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Original Article

A Study of Menstrual Pattern in Relation to Thyroid Status in Infertile Women

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Abstract

Background: Thyroid dysfunction plays a pivotal role in female reproductive health. It can significantly influence menstrual cycles and fertility through its effects on the hypothalamic-pituitary-ovarian axis. Menstrual irregularities are frequently observed in women with altered thyroid status, yet the extent of this association in infertile women warrants further investigation. ***Aim:*** A study of menstrual pattern in relation to thyroid status in infertile women. ***Materials and Methods:*** This comparative, observational study was conducted in the Department of Obstetrics and Gynecology at SMGS GMC Jammu over 1.5 years. A total of 120 women aged 20-40 years were enrolled, including 60 infertile women as the study group and 60 fertile women as the control group. Participants were selected using strict inclusion and exclusion criteria. After obtaining ethical clearance and informed consent, all subjects underwent comprehensive hematological, biochemical, hormonal, and imaging evaluations to assess thyroid status and menstrual patterns. ***Results:*** Subclinical hypothyroidism was the most common thyroid abnormality in the study group (28.33%), followed by clinical hypothyroidism (6.67%). In contrast, thyroid dysfunction was significantly lower in the control group. Amenorrhea was the most prevalent menstrual irregularity among euthyroid women in both study (55.26%) and control (80%) groups. In hypothyroid infertile women, amenorrhea (42.86%) and menorrhagia (19.04%) were frequently observed, while hypothyroid controls primarily experienced oligomenorrhea (80%). ***Conclusion:*** The study demonstrates a strong correlation between thyroid dysfunction-especially subclinical hypothyroidism-and menstrual irregularities in infertile women. Amenorrhea was the predominant disturbance in both euthyroid and hypothyroid states. These findings emphasize the need for routine thyroid evaluation in infertile women presenting with abnormal menstrual cycles to ensure timely intervention and improved reproductive outcomes.

Keywords: ***Thyroid dysfunction, menstrual irregularities, infertility, subclinical hypothyroidism, amenorrheaIntroduction***

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 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

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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.

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: Type of Thyroid Disorder in Study and Control Groups (n = 60 each)

Thyroid Disorder	Study Group n (%)	Control Group n (%)
Subclinical Hypothyroidism	17 (28.33%)	4 (6.67%)
Clinical Hypothyroidism	4 (6.67%)	1 (1.67%)
Subclinical Hyperthyroidism	1 (1.67%)	0 (0%)
Clinical Hyperthyroidism	0 (0%)	0 (0%)

In the study group consisting of 60 participants, subclinical hypothyroidism emerged as the most prevalent thyroid disorder, observed in 17 individuals (28.33%). This was followed by clinical hypothyroidism, which affected 4 participants (6.67%). A smaller proportion, 1 participant (1.67%), exhibited subclinical hyperthyroidism, while no cases of clinical hyperthyroidism were

noted in this group. These findings highlight that hypothyroid conditions, particularly in their subclinical form, were more common among the study population.

In contrast, the control group (also consisting of 60 participants) demonstrated a significantly lower incidence of thyroid dysfunction. Only 4 individuals (6.67%) had subclinical hypothyroidism, and 1 individual (1.67%) had clinical hypothyroidism. Notably, no participants in the control group exhibited any form of hyperthyroidism, whether clinical or subclinical. The comparison indicates a marked difference in thyroid disorder prevalence between the study and control groups, suggesting a potential association between the study condition and thyroid abnormalities.

Table 2: Menstrual Pattern in Relation to Thyroid Status

Menstrual Pattern	Euthyroid (Study Group) n (%)	Euthyroid (Control Group) n (%)	Hypothyroid (Study Group) n (%)	Hypothyroid (Control Group) n (%)
Menorrhagia	4 (10.52%)	4 (7.27%)	7 (19.04%)	0 (0%)
Polymenorrhea	0 (0%)	2 (3.63%)	1 (4.76%)	0 (0%)
Oligomenorrhea	6 (15.78%)	2 (3.63%)	4 (19.04%)	4 (80.00%)
Hypomenorrhea	4 (10.52%)	2 (3.63%)	2 (9.52%)	0 (0%)
Hypomenorrhea	3 (7.89%)	1 (1.81%)	1 (4.76%)	1 (20.00%)
Amenorrhea	21 (55.26%)	44 (80.00%)	6 (42.86%)	0 (0%)
Total	38	55	21	5

This table evaluates the menstrual patterns across euthyroid and hypothyroid individuals in both study and control groups. Among euthyroid women in the study group, amenorrhea was the most common menstrual abnormality, seen in 21 women (55.26%), followed by oligomenorrhea (15.78%), hypomenorrhea (10.52%), and menorrhagia (10.52%). Polymenorrhea was not reported in any euthyroid study participant. These findings reflect a notable burden of menstrual disturbances even in those with normal thyroid function within the study cohort.

Among euthyroid women in the control group, amenorrhea was even more prevalent, affecting 44 participants (80.00%). Other abnormalities included menorrhagia (7.27%), polymenorrhea (3.63%), oligomenorrhea (3.63%), and hypomenorrhea (3.63%). The occurrence of menstrual irregularities, particularly amenorrhea, was significantly higher in this euthyroid control group, although fewer participants had other forms of menstrual dysfunction compared to the study group.

In the hypothyroid subgroup of the study population, amenorrhea again emerged as the most frequent issue, affecting 6 women (42.86%). This was followed by menorrhagia (19.04%), oligomenorrhea (19.04%), hypomenorrhea (9.52%), and polymenorrhea (4.76%). These results suggest a broad spectrum of menstrual disturbances in hypothyroid individuals, with a slightly more balanced distribution across the types of dysfunctions.

Among the hypothyroid control group (n = 5), oligomenorrhea was the predominant abnormality, seen in 4 women (80.00%), followed by hypomenorrhea in 1 woman (20.00%). Notably, no cases of amenorrhea, menorrhagia, or polymenorrhea were observed. Though the sample size is small, these findings indicate a high rate of specific menstrual abnormalities associated with hypothyroid status.

Discussion

In the present study, subclinical hypothyroidism was the most common thyroid disorder, observed in 17 out of 60 participants (28.33%) in the study group. This prevalence is considerably higher than the 6.67% reported in the control group. These findings align with the study by Elda-Geva *et al*. (2012) [6], who reported a prevalence of subclinical hypothyroidism of approximately 26% in infertile women. Similarly, Kumar *et al*. (2018) [7] documented a prevalence of 22–28% of subclinical hypothyroidism in women presenting with menstrual disturbances and infertility. The high frequency in the present cohort underlines the silent but significant role of this disorder in reproductive dysfunction.

Clinical hypothyroidism was found in 4 patients (6.67%) in the study group and 1 (1.67%) in the control group. These results are consistent with the findings of Lincoln *et al*. (2015) [8], who observed clinical hypothyroidism in approximately 5-8% of infertile women, and Brown *et al*. (2019) [9], who noted that even mild clinical hypothyroidism could have a profound impact on ovulatory function and menstrual regularity. The minimal presence of hyperthyroid states (only 1 case of subclinical hyperthyroidism) in this study reflects findings from Chen *et al*. (2021) [10], who noted that while hyperthyroidism affects reproductive outcomes, it is less prevalent than hypothyroidism in such populations.

Among euthyroid women in the study group, amenorrhea was most common, affecting 21 out of 38 (55.26%), followed by oligomenorrhea (15.78%), hypomenorrhea (10.52%), and menorrhagia (10.52%). These patterns echo the findings of Garcia *et al*. (2017) [11], who reported amenorrhea in 46% and oligomenorrhea in 20% of euthyroid women with prolactin or metabolic irregularities. Anderson *et al*. (2020) [12] similarly noted that non-thyroidal factors such as stress, hyperprolactinemia, and insulin resistance may account for menstrual disturbances even in euthyroid states.

Among euthyroid controls, amenorrhea was even higher at 80% (44 out of 55), a surprising figure. However, this anomaly might be due to additional unidentified causes such as polycystic ovarian syndrome, nutritional deficits, or psychological stressors. Williams *et al*. (2016) [13] emphasized that while thyroid dysfunction plays a crucial role, other endocrine and systemic factors can also lead to menstrual suppression or delay.

In the hypothyroid study group (n = 21), amenorrhea (42.86%) remained the most frequent abnormality, followed by menorrhagia (19.04%), oligomenorrhea (19.04%), hypomenorrhea (9.52%), and polymenorrhea (4.76%). These findings are closely comparable to those by Patel *et al*. (2020) [14], who observed amenorrhea in 40%, oligomenorrhea in 25%, and menorrhagia in 15% of hypothyroid women. This consistency across studies strengthens the assertion that hypothyroidism is associated with a wide range of menstrual abnormalities due to its regulatory effects on the hypothalamic-pituitary-ovarian axis and endometrial function.

Interestingly, the hypothyroid control group (n = 5) showed a disproportionately high rate of oligomenorrhea (80%), followed by

hypomenorrhea (20%), with no cases of amenorrhea or menorrhagia. Although the sample size is limited, the pattern is consistent with the spectrum of thyroid-related reproductive dysfunction described by Ivan *et al*. (2014) [15], who noted a reduction in menstrual volume and frequency as common early manifestations in subclinical hypothyroidism.

Cumulatively, the results of this study, in concordance with existing literature, affirm that thyroid dysfunction, especially hypothyroidism in both its subclinical and clinical forms, is strongly associated with menstrual irregularities. Early screening and management of thyroid dysfunction in reproductive-age women presenting with menstrual abnormalities can have a significant impact on reproductive health outcomes. According to Kumar *et al*. (2018) [7] and Ivan *et al*. (2014) [15], thyroxine therapy has shown improvements in both ovulation and menstrual regularity in women with diagnosed hypothyroidism.

Conclusions

This study highlights a significant association between thyroid dysfunction-particularly subclinical and clinical hypothyroidism-and menstrual irregularities in reproductive-age women. Subclinical hypothyroidism was the most prevalent disorder in the study group, with a broad spectrum of menstrual disturbances observed. Amenorrhea was the most common abnormality across both euthyroid and hypothyroid individuals. These findings underscore the importance of routine thyroid screening in women presenting with menstrual complaints. Early diagnosis and appropriate management can improve reproductive outcomes and overall hormonal health.

Declarations

Acknowledgements

Nil

Conflict of interest

Nil

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Nil

Contributors

Dr. Anuradha conceived and designed the study, supported the statistical analysis and, analysed the data, and wrote the initial manuscript. Dr. Tarini Singh, contributed in designing the study Design, Data analysis, manuscript checking, Dr Parikh Rana, assisted in manuscript preparation, Dr Nancy Bhagat prepared and typed the manuscript.

Ethical Clearance

It was obtained from Institute Ethical Review Committee.

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