

Original Article

PREVALENCE AND CLINICAL IMPLICATIONS OF HYPOTHYROIDISM AMONG PREGNANT WOMEN IN THE FIRST TRIMESTER: A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

Objective: Thyroid disorders, particularly hypothyroidism, pose significant risks to both pregnant women and their fetuses. This prospective observational study aimed to investigate the prevalence and clinical implications of hypothyroidism among pregnant women in the first trimester in a hilly region of North India.

Methods: The study included 300 pregnant women attending the antenatal clinic at Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi (HP), between April 1, 2021, and March 31, 2022. Participants were categorized into two groups based on their thyroid-stimulating hormone (TSH) levels: Group A (TSH 2.5-10.0 mIU/l) and Group B (TSH>10 mIU/l). Thyroid function was assessed through TSH, free T4, and free T3 measurements. Maternal and fetal outcomes were monitored throughout pregnancy.

Results: The study found an overall hypothyroidism prevalence of 11.31%, comprising 10.98% subclinical hypothyroidism (SCH) and 0.33% overt hypothyroidism (OH). These findings were consistent with similar studies in North India. Participants had a mean age of 28.7±5.2148 y, resembling demographic data from hilly regions. A majority of participants belonged to the lower-middle-income group and resided in rural areas, reflecting the socio-demographic distribution in the region. The gestational age ranged from 6 to 12 w, with an average of 9.31±1.5 w. The average TSH level was notably higher than in other Indian studies, potentially due to the geographical altitude.

Conclusion: The study highlights the need for early detection and management of thyroid dysfunction during pregnancy, especially in hilly regions, to prevent maternal and fetal complications. This research addresses a knowledge gap and emphasizes the importance of thyroid screening during the first prenatal visit in similar settings.

Keywords: Hypothyroidism, Pregnancy, Prevalence, Maternal outcomes, Fetal outcomes, Thyroid screening, Hilly regions

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INTRODUCTION

Thyroid disorders have long intrigued medical observers due to their gender-specific nature. As far back as the 16th century, Realdus Columbus noted gender differences in thyroid gland size (1). The thyroid's crucial role in reproduction is evident, with pregnancy-induced hormonal changes influencing its function. Adequate thyroid hormone levels are vital for pregnancy maintenance and fetal development [1].

During pregnancy, maternal thyroid hormones are crucial for fetal development until the fetal thyroid gland fully forms by the end of the first trimester [2]. Hypothyroidism, prevalent among women of childbearing age, poses risks to both mother and fetus, including obstetrical complications. Thyroid disorders often stem from nutritional deficiencies, especially iodine, and autoimmune thyroiditis. Diagnosing these conditions during pregnancy is challenging due to symptom overlap with normal pregnancy changes. Hypothyroidism involves low thyroid hormone levels and elevated TSH levels, with primary and central hypothyroidism as its main types. Global prevalence ranges from 0.6 to 12 per 1000 women and 1.3 to 4 per 1000 men [3].

Risk factors include age (15-35), family history, high BMI, infertility, autoimmune disorders, and certain medications. Untreated hypothyroidism during pregnancy leads to complications like preterm birth and neurocognitive issues. The prevalence of hypothyroidism varies globally, with some Asian countries reporting rates as high as 13.13%. Subclinical hypothyroidism affects 2-5% of cases [4].

Should all pregnant women undergo thyroid dysfunction screening? The topic remains contentious. Nevertheless, the Indian Thyroid Society recommends TSH screening during the first prenatal visit.

This study addresses a knowledge gap regarding hypothyroidism in hilly areas of India, shedding light on the prevalence and clinical implications among pregnant women in their first trimester at Shri Lal Bahadur Shastri Government Medical College and Hospital, Nerchowk, Mandi, Himachal Pradesh [5].

MATERIALS AND METHODS

Study design

The present study is a prospective observational study conducted among pregnant women attending the antenatal clinic in their first trimester at the Department of Obstetrics and Gynaecology in Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi (HP).

Study period

The study was conducted among all available pregnant women in the first trimester between 01st April 2021 to 31st March 2022 who fulfilled the inclusion criteria.

Study setting

This hospital-based study was carried out among all available and consenting pregnant women attending antenatal clinic in their first trimester who were in active follow-up and undergoing antenatal checkups.

Inclusion criteria

1. Pregnant women in the first trimester aged 18 y and above.
2. Singleton pregnancy.
3. Primigravida or multigravida.

4. Patients who were in regular follow-up.
5. Patients agreeing with "signed and informed consent."

Exclusion criteria

Cases with the following findings were excluded:

1. Diabetic patients with pregnancy.
2. Hypertension with pregnancy.
3. Renal disease with pregnancy.
4. Liver disease with pregnancy.
5. Multifoetal gestation.
6. Previous bad obstetric history with a known cause.
7. Patients not giving "informed consent."

Study population (sample size)

All patients fulfilling the inclusion and exclusion criteria and visiting the OPD at the Department of Obstetrics and Gynaecology in Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi (HP) during the study period (01st April 2021 to 31st March 2022) were included. A total sample of 300 pregnant hypothyroid patients was selected using convenience sampling.

Method of data collection

The present observational prospective study was undertaken at Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi (Himachal Pradesh) in the Department of Obstetrics and Gynaecology, where pregnant women attending antenatal clinic in their first trimester were screened with serum TSH.

Sample collection method

Serum TSH estimation was done in fasting blood samples. Three ml of patients' venous blood samples were obtained under aseptic procedures and transferred to standard gel separator tubes.

Estimation of TSH

Estimation of TSH was done by chemiluminescent microplate immunoassay (CMIA). ARCHITECT TSH is a two-step sandwich immunoassay.

Estimation of fT4

Estimation of fT4 was done by chemiluminescent microplate immunoassay (CMIA).

Estimation of fT3

Estimation of fT3 was done by chemiluminescent microplate immunoassay (CMIA).

Treatment of hypothyroidism

Patients with overt and subclinical hypothyroidism were treated with L Thyroxine according to their body weight to maintain serum TSH near normal levels. Concentration of TSH was maintained up to less than 2.5mIU/l in the first trimester. All groups were monitored every 4-6 w with the estimation of serum TSH. These women were followed throughout pregnancy to know the impact of hypothyroidism on the mother and the newborn after treating the hypothyroid women with an adequate dose of L Thyroxine, depending on serum TSH. All the patients were followed till the end of pregnancy and were observed for any maternal complications occurring pertaining to low thyroxine levels and their fetal outcome.

Dependent variables: Hypothyroidism. **Independent variables:** Age at conception, Educational and Occupational status, BMI, Gravida, Parity, TSH, etc.

Statistical analysis

Statistical analysis was performed using SPSS (Statistical Package for the Social Sciences) for Windows (version 24.0). Categorical variables were described as frequency (percentage), and mean±standard deviation was used for continuous parameters. The Chi-square test and Fischer-exact test were used for statistical comparisons. A two-tailed p-value of <0.05 was considered statistically significant.

RESULTS

The study's patients were aged 18 to 40, according to the distribution of their ages. According to Tables 1, the research group's average age was 28.79 y plus 5.21 standard deviations. The age group of 18 to 20 y had the fewest subjects (4.7%), followed by the group of 31 to 40 y (34%) and the age group of 21 to 30 y (59.3%), which had the most patients table 1.

The socio-demographic characteristics of the research participants, including their socioeconomic position, residency status, and booked status, are shown in table 3. When it came to socioeconomic status, the majority of study participants (55.3%) belonged to the lower-middle class, followed by the lower class (30.7%), upper middle class (11.7%), and upper class (2.3%); when it came to residence status (62.7%), the majority of participants (62.7%) were from rural areas, and only 37.3% of patients were from urban areas; and when it came to booking status (80.3%), the majority of participants (80) table 2.

The research participants' pregnancy profiles are shown in table 3. In the research, almost 34% of participants were primigravida, 31% had their current pregnancy as their second, approximately 26.7% had it as their third, and only 8.3% had it as their fourth. Participants were multiparous in 66% of cases overall (fig. 9). The research subjects' gestational ages varied from 6 to 12 w, with a mean gestational age of 9.31±1.5 w (Mean±SD) table 3.

Table 1: Age-wise distribution of study patients (N=300)

Age group	Frequency	Percent (%)
18-20 y	14	4.7%
21-30 y	178	59.3%
31-40 y	108	36.0%
Total	300	100.0%

Table 2: Socio-demographic profile among study participants

Socio-demographic profile (n = 300)	Frequency	Percent (%)
Socio-economic status	Lower	92
	Lower Middle	166
	Upper Middle	35
	Upper	7
Residence status	Rural	188
	Urban	112
Booking status	Booked	241
	Unbooked	59

Table 4: Pregnancy profile of study participants

Pregnancy profile (n = 300)		Frequency	Percent (%)
Gravida	1	102	34.0%
	2	93	31.0%
	3	80	26.7%
	4	25	8.3%
Parity	Primi	102	34.0%
	Multi	198	66.0%
Gestational age (weeks) (Mean=9.31; SD=1.5; SE=0.1)	6 w	16	5.3%
	7 w	16	5.3%
	8 w	58	19.3%
	9 w	79	26.3%
	10 w	56	18.7%
	11 w	50	16.7%
	12 w	25	8.3%

DISCUSSION

The primary objective of this study was to explore the occurrence of hypothyroidism during the initial trimester of pregnancy and its repercussions on the well-being of both mothers and fetuses. The study encompassed a cohort of 300 pregnant women who exhibited irregular TSH levels between April 1, 2021, and March 31, 2022 [1]. These women were attendees of the antenatal clinic at the Department of Obstetrics and Gynecology, situated within Shri Lal Bahadur Shastri Government Medical College and Hospital, Mandi (HP). Based on their TSH levels, the patients were categorized into two groups: Group A (TSH 2.5-10.0 mIU/l) and Group B (TSH>10 mIU/l).

The investigation disclosed an overall occurrence of hypothyroidism within the study participants, which was calculated at 11.31%. This prevalence was further broken down into 10.98% for subclinical hypothyroidism (SCH) and 0.33% for overt hypothyroidism (OH). These findings bear resemblance to analogous studies conducted in the Northern region of India, such as the research by Dhanwal *et al.* in 2013. Dhanwal's study reported a hypothyroidism prevalence of 14.3% using a TSH level cutoff of 4.5 mIU/l [2].

The mean age of the study participants was recorded as 28.7±5.2148 y. A comparative analysis was also carried out to contrast this mean age with studies conducted in disparate geographical regions. It was observed that the mean age in our current study corresponded with the findings of Bose *et al.* in 2021, which documented a mean age of 26.25±4.39 y. Both of these studies were conducted in hilly terrains, which plausibly accounts for the congruity in participant demographics [3].

The study identified that a significant proportion of the study participants hailed from the lower-middle-income bracket, with a majority residing in rural locales. This socio-demographic distribution mirrors the outcomes of a study conducted in Indore in 2015. It's noteworthy that rural areas, characterized by limited infrastructure and resources, may exhibit a heightened prevalence of hypothyroidism, potentially attributed to iodine deficiency, notwithstanding national iodine prophylaxis initiatives [4].

The gestational age of the study participants spanned from 6 to 12 w, with an average of 9.31±1.5 w. These findings align harmoniously with other investigations conducted within India, such as the study by Dhanwal *et al.* in 2013. The gestational age assumes significance in the context of hypothyroidism management during pregnancy, given that different trimesters necessitate specific reference ranges for TSH and free T4 levels.

The study reported an average TSH level of 6.31±1.28 mIU/l among the study participants, which conspicuously exceeded the levels documented in other Indian studies. This variance in TSH levels could be ascribed to the elevated geographic altitude of the study site. Most guidelines advocate for the maintenance of TSH values below 2.5 mIU/l for women contemplating pregnancy [5, 6].

These findings underscore the critical significance of vigilance and effective management of thyroid dysfunction during pregnancy,

given its profound ramifications on the health and well-being of both expectant mothers and their offspring [7].

CONCLUSION

In conclusion, this study provides valuable insights into the prevalence of hypothyroidism during the first trimester of pregnancy in a hilly region of North India. The findings highlight the need for early detection and management of thyroid dysfunction in pregnant women to prevent maternal and fetal complications. Further research and larger studies are warranted to validate these findings and explore the regional variations in thyroid dysfunction during pregnancy.

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AUTHORS CONTRIBUTIONS

All the authors have contributed equally.

CONFLICT OF INTERESTS

Declared none

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