

Infertility Associated with Thyroid Dysfunction

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Abstract

Infertility remains a significant reproductive health concern affecting millions of couples worldwide. Among the numerous factors contributing to impaired fertility, thyroid dysfunction has emerged as an important endocrine disorder influencing reproductive capacity in both women and men. Thyroid hormones play a critical role in regulating metabolism, growth, development, and reproductive physiology. Alterations in thyroid function may disrupt hormonal balance, interfere with ovulation, impair implantation, and negatively affect pregnancy outcomes. The present study examines the relationship between thyroid dysfunction and infertility, focusing on the physiological mechanisms involved and their clinical implications. Current evidence indicates that both hypothyroidism and hyperthyroidism can adversely affect reproductive function through disturbances in the hypothalamic-pituitary-gonadal axis. Early diagnosis and appropriate management of thyroid disorders contribute significantly to improving fertility outcomes and increasing the likelihood of successful conception. Understanding the impact of thyroid dysfunction on reproductive health is essential for optimizing infertility evaluation and treatment strategies.

Keywords: infertility, thyroid dysfunction, hypothyroidism, hyperthyroidism, reproductive health, thyroid hormones, ovulation, endocrine disorders, fertility, pregnancy.

1. Introduction

Infertility is recognized as a major public health issue that affects individuals, families, and healthcare systems throughout the world. It is generally defined as the inability to achieve pregnancy after twelve months of regular unprotected sexual intercourse. The etiology of infertility is multifactorial and may involve female factors, male factors, combined causes, or unexplained reproductive dysfunction. Among the endocrine disorders associated with infertility, abnormalities of thyroid gland function occupy a particularly important position due to their widespread prevalence and significant influence on reproductive physiology.

The thyroid gland is responsible for the production of triiodothyronine and thyroxine, hormones that regulate numerous metabolic and physiological processes. These hormones influence energy metabolism, cardiovascular activity, neurological development, and reproductive function. Maintenance of normal thyroid activity is essential for the proper functioning of the reproductive system in both sexes.

The relationship between thyroid hormones and fertility is complex and involves multiple regulatory pathways. Thyroid hormones interact closely with the hypothalamic-pituitary-gonadal axis, which controls the production of reproductive hormones and the development of reproductive tissues.

Disturbances in thyroid function may alter the secretion of gonadotropins, estrogen, progesterone, and testosterone, leading to impaired fertility.

Hypothyroidism is one of the most common endocrine disorders encountered among reproductive-aged women. Reduced thyroid hormone production may result in menstrual irregularities, anovulation, luteal phase defects, and decreased fertility potential. Women with untreated hypothyroidism often experience difficulties conceiving and may have an increased risk of miscarriage and pregnancy complications.

Hyperthyroidism can also adversely affect reproductive health. Excessive thyroid hormone production may disrupt menstrual cycles, impair ovarian function, and contribute to infertility. In men, thyroid dysfunction may negatively influence spermatogenesis, sperm motility, and overall reproductive capacity. Consequently, evaluation of thyroid function has become an important component of infertility assessment in both genders.

Recent advances in endocrinology and reproductive medicine have improved understanding of the mechanisms linking thyroid disorders and infertility. Numerous studies have demonstrated that even subtle alterations in thyroid hormone levels may influence reproductive outcomes. Subclinical thyroid dysfunction, which may occur without obvious clinical symptoms, has gained increasing attention due to its potential effects on conception and pregnancy.

Autoimmune thyroid diseases represent another important factor in reproductive medicine.

Autoimmune conditions affecting the thyroid gland may be associated with reproductive failure, recurrent pregnancy loss, and reduced success rates of assisted reproductive technologies. The presence of thyroid autoantibodies has been investigated as a possible marker of reproductive risk even in individuals with normal thyroid hormone concentrations.

The impact of thyroid dysfunction extends beyond conception and influences pregnancy maintenance and fetal development. Adequate maternal thyroid hormone levels are essential for embryonic growth, placental function, and neurological development of the fetus. Therefore, timely recognition and management of thyroid abnormalities before and during pregnancy are crucial for ensuring favorable maternal and neonatal outcomes.

Given the increasing prevalence of both infertility and thyroid disorders, understanding their interaction is of considerable clinical importance. Improved knowledge regarding endocrine influences on reproductive health may facilitate earlier diagnosis, more effective treatment strategies, and better reproductive outcomes for affected individuals.

The aim of this study is to evaluate the association between thyroid dysfunction and infertility, analyze the underlying physiological mechanisms, and assess the importance of thyroid evaluation in the management of reproductive disorders.

2. Materials and Methods

The present study was conducted between 2024 and 2025 at specialized endocrinology and reproductive medicine centers. A total of 160 individuals diagnosed with infertility participated in the investigation. The study population included 110 women and 50 men aged between 22 and 42 years who had experienced failure to conceive despite regular unprotected intercourse for at least one year. All participants underwent comprehensive clinical, laboratory, and hormonal evaluation. Medical histories were obtained with particular attention to menstrual irregularities, reproductive history, duration of infertility, previous pregnancies, thyroid disorders, and family history of endocrine diseases.

Laboratory investigations included measurement of serum thyroid-stimulating hormone (TSH), free thyroxine (FT4), free triiodothyronine (FT3), anti-thyroid peroxidase antibodies (anti-TPO), and anti-thyroglobulin antibodies (anti-Tg). Additional reproductive hormone assessments included follicle-stimulating hormone, luteinizing hormone, prolactin, estradiol, progesterone, and testosterone according to gender-specific clinical requirements.

Women underwent pelvic ultrasonography to assess ovarian morphology, follicular development, and uterine characteristics. Male participants received semen analysis evaluating sperm concentration, motility, morphology, and semen volume according to internationally accepted laboratory standards. Participants were categorized into four groups according to thyroid status:

- Euthyroid individuals with normal thyroid function;
- Patients diagnosed with overt hypothyroidism;
- Patients diagnosed with subclinical hypothyroidism;

- Patients diagnosed with hyperthyroidism.

Clinical outcomes analyzed included menstrual regularity, ovulatory function, sperm quality parameters, conception rates, and response to fertility treatment. Statistical analysis was performed using standard biomedical methods.

3. Results

The findings demonstrated a significant association between thyroid dysfunction and impaired reproductive performance. Thyroid abnormalities were identified in a considerable proportion of infertile participants, particularly among women presenting with menstrual disturbances and ovulatory dysfunction.

Among female participants, hypothyroidism was associated with increased prevalence of irregular menstrual cycles, prolonged cycle duration, and anovulatory cycles. Women with elevated thyroid-stimulating hormone levels demonstrated reduced ovulation frequency compared with individuals exhibiting normal thyroid function. Delayed follicular maturation and inadequate luteal phase development were also observed more frequently in this group.

Subclinical hypothyroidism was detected in a substantial number of women who initially presented without obvious symptoms of thyroid disease. Despite the absence of overt clinical manifestations, these individuals exhibited reduced fertility potential and lower spontaneous conception rates. The findings suggest that even mild thyroid hormone disturbances may negatively influence reproductive physiology.

Women affected by hyperthyroidism also demonstrated reproductive abnormalities. Menstrual irregularities, shortened cycles, and hormonal imbalance were frequently observed. Several participants reported previous miscarriages and unsuccessful fertility treatments prior to thyroid evaluation and management.

The presence of thyroid autoantibodies was significantly more common among infertile women than expected in the general population. Autoimmune thyroid disease appeared to be associated with increased reproductive challenges, including recurrent pregnancy loss and reduced implantation success.

Male participants with thyroid dysfunction demonstrated alterations in semen quality. Hypothyroidism was associated with reduced sperm motility, lower sperm concentration, and impaired sperm morphology. Hyperthyroidism similarly affected reproductive parameters, although the pattern of abnormalities varied among individuals.

Following initiation of appropriate thyroid treatment, significant improvements in reproductive function were observed. Women who achieved normalization of thyroid hormone levels demonstrated improved menstrual regularity, restoration of ovulatory cycles, and increased conception rates. Male patients also exhibited gradual improvement in semen parameters after endocrine correction. The overall findings indicated that thyroid dysfunction represents a clinically important and potentially reversible contributor to infertility.

4. Discussion

The results of the present study emphasize the critical role of thyroid hormones in maintaining normal reproductive function. Thyroid activity influences numerous physiological processes involved in fertility, including gonadal function, hormone production, gamete maturation, implantation, and pregnancy maintenance.

One of the most important observations was the high prevalence of thyroid abnormalities among individuals presenting with infertility. This finding supports the growing body of evidence suggesting that endocrine evaluation should be an integral component of fertility assessment.

Hypothyroidism appears to affect female fertility through several mechanisms. Reduced thyroid hormone availability may disrupt gonadotropin secretion, alter ovarian responsiveness, and impair endometrial receptivity. These alterations contribute to menstrual irregularities, anovulation, and decreased likelihood of successful conception.

The identification of subclinical hypothyroidism as a significant factor affecting reproductive outcomes is particularly noteworthy. Many patients with this condition remain undiagnosed because symptoms may be minimal or absent. However, subtle endocrine disturbances may still interfere with fertility and pregnancy outcomes. Early laboratory screening therefore plays an important role in reproductive

medicine.

Hyperthyroidism similarly influences reproductive health through hormonal dysregulation and metabolic alterations. Excess thyroid hormone levels may affect ovarian function, menstrual patterns, and reproductive hormone balance. In men, both hypothyroidism and hyperthyroidism have been associated with impaired spermatogenesis and reduced semen quality.

The association between thyroid autoimmunity and infertility remains an area of considerable scientific interest. Autoimmune mechanisms may contribute to reproductive failure independently of thyroid hormone concentrations. The increased prevalence of thyroid antibodies among infertile individuals suggests that immune-mediated pathways may influence implantation and pregnancy maintenance.

The observed improvement in fertility outcomes following thyroid treatment highlights the importance of early diagnosis and intervention. Restoration of normal thyroid function frequently leads to improvement of reproductive physiology and may increase the effectiveness of both natural conception and assisted reproductive techniques.

These findings underscore the necessity of interdisciplinary collaboration between endocrinologists, gynecologists, reproductive specialists, and laboratory professionals. Comprehensive evaluation of endocrine health may significantly improve diagnostic accuracy and treatment outcomes in infertile patients.

Although the present study provides valuable insights, several limitations should be acknowledged. The sample size was relatively limited, and longer follow-up periods are required to assess long-term reproductive outcomes. Future multicenter investigations may further clarify the complex interactions between thyroid function and fertility.

5. Conclusion

The present study demonstrated a significant relationship between thyroid dysfunction and infertility in both women and men. Abnormal thyroid hormone levels were associated with menstrual disturbances, ovulatory dysfunction, impaired semen quality, reduced conception rates, and increased reproductive complications.

Both overt and subclinical thyroid disorders negatively influenced reproductive health, emphasizing the importance of routine thyroid evaluation during infertility assessment. Autoimmune thyroid disease also appeared to contribute to reproductive difficulties and should be considered during clinical investigation.

Appropriate diagnosis and management of thyroid dysfunction resulted in substantial improvement of reproductive parameters and fertility outcomes. Early detection of endocrine abnormalities may therefore increase the likelihood of successful conception and improve overall reproductive health. The findings support the inclusion of comprehensive thyroid screening as a standard component of infertility evaluation and highlight the importance of individualized endocrine management in reproductive medicine.

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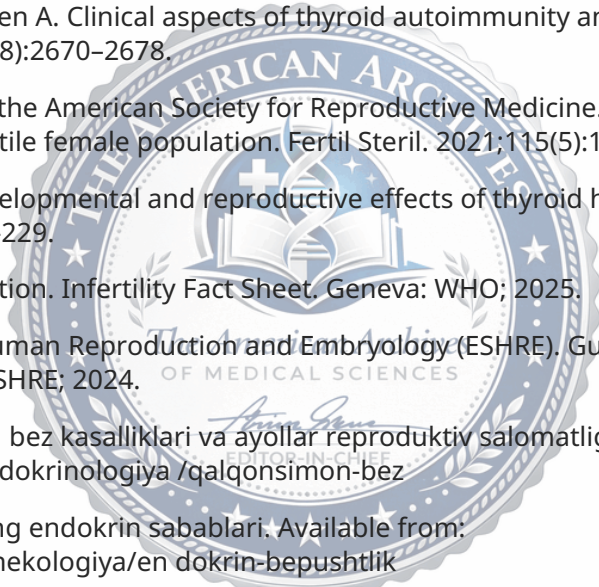
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