

RESEARCH ARTICLE

Prospective Observational Study on Prevalence and Treatment Pattern of Hypothyroidism During Pregnancy



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Abstract: This prospective observational study examined hypothyroidism in pregnant women at a tertiary care hospital in Andhra Pradesh, India. Over six months, 1,272 pregnant women were screened, revealing an 11.55% prevalence of hypothyroidism. The study analyzed 100 hypothyroid pregnant women, with 70% of cases occurring in the 21-30 year age group. Subclinical hypothyroidism (59%) was more common than overt hypothyroidism (41%). Most cases (71%) were identified in the first trimester. Prevalent complications included pre-eclampsia (10%), gestational diabetes mellitus (10%), anemia (7%), and cardiac problems (7%). Socioeconomically, 61% of patients were from the upper-lower class. Levothyroxine treatment significantly reduced TSH levels ($p < 0.0001$), indicating effective management. These findings show the importance of early screening and proper treatment of hypothyroidism during pregnancy to enhance maternal and fetal health outcomes. The high prevalence observed suggests the need for routine thyroid function screening in antenatal care, particularly in high-risk regions. Ongoing research is essential to further refine treatment approaches and monitor long-term effects on mothers and their children.

Keywords: Hypothyroidism; Prevalence; Levothyroxine; Treatment patterns; Pregnancy

1. Introduction

Hypothyroidism, characterized by insufficient production of thyroid hormones, is a common endocrine disorder that can significantly impact pregnancy outcomes [1]. The thyroid gland plays a crucial role in regulating metabolism and various bodily functions, including fetal development [2]. During pregnancy, the demand for thyroid hormones increases, and any deficiency can lead to adverse effects on both the mother and the developing fetus [3]. The prevalence of hypothyroidism during pregnancy varies globally, with significant regional differences [4]. In India, the prevalence is estimated to be around 13.13%, although many cases remain undiagnosed due to a lack of routine screening [5]. The Indian Thyroid Society recommends universal screening for hypothyroidism during pregnancy, given the uncertainty surrounding iodine adequacy and the higher rate of thyroid antibody positivity in the Indian population [6].

Hypothyroidism in pregnancy is typically classified into two types: overt hypothyroidism (OH) and subclinical hypothyroidism (SH) [7]. OH is characterized by elevated serum TSH levels (usually >10 mIU/L) and decreased thyroxine (T4) concentrations, while SH presents with mildly elevated TSH levels (typically between 4 and 10 mIU/L) and normal T4 levels [8]. The impact of maternal hypothyroidism on fetal development is significant, particularly during the first trimester when the fetus relies entirely on maternal thyroid hormone supply [9]. Untreated hypothyroidism can lead to various complications, including preterm labor, placental abruption, miscarriage, preeclampsia, low birth weight, stillbirth, and impaired neurocognitive development in the offspring [10]. Given the potential risks associated with hypothyroidism during pregnancy, early diagnosis and appropriate management are crucial [11]. Levothyroxine replacement therapy is the standard treatment, with dosage adjustments often necessary throughout pregnancy to maintain optimal thyroid function [12].

The management of hypothyroidism during pregnancy presents unique challenges due to the physiological changes that occur in thyroid function and the increased demand for thyroid hormones [13]. These changes include an increase in thyroid-binding globulin, enhanced renal iodine clearance, and the thyroid-stimulating effects of human chorionic gonadotropin (hCG) [14]. Proper diagnosis and treatment are critical, as both maternal and fetal complications can arise from untreated or inadequately treated hypothyroidism [15]. The American Thyroid Association and the Endocrine Society have published guidelines for the management

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of thyroid dysfunction during pregnancy, emphasizing the importance of trimester-specific reference ranges for thyroid function tests and recommending targeted screening in high-risk populations [16]. However, the implementation of these guidelines varies across different healthcare settings, particularly in developing countries where resources may be limited [17]. Despite the importance of this condition, there is a paucity of data on the prevalence and treatment patterns of hypothyroidism during pregnancy in many parts of India, including the southern regions. This study aims to bridge this knowledge gap by investigating the prevalence of hypothyroidism among pregnant women in a tertiary care hospital in Andhra Pradesh, evaluating treatment responses, and examining associated maternal complications.

2. Methodology

2.1. Study Design and Setting

This prospective observational study was conducted over a period of 6 months at a tertiary care hospital in Andhra Pradesh, India. The study was designed to assess the prevalence of hypothyroidism among pregnant women and evaluate the response to treatment.

2.2. Study Population

The study included pregnant women aged 18 to 45 years who presented to the hospital for antenatal care during the study period. All participants provided informed consent before enrollment.

2.3. Inclusion criteria

- Pregnant women aged 18-45 years
- Willingness to participate in the study and provide informed consent.

2.4. Exclusion criteria

- Patients with preexisting thyroid conditions other than hypothyroidism
- History of thyroid surgery or radioactive iodine treatment
- Severe comorbid conditions that could affect thyroid function
- Unwillingness to participate in the study.

2.5. Sample size

A total of 1,272 pregnant women were screened for hypothyroidism. Among these, 147 women diagnosed with hypothyroidism out of which 47 were excluded and 100 patients were included in the final analysis.

2.6. Data collection

Data was collected using a structured questionnaire and patient medical records. The questionnaire [14, 15] gathered information on:

- Demographics (age, socioeconomic status)
- Medical history
- Lifestyle factors
- Obstetric history

Medical records provided data on: Thyroid function test results (TSH, T3, T4 levels), Treatment regimens, Pregnancy outcomes, Associated complications.

2.7. Thyroid function assessment

Thyroid function tests were performed for all participants. Hypothyroidism was classified as:

- Subclinical hypothyroidism: TSH between 4-10 mIU/L with normal T4 levels
- Overt hypothyroidism: TSH >10 mIU/L or TSH >4 mIU/L with low T4 levels.

2.8. Treatment protocol

Patients diagnosed with hypothyroidism were treated with levothyroxine. The initial dosage was determined based on the severity of hypothyroidism and adjusted according to follow-up thyroid function tests

2.9. Follow up

Participants were followed up throughout their pregnancy. Thyroid function tests were repeated at regular intervals to assess treatment response and adjust medication dosage as necessary

2.10. Outcome measures

- Prevalence of hypothyroidism among pregnant women
- Distribution of subclinical and overt hypothyroidism
- Trimester-wise prevalence of hypothyroidism
- Associated maternal complications
- Response to levothyroxine treatment (change in TSH levels)

2.11. Statistical Analysis

Data was analyzed using SPSS software version 20.0 and MS Excel 2019. Descriptive statistics were presented as percentages and means. The Z-test was used to evaluate treatment response, comparing TSH levels before and after treatment. A p-value <0.05 was considered statistically significant

2.12. Ethical considerations

The study was conducted in accordance with the Declaration of Helsinki and approved by the institutional ethics committee. Informed consent was obtained from all participants, and patient confidentiality was maintained throughout the study

3. Results

3.1. Demographic Characteristics

The study included 100 pregnant women diagnosed with hypothyroidism. The age distribution revealed that the majority (70%) of cases were observed in the 21-30 years age group, with 35% each in the 21-25 and 26-30 age brackets (Figure 1a). The body mass index (BMI) distribution showed that 40% of patients were overweight (BMI 25.0-29.9), while 30% were in the normal range (BMI 18.5-24.9) (Figure 1b). Socioeconomic analysis revealed that 61% of patients belonged to the upper-lower class, followed by 29% from the lower class (Figure 1d). This distribution highlights the prevalence of hypothyroidism across different socioeconomic strata, with a higher incidence in lower-income groups [18].

3.2. Prevalence and classification of hypothyroidism

Among the 1,272 pregnant women screened, 147 were diagnosed with hypothyroidism, resulting in a prevalence rate of 11.55%. Of the 100 cases analyzed in detail, subclinical hypothyroidism was more prevalent (59%) compared to overt hypothyroidism (41%) (Figure 1c). This finding is consistent with previous studies that have reported a higher prevalence of subclinical hypothyroidism in pregnancy [19].

3.2.1. Trimester wise distribution

The majority of hypothyroidism cases (71%) were diagnosed in the first trimester, followed by 22% in the second trimester and 7% in the third trimester (Figure 1e). This distribution underscores the importance of early screening for thyroid dysfunction in pregnancy [20]

3.3. Associated complications

Gynecological problems were observed in 38% of the patients, with vaginitis (22%) and oligohydramnios (10%) being the most common (Table 1). Regarding comorbidities, pre-eclampsia and gestational diabetes mellitus each affected 10% of the patients, while anemia and cardiac problems occurred in 7% of cases (Figure 1f). These findings align with previous research indicating an increased risk of pregnancy complications in women with hypothyroidism [21]

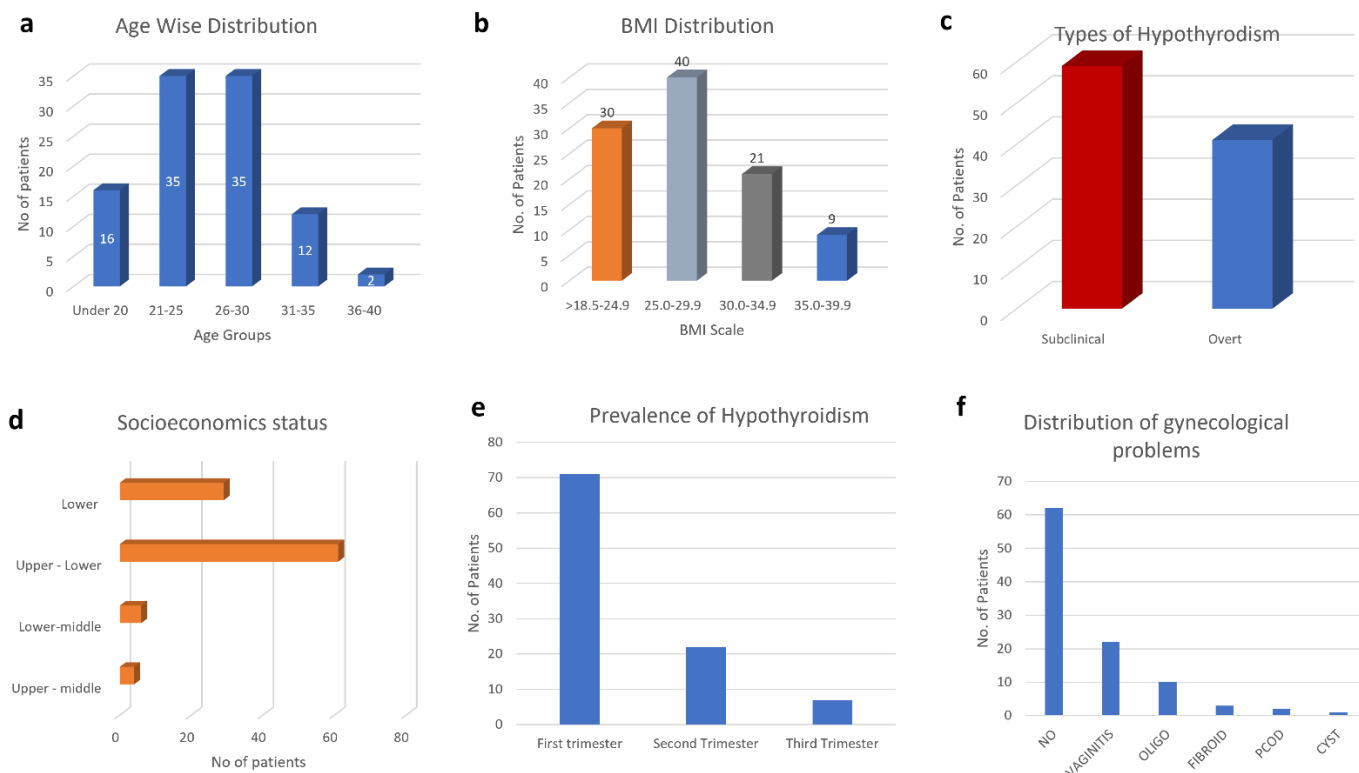


Figure 1. Results of the study

Table 1. Pattern of Gynecological problems Among Hypothyroidism patients during pregnancy

Complications	No. of Women
Pre-eclampsia	10
Gestational diabetes	10
Anemia	7
Cardiac Problems	7
Epilepsy	3
Others	15
No comorbidities	48

3.4. Treatment response

Levothyroxine treatment resulted in a significant reduction in TSH levels. A matched pair Z-Test conducted at a 0.05 significance level revealed a statistically significant improvement in TSH levels following treatment ($p < 0.0001$). This demonstrates the effectiveness of levothyroxine in managing hypothyroidism during pregnancy [22]

Table 2. Results of statistical analysis

Parameter	Value
Sample Size (N)	100
Mean TSH Level (Before Treatment)	8.6 mIU/L
Mean TSH Level (After Treatment)	3.2 mIU/L
Z-Value	10.475
P-value (One-tailed)	0.0001
P-value (Two-tailed)	0.0001
Z Critical (One-tailed)	1.9440
Z Critical (Two-tailed)	2.9599
Correlation Coefficient	0.8212

The matched pair Z-test results demonstrate a statistically significant reduction in TSH levels following treatment in hypothyroid pregnant women. The mean TSH level decreased from 8.6 mIU/L to 3.2 mIU/L after treatment. The calculated Z-value (10.475) exceeds both one-tailed and two-tailed critical values, and the p-values (0.0001) are well below the 0.05 significance level, confirming the statistical significance of this reduction. The strong positive correlation (0.8212) between pre- and post-treatment TSH levels indicates that while all patients experienced a reduction, those with higher initial levels tended to have higher post-treatment levels as well.

4. Discussion

The prevalence of hypothyroidism (11.55%) observed in this study is comparable to previous reports from India, which have estimated prevalence rates between 10-15% [23]. However, it is higher than global estimates, which range from 2-4% [24]. This discrepancy could be attributed to factors such as iodine deficiency, which remains a concern in some parts of India despite iodization programs [25]. The higher prevalence of subclinical hypothyroidism (59%) compared to overt hypothyroidism (41%) is consistent with existing literature [26]. This finding highlights the importance of routine screening, as subclinical hypothyroidism may not present with overt symptoms but can still impact pregnancy outcomes [27]. The majority of cases being diagnosed in the first trimester (71%) emphasizes the critical need for early screening. This aligns with recommendations from various professional societies, including the American Thyroid Association, which advocate for thyroid function assessment in early pregnancy [28]. The observed complications, including pre-eclampsia, gestational diabetes mellitus, and anemia, are known to be associated with maternal hypothyroidism [29]. The prevalence of these complications in our study population underscores the potential risks of untreated or inadequately treated hypothyroidism during pregnancy. The significant improvement in TSH levels following levothyroxine treatment demonstrates the efficacy of this management approach. However, the need for close monitoring and dose adjustments throughout pregnancy cannot be overstated, given the changing physiological demands [30].

The socioeconomic distribution of cases, with a higher prevalence in lower-income groups, raises questions about access to healthcare and nutritional factors that may contribute to thyroid dysfunction. This finding suggests a need for targeted interventions and awareness programs in these populations [31]. The high prevalence of hypothyroidism observed in this study supports the case for universal screening in pregnancy, particularly in regions with known iodine deficiency or high rates of thyroid autoimmunity [32]. However, the cost-effectiveness and feasibility of such an approach in resource-limited settings require further evaluation. Limitations of this study include its single-center design and relatively small sample size, which may limit the generalizability of the findings. Additionally, long-term follow-up of the mothers and their offspring was beyond the scope of this study but would provide valuable insights into the long-term impacts of maternal hypothyroidism and its treatment.

5. Conclusion

This study reveals a high prevalence of hypothyroidism (11.55%) among pregnant women in southern India, with subclinical hypothyroidism being more common than overt hypothyroidism. The majority of cases were diagnosed in the first trimester,

emphasizing the importance of early screening. Levothyroxine treatment significantly improved TSH levels, demonstrating its effectiveness in managing the condition. The observed association with various maternal complications underscores the need for timely diagnosis and appropriate management. These findings support the case for routine thyroid function screening in antenatal care, particularly in high-risk populations, to improve maternal and fetal outcomes.

Compliance with ethical standards

Conflict of interest statement

We express our sincere gratitude to Dr. Yalla Annapoorna, Professor and HOD of Obstetrics and Gynecology, for her invaluable guidance and encouragement. We also thank Dr. Mukesh Kumar Saphi, the family members of the patients involved in the study, and all staff members for their support in completing this work.

Conflict of interest statement

The authors declare that there are no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

Statement of ethical approval

Ethical approval was obtained from the institutional ethics committee before initiation of the study

Statement of informed consent

Informed consent was obtained from all individual participants included in the study

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Author's short biography

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