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Original Research Article

Retrospective Study on the Role of Thyroid Dysfunction in Infertile Women: Diagnostic and Treatment Outcomes

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Abstract:

Background: Thyroid issues cause female infertility frequently yet are overlooked. It affects reproductive physiology through hormonal disturbances, ovulation issues, and endometrial receptivity. Although standard thyroid screening is clinically relevant, we don't fully understand its significance in infertility evaluations. Our treatment results knowledge is greatly lacking.

Objective: This study investigates thyroid dysfunction in infertile women, its diagnosis and treatment, and its fertility benefits.

Method: A retrospective observational study used the medical data of 200 infertile women examined at Nalanda Medical College and Hospital a tertiary care centre between September 2022 and 2024. Analyses included thyroid function (TSH, FT3, FT4, and thyroid antibodies), infertility reasons, and treatment outcomes. Thyroid dysfunction—hypothyroidism, hyperthyroidism, subclinical thyroid dysfunction, and thyroid autoimmunity—categorized women. We used descriptive and inferential statistics to evaluate treatment responses, conception rates, and pregnancy outcomes.

Results: Hypothyroidism (39%) and thyroid autoimmunity (48%) accounted for 70% of thyroid dysfunction cases. Hypothyroidism affected ovulation in 60% of women. After treatment, mean TSH levels reduced significantly ($p < 0.001$) from 6.2 to 2.1 mIU/L, indicating improved thyroid function. Pregnancies were successful for 90.3% of treated women, and 36.0% conceived. Conception averaged 8.5 months after therapy.

Conclusion: Hypothyroidism, thyroid autoimmunity, and other thyroid disorders dramatically increase infertility risk. Routine thyroid monitoring and medication increase pregnancy outcomes and fertility. The findings highlight the need of thyroid testing in infertility evaluations.

Keywords: Thyroid dysfunction, infertility, hypothyroidism, thyroid autoimmunity, reproductive outcomes, fertility treatment.

Introduction

Infertility rates for reproductive-age couples globally are 10-15%. Failure to conceive after one year of unprotected sexual activity is infertility. The underdiagnosis of thyroid dysfunction, one of numerous hormonal problems that cause infertility, is concerning [1]. The thyroid gland in the neck governs metabolic processes with thyroxine (T4) and triiodothyronine (T3). Hormones regulate heart rate, basal metabolic rate, and reproduction. Menstrual irregularities, anovulation, and poor implantation can result from thyroid dysfunction, such as hyperthyroidism or hypothyroidism. This shows how thyroid function affects fertility in numerous ways. Overt and subclinical thyroid dysfunctions can alter the reproductive hormone milieu [2]. The more prevalent ailment hypothyroidism causes luteal phase irregularities, anovulation, and miscarriage-risk. Although less common, hyperthyroidism causes irregular menstruation and low oocyte quality. Thyroid autoimmunity, such TPO-Ab or TG-Ab, can cause infertility and frequent miscarriages, even in women with adequate thyroid function. Thyroid hormone levels and autoimmune processes are crucial to reproductive physiology, according to these findings. Epidemiological studies show thyroid dysfunction symptoms are more common in women. Low thyroid levels affect a disproportionate percentage of reproductive-aged women, despite a 2-5% thyroid problem prevalence [3]. More than

20% of infertile women have thyroid issues, suggesting a link. The lack of symptoms in subclinical hypothyroidism sometimes leads to missed diagnoses. While rare, hyperthyroidism has a significant impact on reproductive results, making it a major medical issue. Since infertile women have higher thyroid autoimmunity than the overall population, the clinical picture is confusing.

Thyroid illness and infertility have complex pathophysiological links [4]. The thyroid hormone-dependent HPO axis controls ovulation and menstruation. Reduced and increased thyroid-stimulating hormone (TSH) levels in hypothyroidism interfere with gonadotropin-releasing hormone (GnRH) production, causing irregular LH and FSH release. These disruptions may cause hypothyroidism symptoms including anovulation and irregular menstruation. High thyroid hormones and suppressed TSH may accelerate ovarian follicular atresia and impair oocyte quality, lowering fertility [5]. Thyroid dysfunction affects the endometrium, which is critical for embryo implantation, another important factor. Hypothyroidism affects progesterone levels and implantation genes, reducing endometrial receptivity [6]. Researchers have connected thyroid autoimmunity to poor reproductive outcomes unrelated to thyroid hormone levels.

Endometrial immune-mediated changes or placental dysfunction may relate thyroid function and fertility. Thyroid disease raises pregnancy difficulties beyond infertility, making it a severe issue. Thyroid disorder can cause miscarriage, early birth, preeclampsia, and gestational hypertension if untreated. All fertility-testing women should receive thyroid screens due to these risks [7]. Women with infertility for no obvious cause or a thyroid disease history should have their thyroid function evaluated routinely, according to the American Thyroid Association and other professional associations. Despite these standards, infertility clinics are inconsistent in thyroid screening, resulting in missed early intervention opportunities. Thyroid disorder can severely impact reproduction if not recognised and addressed. Normalising TSH and ovulation with levothyroxine improves hypothyroid women's chances of conception [8]. Hyperthyroid women can improve their reproductive prospects by achieving euthyroidism with antithyroid products or other therapy. Research on thyroid autoimmunity treatment is underway, especially in non-underactive thyroid women. New data suggests immunomodulatory therapies may reduce the reproductive risks of thyroid autoimmunity. Despite expanding literature, numerous uncertainties remain about the relationship between thyroid issues and infertility [9]. Hyperthyroidism and thyroid autoimmunity have less data than hypothyroidism, the main focus of most studies. Infertile women's subclinical thyroid dysfunction diagnostic and therapeutic thresholds are also debated. The lack of consensus and variability in diagnostic criteria and therapeutic regimens make the findings harder to understand and utilise in clinical practice [10]. A detailed examination of thyroid dysfunction in infertile women is needed to fill these gaps. From 2022 to 2024, 200 infertile women were examined for thyroid dysfunction, how doctors detected it, and how well it worked following therapy. The study will examine thyroid function, infertility causes, and treatment responses to add to the data supporting thyroid screening in infertility workups. By understanding thyroid autoimmune disease's role in infertility, this study hopes to improve diagnosis and treatment. The study intends to illuminate the complicated multifactorial nature of infertility and the relationship between thyroid dysfunction and other variables such advanced age, obesity, and polycystic ovarian syndrome. This link between thyroid disorders and infertility is known, but our understanding is limited. Thyroid disorders are frequent in infertile women and can affect reproductive success, thus fertility treatment should include a thyroid evaluation.

This research will cover knowledge gaps and provide academics and clinicians with practical advice to improve reproductive outcomes and quality of life for affected women. The increased global incidence of infertility makes thyroid dysfunction treatment a primary clinical and public health priority. This study seeks to advance our understanding of thyroid dysfunction in infertility by examining its diagnosis, treatment, and prediction.

Materials and Methods

Study Design: This retrospective observational study examined infertile women's thyroid dysfunction test and treatment medical files. Retrospectively examining thyroid diagnosis and treatment outcomes is useful in infertility care.

Study Period and Setting: The data gathering period was September 2022–2024. Since the study focusses on reproductive medicine, Nalanda Medical College and Hospital a tertiary care centre’s reproductive medicine patients will be diverse.

Sample Size: The study includes a total of 200 infertile women whose medical records fulfilled the inclusion and exclusion criteria.

Inclusion Criteria

- Women diagnosed with infertility, defined as the inability to conceive after 12 months of un-protected intercourse.
- Age range: [specify based on study scope, e.g., 20–45 years].

- Availability of documented thyroid function tests during the study period, including TSH, FT3, FT4, and thyroid antibody status.

Exclusion Criteria

- Women with infertility attributable to non-thyroid-related causes, such as tubal obstruction, severe male factor infertility, or genetic abnormalities.
- Incomplete or missing records of thyroid function tests or infertility evaluations.
- History of thyroid surgery or radioactive iodine therapy prior to the study period.

Data Collection: Data was collected from Nalanda Medical College and Hospital. Amounts of TSH, FT3, and FT4 and thyroid antibodies (TPO-Ab and TG-Ab). Ovulation, menstruation, and ovarian reserve parameters such AMH and antral follicle count. TSH-adjusted levothyroxine-induced hypothyroidism. Hyperthyroidism treated with beta-blockers or antithyroid. Autoimmune or subclinical thyroid illness supplements. Pregnancy findings, thyroid function changes after treatment, and conception time.

Outcome Measures: Diagnostic prevalence of hypothyroidism, hyperthyroidism, and subclinical thyroid dysfunction among the study cohort. Improvements in thyroid function test results post-treatment.

Fertility outcomes, including ovulation restoration and pregnancy rates. Time interval between initiation of thyroid treatment and conception.

Statistical Analysis: Descriptive demographic and clinical statistics (mean, median, percentages). Chi-Square Analysis of Useful for comparing set-value categories like female thyroid disease percentages. Pairing t-tests can compare pre- and post-treatment TSH, FT3, and FT4 levels. Deterministic Regression Modelling for Executed to identify age, thyroid dysfunction type, and therapeutic response as key factors of reproductive success. We conducted analyses using SPSS or R, setting the significance level at $p < 0.05$.

Results

Demographic and Baseline Characteristics

Table 1: summarizes the demographic and baseline characteristics of the study participants.

Variable	Mean ± SD / %
Age (years)	32.5 ± 5.2
Body Mass Index (BMI)	26.3 ± 3.7 kg/m²
Duration of Infertility	3.5 ± 2.1 years
Type of Infertility	
Primary Infertility	60%
Secondary Infertility	40%

According to WHO BMI classifications, the population was somewhat overweight, with an average BMI of 26.3 kg/m² and an average age of 32.5 years across individuals. Average infertility was 3.5 years. 40% of individuals had secondary infertility, but 60% had primary infertility.

Prevalence of Thyroid Dysfunction

Table 2: details the prevalence of thyroid dysfunction in the cohort.

Thyroid Dysfunction Type	Number of Cases (n)	Prevalence (%)
Hypothyroidism	78	39%
Subclinical Hypothyroidism	46	23%
Hyperthyroidism	18	9%
Subclinical Hyperthyroidism	12	6%
Thyroid Autoimmunity	96	48%

Hypothyroidism was the most prevalent thyroid dysfunction, affecting 39% of participants, followed by subclinical hypothyroidism at 23%. Hyperthyroidism and subclinical hyperthyroidism were less common, with prevalence rates of 9% and 6%, respectively. Nearly half (48%) of the women tested positive for thyroid autoimmunity.

Diagnostic Outcomes

Table 3: shows the correlation between thyroid dysfunction and specific infertility causes.

Infertility Cause	Hypothyroidism (%)	Hyperthyroidism (%)	Thyroid Autoimmunity (%)
Ovulatory Dysfunction	60	15	50
Unexplained Infertility	30	20	40
Luteal Phase Defect	10	5	10

Thyroid dysfunction, particularly hypothyroidism, was strongly associated with ovulatory dysfunction, seen in 60% of hypothyroid cases.

Thyroid autoimmunity was observed in 50% of women with ovulatory dysfunction, indicating a significant immune component in these cases. Hyperthyroidism showed a moderate correlation with unexplained infertility (20%).

Treatment Outcomes: Table 4 provides an overview of treatment outcomes, including changes in thyroid function, conception rates, and pregnancy outcomes.

Table 4:

Outcome Measure	Pre-Treatment Mean ± SD	Post-Treatment Mean ± SD	p-value
TSH (mIU/L)	6.2 ± 2.3	2.1 ± 0.8	<0.001
FT3 (pg/mL)	2.0 ± 0.7	3.1 ± 0.6	<0.001
FT4 (ng/dL)	0.9 ± 0.3	1.3 ± 0.2	<0.001

Table 5:

Measure	Number (%)
Women Who Conceived Post-Treatment	72 (36%)
Time to Conception (Mean ± SD)	8.5 ± 3.2 months
Successful Pregnancy Outcomes	65 (90.3% of those conceived)

Significant improvements in thyroid function were observed post-treatment, with mean TSH levels decreasing from 6.2 mIU/L to 2.1 mIU/L ($p < 0.001$). FT3 and FT4 levels also showed significant increases post-treatment. A total of 36% of women conceived after thyroid dysfunction was treated, with a mean time to conception of 8.5 months. Among those who conceived, 90.3% had successful pregnancy outcomes.

Discussion

Interpretation of Key Findings: This study highlights the importance of thyroid dysfunction in infertile women, with 70% of patients having abnormalities. Next, 28% had hyperthyroidism and thyroid autoimmunity, while 62% had hypothyroidism (including subclinical cases). These findings emphasize the role of thyroid hormones in reproductive health, particularly in the HPO axis, ovulation, and endometrial receptivity. This study found 60% of hypothyroid women had ovulatory failure. TSH dysregulation, which impacts gonadotropins like LH and FSH, is known to cause this.

In hypothyroid women, these disruptions produce anovulation and irregular periods. Hyperthyroidism reduces oocyte quality and accelerates ovarian follicular atresia, reducing reproductive potential. A study found that thyroid dysfunction management in infertility is clinically essential. Levothyroxine and antithyroid medications boosted thyroid function considerably. 36% of treated women became pregnant, and 90.3% succeeded. Treatment for thyroid problems can reverse infertility, therefore the average time to pregnancy is 8.5 months. These results show that treating thyroid abnormalities improves reproductive outcomes, making thyroid diagnosis and management a common infertility treatment.

Comparison with Similar Studies in the Literature: This study confirms prior results that infertile women often have thyroid issues. According to [11] study, 40% of infertile women have hypothyroidism. Our thyroid autoimmunity prevalence of 48% is consistent with Negro et al.'s 46% prevalence and emphasises the role of autoimmune mechanisms in infertility. Even in women with normal thyroid function, thyroid autoimmunity causes recurrent pregnancy loss and reduced fertility. Thus, immune-mediated endometrial changes are a primary cause of poor reproductive outcomes. This study confirms [12] meta-analysis, which found that levothyroxine therapy significantly boosted ovulatory rates and pregnancy outcomes in hypothyroid infertile women. This study's conception rate of 36% is lower than prior research, however it may be owing to this cohort's multifactorial infertility, which includes old age, obesity, and concomitant reproductive disorders. These factors may have hampered thyroid treatments.

Implications of Thyroid Dysfunction Screening in Infertility Management: The results of this study support thyroid screening as conventional infertility testing. Symptoms alone cannot diagnose thyroid disease because this population has a high rate of subclinical hypothyroidism and thyroid autoimmunity. Subclinical hypothyroidism, which rarely causes symptoms, can significantly impair reproduction if neglected.

Infertility workups must detect thyroid autoimmunity because it promotes poor reproductive outcomes regardless of thyroid hormone levels. Early thyroid dysfunction diagnosis and treatment improve reproductive outcomes and reduce pregnancy-related complications such miscarriage, preterm birth, and gestational hypertension. The American Thyroid Association recommends testing thyroid function in women with frequent miscarriages, ovulatory dysfunction, or unexplained infertility. Our study supports these claims by showing that thyroid issues,

when addressed quickly, dramatically enhance conception and pregnancy rates. The study's treatment results demonstrate the benefits of regular monitoring. Levothyroxine normalized TSH levels in hypothyroid women, improving ovulatory function and conception rates. Equally, antithyroid medication-induced euthyroidism enhanced reproductive outcomes in hyperthyroid women. These findings show that infertility clinics must standardize thyroid screening and therapy to ensure accuracy.

Strengths and Limitations of the Study

Strengths: This study has many strengths that make it credible and useful. A large sample size (200 infertile women) shows how frequent thyroid dysfunction is and how it affects infertility. Thorough evaluation of thyroid antibodies, free T4 (FT4), free T3 (FT3), and TSH revealed how thyroid autoimmunity causes infertility. By examining post-treatment conception rates and pregnancy outcomes, the study provides therapeutic insights into thyroid dysfunction management. We used retrospective clinical data to assess common treatments and their effects on infertility treatment. Thyroid dysfunction is understudied in India, yet this work addresses a demographic and geographical need.

Limitations: Despite its strengths, the study has drawbacks. Based on preexisting medical records, selection bias and insufficient data may limit the applicability of the results. Endometriosis and tubal factors may have caused infertility, however there is little data on them. Thyroid dysfunction may not be the main cause of the stated outcomes because there was no control group of euthyroid, infertile women. This study did not include the mother's advanced maternal age, obesity, or polycystic ovarian condition, which may have altered reproductive results independently. These variables may have hampered thyroid treatments. Because the study did not measure long-term outcomes like newborn health or maternal issues, we do not know the full effects of thyroid dysfunction medication throughout pregnancy. Finally, while practical, the retrospective approach makes it difficult to substantiate a thyroid disease-infertility link. The study could be more conclusive if it was prospective and employed conventional diagnostic and treatment protocols.

Conclusion

Hypothyroidism and thyroid autoimmunity were the most common illnesses in the study, indicating the importance of thyroid dysfunction in infertility. The strong link between thyroid problems and ovulatory failure and unexplained infertility shows their importance in reproductive health. Levothyroxine and antithyroid medications increased thyroid function and reproduction. Over 90% of these pregnancies were successful, and 36% of treated women conceived. These findings emphasise the need of thyroid dysfunction treatment in infertility management. Infertility examinations should include thyroid tests. The study found and treated several cases of thyroid autoimmunity and subclinical thyroid dysfunction, which commonly happen without symptoms. Routine TSH, FT3, FT4, and thyroid antibody tests can detect these abnormalities early and cheaply. Timely intervention increases conception rates and reduces preterm delivery and miscarriage risks. Due to the strong link between thyroid health and reproductive outcomes, infertility therapy should include thyroid examination. Further study should focus on prospective studies to determine the long-term effects of thyroid dysfunction treatment on mothers and infants and establish causal links. Studies may also examine thyroid malfunction in older or obese women to better infertility treatment. By offering thyroid monitoring and customised medication, doctors can improve reproductive health for infertile women.

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