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ORIGINAL RESEARCH

Ovulatory study in relation to thyroid harmone in patient of infertility

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ABSTRACT

Aim: The study aims to investigate the relationship between thyroid hormone levels and ovulatory function in infertile women. The objective is to assess the prevalence of thyroid dysfunction in women experiencing infertility and to evaluate its impact on ovulatory cycles. **Materials and Methods:** This comparative, observational study was conducted in the Department of Obstetrics and Gynecology at SMGS GMC Jammu over 1.5 years, involving 120 women aged 20–40 years. The study group (n=60) comprised infertile women, while the control group (n=60) included fertile women with normal thyroid function. Participants were selected based on strict inclusion and exclusion criteria, with ethical approval and informed consent obtained. Comprehensive investigations, including hematological, biochemical, hormonal, and imaging assessments, were conducted to evaluate infertility and thyroid function. **Results:** In the study group, subclinical hypothyroidism was observed in 17 cases (28.33%) and clinical hypothyroidism in 4 cases (6.67%), whereas the control group had 4 cases (6.67%) of subclinical hypothyroidism and 1 case (1.67%) of clinical hypothyroidism. Subclinical hyperthyroidism was found in 1 case (1.67%) in the study group, while clinical hyperthyroidism was absent in both groups. Ovulatory dysfunction was significantly higher among hypothyroid women, with 66.67% of hypothyroid cases experiencing anovulatory cycles, compared to 28.95% in euthyroid women. In contrast, 71.05% of euthyroid women exhibited ovulatory cycles, while only 33.33% of hypothyroid women ovulated. A single case of clinical hyperthyroidism was observed, and this participant had an ovulatory cycle. **Conclusion:** This study establishes a strong link between thyroid dysfunction, particularly hypothyroidism, and ovulatory dysfunction in infertile women. Hypothyroidism was more prevalent in women with anovulatory cycles, emphasizing the need for routine thyroid screening in infertile women, especially those with irregular menstrual cycles. Early diagnosis and thyroxine supplementation can help restore ovulatory function and improve fertility outcomes.

Keywords: Thyroid dysfunction, Ovulation, Infertility, Hypothyroidism, Thyroid screening

INTRODUCTION

Infertility is a significant health concern that affects millions of couples worldwide. It is defined as the inability to conceive after one year of unprotected intercourse. While various factors contribute to infertility, endocrine disorders play a crucial role, with thyroid dysfunction being one of the most common. Thyroid hormones regulate multiple physiological processes, including metabolism, growth, and reproductive function. The interrelationship between thyroid function and female fertility is complex, involving direct and indirect effects on ovarian activity, menstrual cycle regulation, and overall reproductive potential.[1] Ovulation, the release of a mature egg from the ovarian follicle, is a critical step in the reproductive process. It is controlled by the hypothalamic-pituitary-ovarian (HPO) axis, which interacts closely with thyroid hormones. The balance of thyroid hormones—thyroxine (T4) and triiodothyronine (T3)—is essential for normal reproductive function. Disruptions in thyroid function, whether in the form of hypothyroidism, hyperthyroidism, or subclinical thyroid disorders, can lead to ovulatory dysfunction, menstrual irregularities, and infertility.[2] The role of thyroid hormones in ovulation is mediated through their influence on gonadotropin-releasing hormone (GnRH) secretion, follicle-stimulating hormone (FSH), and luteinizing hormone (LH). These hormones orchestrate the maturation and release of the oocyte. Hypothyroidism, characterized by reduced thyroid hormone levels, is commonly associated with menstrual disturbances, anovulation, and luteal phase defects. This condition can result in prolonged cycles, oligomenorrhea, and even amenorrhea, which significantly reduce the chances of conception. Additionally, elevated levels

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of thyroid-stimulating hormone (TSH), a compensatory response to thyroid hormone deficiency, have been linked to impaired follicular development and poor ovarian reserve.[3] Conversely, hyperthyroidism, marked by excessive thyroid hormone levels, can also disrupt reproductive function. Excess thyroid hormones may lead to increased estrogen metabolism, causing alterations in FSH and LH levels. This imbalance can lead to irregular menstrual cycles, anovulation, and a higher risk of early pregnancy loss. Women with untreated hyperthyroidism often experience shortened luteal phases, decreased progesterone levels, and inadequate endometrial preparation for implantation. Subclinical thyroid dysfunction, which includes mild elevations in TSH with normal T3 and T4 levels, has gained increasing attention in infertility research. Even in the absence of overt symptoms, subclinical hypothyroidism has been associated with a higher risk of anovulation and miscarriage. Similarly, subclinical hyperthyroidism can disrupt reproductive hormone balance, affecting ovulatory cycles and endometrial receptivity.[4] Autoimmune thyroid disorders, such as Hashimoto's thyroiditis and Graves' disease, are also implicated in female infertility. The presence of anti-thyroid antibodies, even in euthyroid individuals, has been correlated with a higher incidence of miscarriage, implantation failure, and unexplained infertility. These antibodies may contribute to immune-mediated disruptions in ovarian and endometrial function, further complicating conception.[5] The assessment of thyroid function in infertile women is crucial for identifying and managing thyroid-related reproductive dysfunction. Routine evaluation of serum TSH, free T3, free T4, and thyroid autoantibodies is recommended for women experiencing infertility, menstrual irregularities, or recurrent pregnancy loss. Early detection and appropriate treatment of thyroid disorders can improve ovulatory function and increase the likelihood of successful conception. The management of thyroid dysfunction in infertility involves restoring hormonal balance through appropriate medical interventions. Hypothyroid patients benefit from levothyroxine therapy, which helps normalize TSH levels and improve ovulatory cycles. In hyperthyroid individuals, antithyroid medications, beta-blockers, or even radioiodine therapy may be necessary, depending on severity. Additionally, lifestyle modifications, including a balanced diet, stress reduction, and adequate iodine intake, play a supportive role in maintaining optimal thyroid function.[6] The relationship between thyroid hormones and ovulation underscores the importance of a multidisciplinary approach to infertility treatment. Endocrinologists, gynecologists, and reproductive specialists must collaborate to ensure comprehensive evaluation and management of thyroid-related reproductive issues. Addressing thyroid dysfunction not only enhances fertility outcomes but also improves overall maternal and fetal health in pregnancy.

MATERIALS AND METHODS

The Present study was conducted in the Department of Obstetrics and Gynecology at SMGS GMC Jammu for a period of one and half year. This study was a comparative, observational study conducted on 120 female participants, divided into two groups: the study group (n=60) and the control group (n=60). The study group included 60 cases of infertile women in the age group of 20 to 40 years who were selected from OPD and IPD. The Control group consist of 60 cases of non pregnantwomen with proven fertility in the same age group of 20 to 40 years. The participants were selected based on specific inclusion and exclusion criteria to ensure a homogenous study population. The study was conducted following ethical guidelines. Informed consent was obtained from all participants, ensuring confidentiality and voluntary participation. Participants diagnosed with thyroid disorders were provided appropriate counseling and referrals for endocrinological evaluation and treatment.

Inclusion Criteria

- Women of reproductive age (20–40 years) presenting with infertility.
- Participants with a history of irregular menstrual cycles or ovulatory dysfunction.
- Women diagnosed with subclinical or clinical hypothyroidism or hyperthyroidism.
- Control group participants with normal thyroid function and no history of infertility.

Exclusion Criteria

- Women with known genetic or anatomical causes of infertility.
- Participants with polycystic ovary syndrome (PCOS), hyperprolactinemia, or other endocrinopathies.
- Women on hormonal therapy, including thyroid medications, contraceptives, or ovulation-inducing drugs.
- Patients with autoimmune disorders affecting thyroid function.

The Following investigations were carried out in the Study group : HB, TLC, DLC, PBF, Blood Grouping, ESR, Blood Sugar (F) and (PP), Urine Routine Examination, HBSAG, HIV, VDRL, Serum Prolactin of Husband And Wife. All cases in Study group were subjected to Semen Analysis of Husband to exclude Male Factor Infertility. HSG was done in Females to exclude Tubal factor Infertility. USG was done for Ovulation Study for three consecutive cycles.

Thyroid Profile was done in both Study and Control group which included Serum TSH, Serum T3 and Serum T4.

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Statistical Analysis

Data analysis was performed using statistical software. Data was presented as Percentage for Qualitative Variables. Mean and Standard Deviation for Quantitative Variables. The chi-square test was used to determine the significance of differences between thyroid dysfunction and ovulatory patterns. A p-value < 0.05 was considered statistically significant. Results were presented in tabular and graphical formats to facilitate comparative analysis between groups.

RESULTS

Table 1: Thyroid Disorder Distribution in Study and Control Groups

This table presents the distribution of different thyroid disorders in the study and control groups. Among the 60 participants in the study group, subclinical hypothyroidism was the most prevalent thyroid disorder, observed in 17 cases (28.33%). In addition, clinical hypothyroidism was identified in 4 cases (6.67%), indicating a small but significant proportion of patients with overt thyroid dysfunction. Subclinical hyperthyroidism was detected in only 1 case (1.67%), while no cases of clinical hyperthyroidism were found in the study group.

In contrast, the control group, which consisted of 60 euthyroid women with no known thyroid dysfunction, showed a much lower prevalence of thyroid abnormalities. Subclinical hypothyroidism was found in 4 cases (6.67%), while clinical hypothyroidism was present in just 1 case (1.67%). Importantly, subclinical hyperthyroidism and clinical hyperthyroidism were entirely absent in the control group, reinforcing the fact that thyroid dysfunction was more common among the infertile women in the study group.

The findings from this table suggest a strong association between subclinical and clinical hypothyroidism and infertility. The higher occurrence of thyroid dysfunction in the study group emphasizes the need for thyroid screening in women experiencing reproductive issues. The absence of clinical hyperthyroidism in both groups indicates that it may be a less common contributor to infertility when compared to hypothyroid disorders.

Table 2: Ovulatory Function in Thyroid States

Table 2 provides insights into the ovulatory function of participants in the study group, categorizing them based on euthyroid and hypothyroid states. Among the euthyroid women, 27 cases (71.05%) had ovulatory cycles, while 11 cases (28.95%) experienced anovulatory cycles. This indicates that the majority of euthyroid participants maintained normal ovulatory function, although a small proportion still exhibited anovulatory cycles.

In contrast, the hypothyroid group (including both clinical and subclinical hypothyroidism) showed a significant disruption in ovulatory function. Only 7 cases (33.33%) had ovulatory cycles, while 14 cases (66.67%) experienced anovulatory cycles. This stark difference highlights the detrimental impact of hypothyroidism on ovulation, as the proportion of anovulatory cycles was considerably higher compared to the euthyroid group.

Additionally, there was 1 case of clinical hyperthyroidism, and notably, this individual had an ovulatory cycle. This suggests that, although hyperthyroidism can impact fertility, its direct effect on ovulation may not be as severe as hypothyroidism. However, further investigation is required to understand the broader implications of hyperthyroid states on reproductive health.

Overall, this table reinforces the significant influence of thyroid function on ovulation. The high prevalence of anovulatory cycles in hypothyroid women underscores the importance of timely thyroid management for improving fertility outcomes. These findings highlight that women with subclinical or clinical hypothyroidism are at a much greater risk of ovulatory dysfunction, which could be a key factor in their infertility. Therefore, addressing thyroid hormone imbalances through appropriate medical intervention could play a crucial role in restoring normal ovulation and enhancing reproductive potential.

Table 1: Type of Thyroid Disorders

Thyroid disorder	Study group n=60 No. %	Control group N=60 No %
Subclinical hypothyroidism	17 (28.33)	4(6.67)
Clinical hypothyroidism	4(6.67)	1 (1.67)
Subclinical hyperthyroidism	1(1.67)	-
Clinical hyperthyroidism	-	-

Table 2: Ovulatory study and Thyroid status in study group

	Euthyroid no. %	Hypothyroid clinical /subclinical
Ovulatory cycle	27(71.05)	7(33.33)
Anovulatory cycle	11(28.95)	14(66.67)

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DISCUSSION

Hypothyroidism appears to be strongly associated with decreased fertility due to its direct impact on ovulatory function. In our study, we found that 66.67% of hypothyroid cases had anovulatory cycles, highlighting the significant role of thyroid hormones in reproductive health. Hypothyroidism disrupts the hypothalamic-pituitary-ovarian (HPO) axis by increasing thyroid-releasing hormone (TRH) levels, which subsequently leads to hyperprolactinemia and suppressed gonadotropin-releasing hormone (GnRH) pulsatile secretion. This cascade ultimately results in delayed luteinizing hormone (LH) responses and inadequate corpus luteum formation, leading to ovulatory dysfunction and infertility (Kumar et al., 2018).[6]

Our findings are consistent with previous research. Lincoln et al. (2015), in their study of 704 infertile couples, reported an anovulatory cycle prevalence of 69% in hypothyroid women, which is comparable to our observation.[7] Moreover, after treating hypothyroidism, they noted a 64% conception rate, suggesting that early diagnosis and management of thyroid dysfunction can significantly improve fertility outcomes. Similarly, Elda-Geva et al. (2012) found that subclinical hypothyroidism was more prevalent in women with ovulation disorders (20.5%) than in those with normal ovulation (8.3%), aligning closely with our study's results, where hypothyroidism was observed in 56% of anovulatory cases compared to only 20.58% of ovulatory cases.[8] This reinforces the notion that even mild thyroid dysfunction can contribute to reproductive challenges (Brown et al., 2019).[9]

Hyperthyroidism, on the other hand, was observed in only one case in our study, and the patient had an ovulatory cycle. This limited data makes it difficult to establish a definitive association between hyperthyroidism and ovulatory dysfunction. However, previous studies suggest that hyperthyroidism can accelerate follicular development but lead to luteal phase defects, increasing the risk of infertility and early pregnancy loss (Chen et al., 2021).[10] Since our study had an insufficient sample size to assess this relationship, future research with a larger cohort is necessary to confirm the effects of hyperthyroidism on ovulation (Anderson et al., 2020).[11]

The prevalence of hypothyroidism in women of reproductive age (20–40 years) varies between 2% and 4%, with autoimmune thyroid disease being the most common cause in this age group (Williams et al., 2016).[12] Given its high prevalence and substantial impact on ovulatory function, thyroid function tests should be considered a routine part of infertility assessments, particularly in cases where anovulatory cycles or menstrual disturbances are present. Additionally, both hypothyroidism and hyperprolactinemia due to increased TRH production lead to altered GnRH pulsatility, further exacerbating ovulatory dysfunction. In our study, all hypothyroid cases underwent prolactin level assessments, as elevated prolactin can further impair fertility by inhibiting normal gonadotropin function (Garcia et al., 2017).[13]

Among thyroid dysfunctions, hypothyroidism was found to be more common than hyperthyroidism, and anovulatory cycles were more frequent than ovulatory cycles in hypothyroid patients. This further supports the idea that both hypothyroidism and hyperthyroidism significantly affect estrogen and androgen metabolism, menstrual function, and fertility (Patel et al., 2020).[14] Given these findings, thyroid screening should be an essential diagnostic tool for infertile women, particularly those with irregular menstrual cycles and suspected ovulatory dysfunction. Furthermore, severe hypothyroidism is strongly linked to ovulatory dysfunction, and thyroxine supplementation is often recommended for infertile women undergoing treatment, even in cases of subclinical hypothyroidism (Ivan et al., 2014).[15]

Our study reaffirms the strong connection between thyroid dysfunction and female infertility, particularly in cases of subclinical and overt hypothyroidism. Since treatment with thyroxine has been shown to restore ovulation and improve pregnancy outcomes, early detection and management of thyroid disorders should be prioritized in women facing infertility.

CONCLUSION

This study highlights the significant impact of thyroid dysfunction, particularly hypothyroidism, on female infertility, primarily through its association with anovulatory cycles. A higher prevalence of anovulation was observed in hypothyroid women compared to euthyroid individuals, reinforcing the role of thyroid hormones in reproductive health. Given the strong link between thyroid disorders and ovulatory dysfunction, routine thyroid screening should be considered in infertile women, especially those with menstrual irregularities. Early diagnosis and appropriate management, including thyroxine supplementation in hypothyroid cases, can improve ovulatory function and enhance fertility outcomes.

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