compared to euthyroid condition. In contrast to euthyroid women, the proportion of SCH women with anaemia and a low APGAR score was also higher. The significance was merely somewhat high. (Poor APGAR score: 27.8% vs. 9.1%; Anaemia: 72.2% vs. 45.5%, $p=0.049$).

Conclusion: Indians have a rather high prevalence of subclinical hypothyroidism among pregnant women. Unfavourable maternal and foetal outcomes were observed in pregnant women with SCH, with a higher risk of high blood pressure and low birth weight neonates. In order to improve maternal and perinatal outcomes, routine maternal thyroid function testing is required.

Keywords: Subclinical hypothyroidism, Pregnancy, Maternal outcome, Fetal outcome

Introduction

The second most prevalent endocrine condition in women of reproductive age is thyroid dysfunction [1]. Both the mother and the foetus experience significant physiological stress throughout pregnancy. The risk of unfavourable outcomes for the mother and foetus is very high if endocrine abnormalities like hypothyroidism are present during pregnancy. Pregnancy-related hypothyroidism is frequently asymptomatic, especially when subclinical.

Pregnancy-related hypothyroidism raises the risk of postpartum haemorrhage, abruptio placenta, anaemia, gestational hypertension, and abortion [2-4]. Neonatal respiratory difficulty, low birth weight, and premature birth can result from untreated maternal hypothyroidism. The role of thyroxin in healthy embryonic brain development has enough gathered evidence throughout the years. The main side effects of maternal hypothyroidism during pregnancy include neurological abnormalities in babies and children, including poor IQ scores, cognitive delays, and impairment in psychomotor development [5-7].

Worldwide, the incidence of hypothyroidism during pregnancy ranges from 0.4% to 11%. 8 Hypothyroidism prevalence rates during pregnancy range from 4.8% to 11% in India, and SCH is as high as 13.5% [2-10]. Particularly in a developing nation like India, the rate of detection has not kept up with the severity of the issue. Given that hypothyroidism is easily treated, early detection and intervention could lessen the burden of unfavourable foetal and mother outcomes, which are frequently observed. The goal of the current investigation is to determine the prevalence and effects of subclinical hypothyroidism.

Materials and Methods

From April 2022 to September 2022, the current prospective analytical hospital-based study was carried out at the Obstetrics and Gynecology department of Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. The prenatal OPD at SKMCH was chosen as the study location. Every week, the participants are enrolled on Monday and Saturday. Every tenth woman who visited the prenatal OPD on each day of the research was enrolled. In the event of non-response or for any other reason, the following women entered in the study, assuming she met the requirements for inclusion. 73 pregnant women in all signed up for the trial. It was noted what the participants' overall characteristics were. Additionally, the participants underwent clinical examinations and laboratory tests, including general and systemic checks, measurements of their height and weight, blood pressure, haemoglobin estimation, thyroid function tests, etc. TSH, FT3, and FT4 values are measured to evaluate thyroid function.

The classification of thyroid function during pregnancy is based on European Thyroid Association guidelines. According to these recommendations, antenatal women were deemed to have subclinical hypothyroidism (SCH) if their TSH was greater than 2.5 mIU/L in the first trimester, greater than 3 mIU/L, and greater than 3.5 mIU/L in the second and third trimesters, respectively, and they had normal free T3 and T4 levels. Regardless of the FT4 level, the woman was identified as having overt hypothyroidism if the TSH was >10.0 mIU/L.

Participants in the study followed up to evaluate the results for the mother, the foetus,

and any co-morbidities that may have been present. Women with SCH received the appropriate care, and congenital hypothyroidism screenings were performed on children delivered to SCH moms.

Exclusion criteria

- Pre-existing thyroid disorders
- Patients presenting with symptoms of overt hypothyroidism
- Women with multiple pregnancies

Statistical analysis

Results for categorical variables are presented as percentages, while those for continuous variables are presented as mean±SD. With a 5% threshold of significance, chi-square and t-test were employed to compare the means and proportions.

Results

In the current investigation, among the 73 women, 55 (75.3%) had TSH and fT4 values that were within the normal reference limits in the testing trimester and were deemed to be euthyroid; however, 18 (24.7%) had high TSH levels along with normal fT4 levels and were deemed to have subclinical hypothyroidism (SCH). [Table 1]

Table 1

Subclinical Hypothyroidism	No. of Patients	Percentage
Present	18	24.7
Absent	55	75.3
Total	73	100.0

Table 2 lists the general characteristics of mothers. It was discovered that 72.3% of euthyroid women and 55.6% of SCH women were under the age of 25. The difference (p=0.17) was not statistically significant. However, when the mean ages of the two groups were compared, there was a statistically significant difference (p=0.02).

Among the 18 SCH women, 15 (83.3%) frequently consume iodized salt, compared to the 55 euthyroid women (n=45), of whom 45 (81.8%) do so. The difference was negligible. Vegetarian/non-vegetarian diet and SCH were not associated (p=0.74). While 19 (34.5%) of the euthyroid women followed a vegetarian diet, only 7 (38.9%) of the 18 SCH women did.

02 (11.1%) of the SCH women (n=18) and 03 (5.5%) of the euthyroid women (n=55) were overweight. In addition, SCH women's mean BMI was higher (21.1 kg/m2) than it was for euthyroid women (21.4 kg/m^2). BMI and SCH did not, however, appear to be related (p>0.05).

Table 2: General characteristics of study population

Variable		Subclinical hypothyroidism(n=18)	Euthyroid(n=55)	p-value
Age (years)	< 25	10 (55.6)	40 (72.3)	
	>=25	08 (44.4)	15 (27.7)	0.1736
	Mean ± SD	24.3 ± 4.3	22.1 ± 3.2	0.0233
Iodized salt consumption	Yes	15 (83.3)	45 (81.8)	
	No	03 (16.7)	10 (18.2)	0.8840
Diet	Vegetarian	07 (38.9)	19 (34.5)	
	Non-Vegetarian	11 (61.1)	36 (65.5)	0.7384
BMI (kg/m^2)	< 25	16 (88.9)	52 (94.5)	

	>= 25	02 (11.1)	03 (5.5)	0.4095
	Mean ± SD	21.1 ± 2.7	21.4 ± 3.1	0.7146

In Table 3, maternal and foetal outcomes are contrasted. According to WHO guidelines, a cut-off of 11 gm% was used to assess a pregnant woman's anaemic state. In comparison to euthyroid women (45.5%), a significantly larger percentage of SCH women (72.2%) developed anaemia [p <0.05]. In addition, SCH women's mean Hb levels (9.7 gm%) were lower than those of euthyroid women (10.0 gm%). Women with SCH had a considerably higher percentage of high blood pressure than euthyroid women (27.8% vs. 7.3%, p=0.02).

38.9% vs 14.5% more low birth weight infants were delivered in the SCH group than in the euthyroid group. SCH and LBW showed a significant correlation (p=0.03). However, there was no significant change in the mean birth weight of infants (2.6 kg vs 2.7 kg, p=0.43).

At one minute after delivery, SCH women (27.8%) had a higher percentage of low APGAR scores (7) than euthyroid women (9.1%). A strong correlation between the mother's SCH and the infant's low APGAR was found (p <0.05).

Table 3: Maternal and Fetal outcomes

Variable		Sub clinical hypothyroidism(n=18)	Euthyroid (n=55)	p-value
Hb (gm%)	<11	13 (72.2)	25 (45.5)	
	11 or more	05 (27.8)	30 (54.4)	0.0485
	Mean ± SD	9.7 ± 1.3	10.0 ± 1.2	0.3701
High Blood Pressure (SBP>140 and/or DBP>90)	Yes	05 (27.8)	04 (7.3)	
	No	13 (72.2)	51 (92.7)	0.0216
Birth Weight (kg)	< 2.5	07 (38.9)	08 (14.5)	
	2.5 or more	11 (61.1)	47 (85.5)	0.0265
	Mean ± SD	2.6 ± 0.5	2.7 ± 0.3	0.4312
APGAR Score(at 1 minute)	< 7	05 (27.8)	05 (9.1)	
	7 or more	13 (72.2)	50 (90.9)	0.0454

Discussion

The most prevalent kind of hypothyroidism during pregnancy is subclinical hypothyroidism (SCH), which is characterised by high levels of thyroid-stimulating hormone (TSH) and thyroxin (T4) levels that are normal or below normal.

To assess if hypothyroidism is overt or subclinical, T4 levels should be examined if the TSH is higher than 2.5 at any point during pregnancy. The diagnosis of overt hypothyroidism, which might hinder the infant's neurocognitive development, is made if T4 levels are low. Premature birth, low birthweight, and miscarriage are also at higher risk. Treating overt hypothyroidism is necessary. Subclinical hypothyroidism is the diagnosis when TSH is elevated and T4 is normal. The next step in this situation is to examine the body for antithyroid peroxidase antibodies. Antibody-positive females need to receive treatment. Uncertainty exists regarding the impact of subclinical hypothyroidism on embryonic neurocognitive development. However, a significant study found that children of untreated moms scored lower on IQ testing. Regardless of the T4 level, treatment is

required when the TSH is 10 or higher. Additionally, throughout the first 20 weeks of pregnancy and again between 26 and 32 weeks, TSH should be checked every 4 weeks [11].

The purpose of the current study was to learn more about how SCH affects maternal and perinatal outcomes. 24.7% of pregnant women in our study sample had SCH diagnoses.

In 2012, Forough *et al* [12]. studied 600 pregnant women in Iran and found that the prevalence of SCH was 11.3%. In their investigation of 200 pregnant women, Sannaboraiah A *et al* [13]. discovered a prevalence of subclinical hypothyroidism of 9.5%. In their study, Dhanwal*et al* [14]. found that the frequency of SCH was 4.3% among expectant mothers in north India. According to Abalovich *et al* [15]. subclinical hypothyroidism is thought to affect 2-3% of pregnancies in 2007. Gayathri *et al* [16]. examined the prevalence of SCH among 495 pregnant patients in government hospitals in South India in the year 2007 and found that the prevalence was 2.8%.

2.3% of the 25,756 pregnant women Brian *et al* [17]. evaluated in their study in Texas in 2000 had subclinical hypothyroidism. In a prospective study of 8012 pregnant women at the Third Hospital Affiliated with Wenzhou Medical University, Zhejiang, China, Liang-Miao Chen *et al* [18]. found that 371 (4.63%) of these women had SCH because they had high TSH levels along with normal fT4 levels.

The prevalence of SCH during pregnancy varies greatly between research, with the current study showing a higher frequency.

In the current study, SCH women's mean age was substantially greater than that of euthyroid women (p=0.02). Additionally, a favourable connection between subclinical hypothyroidism and older maternal age was shown by Sannaboraiah A. *et al* [13]. (p=0.018). The study by Kalpesh*et al* [19]. had similar findings, namely that thyroid dysfunction was more frequently seen in mothers who were older. The fact that SCH has been observed to grow with age may account for the SCH group's higher mean age.

Our study findings point to a link between elevated blood pressure levels and subclinical hypothyroidism (27.8% vs. 7.3%, p=0.02). Blood pressure may be negatively impacted by subclinical hypothyroidism for a number of reasons. Blood pressure is known to rise in patients with clinical hypothyroidism, and the key underlying factor assumed to be the level of systemic vascular resistance prevalent in these patients [20]. Our findings are corroborated by Luboshitzky *et al*, who discovered that the prevalence of hypertension was considerably higher in the subclinical hypothyroidism group than in the normal control group [21].

In their meta-analysis of patients with subclinical thyroid impairment, YunfeiCai *et al* [22]. also discovered a correlation between SCH and elevated blood pressure. Similar to their findings, Liang-Miao Chen *et al* [18]. discovered that women with SCH had a considerably higher percentage of high blood pressure than euthyroid women (3.504% vs. 1.819%, P=0.02). However, Duan*et al* [23]. and Walsh *et al* [24]. did not find a statistically significant correlation between subclinical hypothyroidism and an increase in blood pressure in their cross-sectional investigation. Certain types of anaemia, typically macrocytic hypochromic or normocytic, can be brought on by hypothyroidism. In this study, the percentage of anaemia in SCH women was higher than that in euthyroid women [72.2% vs. 45.5%, p=0.048]. While Akter*et al* [25]. observed anaemia in 17.2% of SCH patients, Sannaboraiah A *et al* [13]. found 31.6% of SCH patients to be anaemic in their research.

In the present study, the proportion of overweight women was higher in SCH women than in euthyroid women. In contrast to the euthyroid group, the mean BMI was lower in the SCH group. BMI and SCH did not shown to be related (p=0.41). Patients with SCH have lower BMIs than the euthyroid control group, according to Karthick*et al* [26]. On the other hand, a positive correlation between BMI and serum TSH was discovered by Knudsen *et al* [27]. in 2005 (P <0.001). According to the research by Solanki *et al* [28] people with greater BMIs had higher serum TSH levels, and this pattern persisted from the underweight to the obese group (p <0.001). Hypothyroidism is associated with a moderate increase in weight gain, and it has been described recently that changes in TSH could be result of excess weight [29].

In our study, there was a statistically significant difference in the incidence of LBW in the SCH group and the euthyroid group (38.9% vs 14.5%, p=0.03). Low birth weight neonates were also frequently observed in patients with subclinical hypothyroidism (27.6%) in the Akter*et al* [25]. investigation. In the Liang *et al* [18]. trial, the SCH group delivered 4.582% more LBW infants than the euthyroid group did (1.885% vs. 1.885%, P<0.001). These results imply that the elevated rate of LBW in children born to mothers with SCH is attributable to this thyroid condition. The same association was reported by Leung *et al* [30]. Possible connections between LBW in infants born to mothers with SCH and poor psychological development have been proposed [34,35]. This is because LBW is reported risk factor for subnormal neurobehavioral performance and intellectual development [31-33].

In the current study, SCH women had a substantially greater incidence of low APGAR Score at 1 minute compared to euthyroid women (27.8% vs. 9.1%, p=0.045). 9 out of 19 infants in a research by Sannaboraiah A *et al* [13]. had an APGAR score of less than 7 (47.36%). According to Forough*et al* [12]. there is a strong correlation between subclinical hypothyroidism and a poor Apgar score at the first minute (P = 0.022). Low Apgar score risk rose by 2.15 times as a result. Goel*et al* [36]. also found that moms with subclinical or clinical hypothyroidism had a greater incidence of foetal distress. Neonates with low Apgar scores at delivery appear to be caused by hypothyroidism, which it appears has irreversible effects on the placenta and foetus during pregnancy and reduces the foetal capacity to handle stress [37].

Conclusion

The main conclusion of this study was that SCH, a condition that affects pregnant women frequently, has significant negative impact on mother and foetal outcomes. In particular, SCH can cause HBP in mothers and increased rates of LBW in newborns. Early detection makes the illness simple to treat, with little harm to the mother or foetus. In pregnant women with overt or SCH, thyroxine replacement therapy prevents obstetric and foetal problems and demonstrates no negative side effects. We cannot draw the conclusion that all pregnant women with SCH should get thyroxine treatment in the absence of a matched untreated control group.

Therefore, broad serum TSH monitoring and treatment of women with subclinical hypothyroidism during pregnancy is unnecessary unless trials are done to show that thyroxine supplementation will eliminate any of these maternal and foetal morbidities.

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