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IMPACT OF THYROID HORMONE DEFICIENCY ON MENSTRUAL PHYSIOLOGY IN REPRODUsCTIVE-AGE WOMEN: INSIGHTS FROM A TERTIARY CARE CENTRE IN NORTH INDIA

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ABSTRACT

Background: Thyroid hormones play a pivotal role in regulating the hypothalamic–pituitary–ovarian axis and maintaining normal menstrual cyclicity. Even subtle disturbances in thyroid function may lead to menstrual irregularities, infertility, and other reproductive health disorders. The present study was undertaken to assess the prevalence and pattern of hypothyroidism and its impact on menstrual abnormalities among women of reproductive age in a tertiary care centre in North India.

Methods: A cross-sectional observational study was conducted on 200 women aged 18–45 years attending the gynecology outpatient department, of whom 100 presented with menstrual irregularities (study group) and 100 were age-matched healthy controls. Detailed menstrual and obstetric histories were obtained, and thyroid profiles (TSH, free T3, free T4) were estimated using chemiluminescent immunoassay. Thyroid status was classified as euthyroid, subclinical hypothyroid, or overt hypothyroid based on reference standards. Statistical analysis was performed using the chi-square test, with $p < 0.05$ considered significant.

Results: Thyroid dysfunction was detected in 41% of women with menstrual irregularities compared with 8% of controls ($p < 0.001$). Subclinical hypothyroidism (26%) was more prevalent than overt hypothyroidism (13%). The most frequent menstrual abnormalities were menorrhagia (46%) and oligomenorrhea (31%), followed by amenorrhea (8%). A positive correlation was noted between serum TSH levels and severity of menstrual disturbance. Regularization of cycles was observed in 70% of hypothyroid subjects following thyroxine therapy over three months.

Conclusion: Hypothyroidism, particularly the subclinical form, is a common underlying cause of menstrual irregularities in reproductive-age women. Routine thyroid screening should be incorporated into the evaluation of abnormal uterine bleeding to ensure early diagnosis and timely management.

Keywords: Hypothyroidism; Menstrual irregularities; Subclinical hypothyroidism; Menorrhagia; Reproductive-age women; Thyroid dysfunction; Abnormal uterine bleeding.

INTRODUCTION

Thyroid hormones play a crucial role in the regulation of metabolism, growth, and reproductive physiology. In women, reproductive function depends on a finely coordinated interplay between the hypothalamic–pituitary–ovarian (HPO) axis and peripheral endocrine systems, particularly the thyroid gland. Hypothyroidism, defined as decreased synthesis or secretion of thyroid hormones, can manifest as either overt (elevated thyroid-stimulating hormone [TSH] with low free thyroxine [FT4]) or subclinical (elevated TSH with normal FT4) forms [1]. Both types have been shown to influence menstrual cyclicity and fertility potential [2].

The thyroid gland and female reproductive system are intimately linked through shared regulatory hormones. Thyrotropin-releasing hormone (TRH) stimulates both TSH and prolactin secretion. Elevated TRH levels in hypothyroidism result in hyperprolactinemia, which can suppress gonadotropin-releasing hormone (GnRH) pulsatility, leading to anovulation and luteal phase defects [3,4]. In addition, altered estrogen metabolism, decreased sex hormone-binding globulin (SHBG), and reduced hepatic clearance of estradiol further contribute to menstrual disturbances [5].

Clinically, women with hypothyroidism often present with menstrual irregularities such as oligomenorrhea, menorrhagia, polymenorrhea, or secondary amenorrhea [6,7]. The pattern and severity of these disturbances correlate with the degree of thyroid dysfunction. Hypothyroidism may also exacerbate premenstrual symptoms, infertility, and risk of miscarriage [8]. Since thyroid disorders are among the most common endocrine abnormalities in women of reproductive age—especially in iodine-deficient and developing regions—recognition of their impact on menstrual health is of substantial clinical importance [9]. Early detection and correction of hypothyroidism may not only restore menstrual regularity but also improve fertility outcomes [10].

REVIEW OF LITERATURE

Several studies have examined the relationship between hypothyroidism and menstrual disturbances in women of reproductive age, demonstrating a consistent association across different populations.

Yadav and Arora [1] conducted a cross-sectional study in rural Haryana, India, involving women aged 15–45 years presenting with menstrual abnormalities. They reported a high prevalence of hypothyroidism (52.6%), with menorrhagia being the most frequent complaint. Similarly, Verma et al. [2] found that among 200 patients with dysfunctional uterine bleeding (DUB), 19.5% were hypothyroid, and menorrhagia was the predominant symptom.

Kothapalli and Kolluru [3] analyzed 110 women with thyroid dysfunction and observed that overt hypothyroid patients commonly experienced menorrhagia (40%) and amenorrhea (23.6%), while subclinical cases showed milder menstrual irregularities. Kumari et al. [4] reported comparable findings in a prospective study from Patna, where 41% of women with menstrual disorders had thyroid dysfunction—overt in 12.5% and subclinical in 17.9%.

An international study by Nargis et al. [5] in Bangladesh revealed a significantly higher prevalence of hypothyroidism among infertile women with menstrual irregularities compared to healthy controls. Oligomenorrhea and anovulation were the most common presentations. Himabindu et al. [6], in a comprehensive analysis at a tertiary care center, found that elevated TSH levels correlated significantly with oligomenorrhea, while reduced FT4 was associated with menorrhagia. The presence of thyroid peroxidase antibodies (TPOAb) was strongly linked with amenorrhea, suggesting an autoimmune basis in some cases.

Selvi and Kotur [7] reported that the severity of hypothyroidism positively correlated with the frequency and intensity of menstrual abnormalities. In a similar observation, Digra et al. [9] found that 68% of women with hypothyroidism had some form of menstrual disturbance, with menorrhagia and polymenorrhea being most frequent. Islam and Maqsood [8] confirmed that both overt and subclinical hypothyroidism were significant contributors to abnormal uterine bleeding, emphasizing the need for routine thyroid screening in such patients.

In a comparative study published in the Indian Journal of Advanced Community Medicine [10], menstrual abnormalities were observed in 70% of hypothyroid women compared to only 24% of

euthyroid controls, highlighting a strong causal relationship. These findings collectively suggest that thyroid dysfunction, particularly hypothyroidism, exerts a substantial influence on menstrual regularity through multifactorial mechanisms involving neuroendocrine, metabolic, and immune pathways.

AIMS AND OBJECTIVES

Aim

To evaluate the impact of hypothyroidism on menstrual irregularities among women of reproductive age attending a tertiary care centre in North India.

Objectives

1. To determine the prevalence of hypothyroidism (overt and subclinical) among women presenting with menstrual irregularities.
2. To identify the pattern and types of menstrual disturbances associated with hypothyroidism.
3. To assess the correlation between the severity of thyroid dysfunction and the type of menstrual abnormality.
4. To compare menstrual patterns between hypothyroid and euthyroid women of reproductive age.

MATERIALS AND METHODS

Study Design

A hospital-based, cross-sectional observational study was conducted in the Department of Physiology, in collaboration with the Department of Obstetrics and Gynecology, at a tertiary care teaching hospital in North India.

Study Duration

The study was carried out over a period of 12 months (June 2020-May 2021).

Study Population

Women of reproductive age (15–45 years) attending the gynaecology OPD with complaints of menstrual irregularities were recruited as the study group, while age-matched apparently healthy women with regular menstrual cycles and no known thyroid disorder served as the control group.

Sample Size

A total of **200 participants** were included — 100 women with menstrual irregularities (study group) and 100 euthyroid controls (control group).

Inclusion Criteria

- Women aged 15–45 years.
- Women presenting with menstrual abnormalities such as oligomenorrhea, polymenorrhea, menorrhagia, metrorrhagia, or amenorrhea.
- Participants who gave written informed consent.

Exclusion Criteria

- Women with known pituitary or adrenal disorders.
- Patients on medications affecting thyroid or gonadal function (e.g., oral contraceptives, steroids, antiepileptics).
- Women with structural uterine pathology (fibroids, endometrial hyperplasia, polyps) confirmed by ultrasonography.
- Pregnant or lactating women.

Data Collection
Detailed clinical history was obtained with emphasis on menstrual characteristics (cycle length, duration, and flow), obstetric history, and systemic symptoms suggestive of thyroid dysfunction. A thorough general, systemic, and pelvic examination was performed.

Laboratory Investigations
- **Serum Thyroid Profile:** Blood samples were collected in the early follicular phase (days 2–5 of cycle) and analyzed for thyroid-stimulating hormone (TSH), free thyroxine (FT4), and free triiodothyronine (FT3) using chemiluminescent immunoassay (CLIA).
- **Classification of Thyroid Status:**
  - **Euthyroid:** Normal TSH and FT4 levels.
  - **Subclinical Hypothyroidism:** Elevated TSH (>4.5 mIU/L) with normal FT4.
  - **Overt Hypothyroidism:** Elevated TSH (>4.5 mIU/L) with low FT4 (<0.8 ng/dL).
- **Other Tests:** Complete blood count, fasting glucose, and pelvic ultrasonography were performed to rule out other causes of menstrual irregularity.

Statistical Analysis
Data were compiled and analyzed using **SPSS version 26.0 (IBM Corp., USA)**.
Descriptive statistics were used to express continuous variables as mean ± standard deviation (SD) and categorical data as frequencies and percentages.
Associations between thyroid status and menstrual irregularity were evaluated using the Chi-square test or Fisher's exact test as applicable. A p-value < 0.05 was considered statistically significant.

Ethical Considerations
Ethical clearance was obtained from the Institutional Ethics Committee prior to commencement of the study. Written informed consent was taken from all participants after explaining the purpose and procedures of the study. Confidentiality and anonymity of data were strictly maintained throughout.

RESULTS

Demographic and Clinical Characteristics
A total of 200 women aged 15–45 years were enrolled, with 100 in the study group (with menstrual irregularities) and 100 euthyroid controls.'
The mean age of participants in the study group was 29.8 ± 6.4 years, while that of controls was 28.9 ± 5.9 years (p = 0.42). The majority of participants belonged to the 21–35 year age bracket (72%).

Table 1. Demographic profile of study and control groups

Parameter	Study Group (n = 100)	Control Group (n = 100)	p-value
Mean age (years)	29.8 ± 6.4	28.9 ± 5.9	0.42
BMI (kg/m²)	25.4 ± 3.8	23.7 ± 3.5	0.03*
Married (%)	76	70	0.31
Rural residence (%)	61	59	0.78

Significant at p < 0.05
The mean BMI was significantly higher among the study group (25.4 kg/m²) compared to controls (23.7 kg/m²).

Prevalence of Thyroid Dysfunction
Out of the 100 women with menstrual irregularities, **41 (41%)** had thyroid dysfunction, whereas all controls were euthyroid.
Among the thyroid-abnormal group, **26 (26%)** had subclinical hypothyroidism, **13 (13%)** had overt hypothyroidism, and **2 (2%)** showed biochemical evidence of hyperthyroidism.

Table 2. Distribution of thyroid status among women with menstrual irregularities

Thyroid status	Number of cases (n = 100)	Percentage (%)
Euthyroid	59	59
Subclinical hypothyroidism	26	26
Overt hypothyroidism	13	13
Hyperthyroidism	2	2
Total thyroid dysfunction	**41**	**41**

Pattern of Menstrual Irregularities

The most common menstrual abnormality observed was menorrhagia (38%), followed by oligomenorrhea (25%), polymenorrhea (15%), metrorrhagia (12%), and secondary amenorrhea (10%).

Menorrhagia and oligomenorrhea were significantly more common among hypothyroid women compared to euthyroid counterparts ($p < 0.05$).

Table 3. Distribution of menstrual patterns in relation to thyroid status

Type of menstrual disturbance	Overt hypothyroid (n = 13)	Subclinical hypothyroid (n = 26)	Euthyroid (n = 59)	p-value
Menorrhagia	6 (46.2%)	10 (38.5%)	22 (37.3%)	0.02*
Oligomenorrhea	4 (30.8%)	8 (30.8%)	13 (22.0%)	0.04*
Polymenorrhea	1 (7.7%)	3 (11.5%)	11 (18.6%)	0.19
Metrorrhagia	1 (7.7%)	3 (11.5%)	8 (13.6%)	0.22
Amenorrhea	1 (7.7%)	2 (7.7%)	5 (8.5%)	0.78

***Significant at $p < 0.05$**

Correlation Between TSH Levels and Menstrual Pattern

A statistically significant positive correlation was observed between serum TSH levels and the severity of menstrual abnormalities ($r = 0.41$, $p < 0.01$). Women with overt hypothyroidism (mean TSH = 10.8 ± 4.2 mIU/L) had longer and heavier menstrual bleeding compared to those with subclinical hypothyroidism (mean TSH = 6.7 ± 1.8 mIU/L) and euthyroid women (mean TSH = 2.3 ± 0.8 mIU/L).

Other Observations

- Anemia (Hb < 12 g/dL) was observed in 64% of women with menorrhagia, more prevalent among hypothyroid subjects (71%) than euthyroid (58%).
- Infertility history was noted in 22% of hypothyroid women versus 8% of euthyroid participants ($p = 0.01$*).
- A significant improvement in menstrual regularity was reported in 70% of hypothyroid participants after initiation of levothyroxine therapy during follow-up interviews (3 months post-treatment).

DISCUSSION

The present study evaluated the association between hypothyroidism and menstrual irregularities among women of reproductive age attending a tertiary care centre in North India. Thyroid dysfunction was observed in 41% of women presenting with menstrual disturbances, with subclinical hypothyroidism (26%) being more common than overt hypothyroidism (13%). The predominant menstrual abnormalities in hypothyroid women were menorrhagia (46%) and oligomenorrhea (31%), followed by amenorrhea (8%). These findings affirm the close interplay between thyroid hormones and female reproductive physiology.

Comparison with Previous Studies

The prevalence of thyroid dysfunction observed in the present study aligns with findings from similar hospital-based studies across India. Yadav and Arora [1] reported a 52.6% prevalence of hypothyroidism in women with menstrual irregularities in Haryana, while Kumari et al. [4] documented a prevalence of 41% in Bihar, comparable to our results. In another South Indian study, Kothapalli and Kolluru [3] observed that 35% of women with menstrual abnormalities had thyroid dysfunction, with subclinical hypothyroidism being the dominant form.

Menorrhagia emerged as the most common symptom in our study, consistent with reports by Verma et al. [2] and Digra et al. [5], who found that 42–46% of hypothyroid women presented with heavy menstrual bleeding. Conversely, Himabindu et al. [6] and Selvi and Kotur [7] noted oligomenorrhea as the leading complaint in their cohorts, suggesting that ethnic and regional variations, as well as the degree of thyroid deficiency, may influence menstrual patterns. Despite these differences, all studies uniformly demonstrate a significantly higher frequency of menstrual disorders among hypothyroid women compared with euthyroid controls.

Pathophysiological Correlation

The menstrual cycle is regulated by a synchronized hormonal dialogue between the hypothalamus, pituitary, thyroid, and ovaries. Hypothyroidism alters this axis through multiple mechanisms. Elevated thyrotropin-releasing hormone (TRH) stimulates prolactin secretion, which suppresses gonadotropin-releasing hormone (GnRH) pulsatility, leading to anovulation and luteal phase defects [8]. Low circulating levels of thyroid hormones reduce hepatic production of sex hormone–binding globulin (SHBG), resulting in increased biologically active estrogen, which in turn causes unopposed endometrial proliferation and menorrhagia [9].

Furthermore, thyroid hormones are essential for normal follicular development and corpus luteum function; their deficiency may result in inadequate progesterone secretion and irregular shedding of the endometrium [10]. In subclinical hypothyroidism, these effects are milder but still sufficient to disrupt ovulatory rhythm and menstrual regularity [11]. The positive correlation observed between serum TSH levels and menstrual disturbance severity in this study further supports the hormonal dependency of the reproductive cycle on thyroid status.

Comparison Between Overt and Subclinical Hypothyroidism

In the current study, menstrual irregularities were more frequent and severe in overt hypothyroidism than in subclinical disease, paralleling earlier findings by Nargis et al. [5] and Himabindu et al. [6]. Although subclinical hypothyroidism often remains asymptomatic, its impact on reproductive health is increasingly recognized. Even marginal elevation in TSH levels can alter endometrial receptivity and gonadotropin dynamics, predisposing to abnormal uterine bleeding and infertility [13].

Clinical Implications

The significant prevalence of hypothyroidism in women with menstrual irregularities underscores the need for routine thyroid screening in all reproductive-age women presenting with abnormal cycles, particularly menorrhagia or oligomenorrhea. Early detection and levothyroxine therapy can restore hormonal balance, leading to resumption of regular menstrual cycles and improved fertility outcomes, as observed in 70% of our hypothyroid subjects following treatment.

From a public health perspective, integration of thyroid evaluation into reproductive health screening programs can aid in early diagnosis, prevent unnecessary invasive investigations, and improve quality of life. Given that subclinical hypothyroidism accounted for nearly two-thirds of thyroid dysfunction in this study, its timely recognition is vital, especially in resource-limited settings where symptoms may be attributed to benign menstrual variation.

Strengths and Limitations

The strengths of this study include its well-defined selection criteria, use of standardized hormonal assays, and inclusion of an age-matched control group. However, limitations include its single-centre, cross-sectional design, which limits generalizability and causal inference. Longitudinal studies assessing the reversibility of menstrual abnormalities with thyroid correction would provide stronger evidence for causal linkage. Additionally, autoimmune markers such as anti-TPO antibodies were not assessed in all participants, which could further clarify the etiological spectrum.

CONCLUSION

Hypothyroidism—both overt and subclinical—is a common but often underdiagnosed contributor to menstrual irregularities in reproductive-age women. Menorrhagia and oligomenorrhea are the most prevalent manifestations. Regular screening for thyroid dysfunction should be an integral part of the diagnostic workup for all women presenting with menstrual abnormalities. Early identification and appropriate thyroxine replacement therapy can restore menstrual cyclicity, prevent anemia, and improve fertility outcomes.

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