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Association of thyroid dysfunction with menstrual irregularities in women of reproductive age

Mohammad Aminul Islam[1], Mosammat Fazilatul Islam[2]

[1]Department of Medicine, Shaheed M Monsur Ali Medical College, Sirajganj, Bangladesh, [2]Department of Obstetrics and Gynaecology, Rajshahi Medical College Hospital, Rajshahi, Bangladesh

Address for correspondence: Dr. Mohammad Aminul Islam, Assistant Professor, Department of Medicine, Shaheed M Monsur Ali Medical College, Sirajganj, Bangladesh. E-mail: lipon37thrmc@gmail.com

Abstract

Introduction: Thyroid hormones play a vital role in regulating the female reproductive system, including the menstrual cycle, ovulation, and fertility. Even subtle alterations in thyroid function can disrupt the hypothalamic–pituitary–ovarian axis, leading to various menstrual irregularities such as oligomenorrhea, menorrhagia, or amenorrhea. This study aims to evaluate the association between thyroid dysfunction and various types of menstrual irregularities in women of reproductive age.

Methods: This cross-sectional observational study was conducted at Shaheed M Monsur Ali Medical College, Sirajganj, Bangladesh, from January 2023 to December 2023. A total of 108 women of reproductive age (18–45 years) presenting with menstrual irregularities were enrolled from the outpatient department of medicine. Data were analyzed using the Statistical Package for the Social Sciences version 25.

Result: In this study of 108 women of reproductive age, the most common menstrual irregularities were oligomenorrhea (31.5%) and menorrhagia (25.9%). Thyroid dysfunction was observed in 66.7% of participants, with hypothyroidism (both subclinical and overt) being the most prevalent (47.2%). A strong association was found between hypothyroidism and menorrhagia, while hyperthyroidism was more linked to oligomenorrhea. Mean thyroid-stimulating hormone levels were highest among those with menorrhagia (6.27 ± 2.51 μIU/mL).

Conclusion: This study highlights a significant association between thyroid dysfunction and menstrual irregularities in women of reproductive age. Hypothyroidism, particularly the subclinical form, was more prevalent and closely linked to menorrhagia and oligomenorrhea, while hyperthyroidism was commonly associated with oligomenorrhea and amenorrhea.

Keywords: Menorrhagia, menstrual irregularities, reproductive age, thyroid dysfunction

Introduction

The interplay between thyroid function and the female reproductive system has long been recognized as a critical component in maintaining hormonal balance and overall reproductive health. Thyroid hormones exert a significant influence on the hypothalamic–pituitary–ovarian (HPO) axis, which regulates the menstrual cycle and fertility. Dysregulation of thyroid function, whether hypothyroidism or hyperthyroidism, can result in various gynecological disturbances, including menstrual irregularities, anovulation, infertility, and even recurrent pregnancy loss.[1] Menstrual irregularities encompass a range of disorders, such as oligomenorrhea, amenorrhea, menorrhagia, polymenorrhea, and metrorrhagia. These disruptions are not merely symptomatic but can be reflective of underlying endocrine dysfunctions, including thyroid disorders. Hypothyroidism, the

most common thyroid disorder among women of reproductive age, is associated with heavy or prolonged menstrual bleeding (menorrhagia), whereas hyperthyroidism is more often linked to lighter, less frequent menstruation (oligomenorrhea or amenorrhea).[2,3] Thyroid hormones – triiodothyronine (T3) and thyroxine (T4) – directly influence the synthesis and metabolism of sex hormone-binding globulin, gonadotropin-releasing hormone (GnRH), and prolactin, thereby affecting estrogen and progesterone levels.[4] The prevalence of thyroid dysfunction among women of reproductive age varies globally. Studies have shown that subclinical hypothyroidism may be present in up to 10% of this population, while overt hypothyroidism affects approximately 2–4%.[5,6] Hyperthyroidism, though less common, still represents a significant concern, particularly due to its association with menstrual cycle disturbances and reduced fertility.[7] Despite these figures, thyroid dysfunction is often underdiagnosed in women presenting with menstrual complaints, primarily due to overlapping symptoms with other gynecological or systemic conditions. The pathophysiological mechanisms underlying menstrual irregularities in thyroid dysfunction involve both central and peripheral pathways. At the central level, altered thyroid hormone levels can disrupt the pulsatile release of GnRH, leading to impaired luteinizing hormone (LH) and follicle-stimulating hormone (FSH) secretion.[8] Peripherally, thyroid hormones influence ovarian folliculogenesis and endometrial development. Hypothyroidism is frequently associated with hyperprolactinemia, which suppresses GnRH secretion and leads to menstrual disturbances.[9] Moreover, thyroid dysfunction may contribute to polycystic ovarian syndrome (PCOS)-like features, especially in subclinical cases, thereby compounding reproductive complications.[10] The relationship between thyroid status and menstrual irregularities has important implications for fertility management, especially in regions where nutritional iodine deficiency or autoimmune thyroiditis is prevalent. It is thus imperative to include thyroid function testing as part of the routine evaluation in women presenting with menstrual abnormalities.[11] Early detection and treatment of thyroid dysfunction can not only restore menstrual regularity but also improve fertility outcomes and quality of life. Levothyroxine therapy in hypothyroid women has been shown to reverse menstrual abnormalities and restore ovulatory cycles.[12] Similarly, management of hyperthyroidism with antithyroid medications can normalize menstrual cycles and alleviate associated reproductive symptoms. This study aims to evaluate the association between thyroid dysfunction and various types of menstrual irregularities in women of reproductive age.

Methods

This cross-sectional observational study was conducted at Shaheed M Monsur Ali Medical College, Sirajganj, Bangladesh, from January 2023 to December 2023. A total of 108 women of reproductive age (18–45 years) presenting with menstrual irregularities were enrolled from the outpatient department of medicine. Women with known thyroid disorders on treatment, those with diagnosed PCOS, hyperprolactinemia, coagulation disorders, structural uterine pathology (e.g., fibroids and polyps), or on hormonal contraceptives were excluded from the study to eliminate confounding factors. After obtaining informed written consent, detailed demographic and clinical data were collected through structured interviews, including menstrual history (cycle length, flow, duration, and irregularities), obstetric history, and relevant past medical history. Anthropometric measurements, including height, weight, and body mass index (BMI), were recorded. All participants underwent thyroid function testing, including serum thyroid-stimulating hormone (TSH), free T3 (FT3), and free T4 (FT4), using chemiluminescent immunoassay methods in an accredited laboratory. Based on these results, participants were categorized into euthyroid, subclinical hypothyroid, overt hypothyroid, subclinical hyperthyroid, or overt hyperthyroid groups as per American Thyroid Association guidelines. Data were analyzed using the Statistical Package for the Social Sciences version 25. Descriptive statistics were used to summarize

demographic characteristics, thyroid status, and types of menstrual irregularities. Chi-square tests were applied to assess the association between thyroid dysfunction and menstrual patterns. $P < 0.05$ was considered statistically significant.

Results

The majority of participants (32.4%) belonged to the 25–30 age group, followed by 25.0% in the 31–35 age range. Women aged 18–24 years constituted 18.5% of the study population. The number of participants progressively declined with increasing age, with only 7.4% in the 41–45 group [Table 1].

Oligomenorrhea was the most frequently reported menstrual irregularity, affecting 31.5% of participants, followed by menorrhagia in 25.9%. Polymenorrhea and amenorrhea were reported by 15.7% and 13.0% of the women, respectively. Metrorrhagia was observed in 8.3% of cases, while only 5.6% reported normal menstrual cycles [Table 2].

Table 1: Age distribution of study participants (*n*=108)

Age group (years)	Number of participants (*n*)	Percentage
18–24	20	18.5
25–30	35	32.4
31–35	27	25.0
36–40	18	16.7
41–45	8	7.4

Table 2: Types of menstrual irregularities reported (*n*=108)

Type of irregularity	Number of participants (*n*)	Percentage
Oligomenorrhea	34	31.5
Menorrhagia	28	25.9
Polymenorrhea	17	15.7
Amenorrhea	14	13.0
Metrorrhagia	9	8.3
Normal cycle (control)	6	5.6

Among the participants, 66.7% were found to have some form of thyroid dysfunction, with subclinical hypothyroidism (25.0%) and overt hypothyroidism (22.2%) being the most prevalent. Hyperthyroidism, both overt and subclinical, accounted for 19.4% of cases. One-third of the participants (33.3%) were euthyroid [Table 3].

Menorrhagia was most frequently observed among hypothyroid participants (41.2%), whereas oligomenorrhea was the predominant irregularity in hyperthyroid individuals (61.9%). Euthyroid women showed a broader range of irregularities, with nearly half (47.2%) experiencing patterns not classifiable as oligomenorrhea, menorrhagia, or amenorrhea [Table 4].

Participants with menorrhagia had the highest mean TSH level (6.27 µIU/mL), followed by those with amenorrhea (4.88 µIU/mL) and oligomenorrhea (3.41 µIU/mL). The lowest TSH levels were observed among participants with normal menstrual cycles (1.89 µIU/mL) [Table 5].

Table 3: Thyroid function status among participants (*n*=108)

Thyroid status	Number of participants (*n*)	Percentage
Euthyroid	36	33.3
Subclinical hypothyroid	27	25.0
Overt hypothyroid	24	22.2
Subclinical hyperthyroid	8	7.4
Overt hyperthyroid	13	12.0

Table 4: Association between thyroid dysfunction and type of menstrual irregularity (*n*=108)

Type of irregularity	Hypothyroid (*n*=51) (%)	Hyperthyroid (*n*=21) (%)	Euthyroid (*n*=36) (%)
Oligomenorrhea	10 (19.6)	13 (61.9)	11 (30.6)
Menorrhagia	21 (41.2)	2 (9.5)	5 (13.9)
Amenorrhea	8 (15.7)	3 (14.3)	3 (8.3)
Other irregularities	12 (23.5)	3 (14.3)	17 (47.2)

Table 5: Mean TSH levels by menstrual pattern

Menstrual pattern	Mean TSH (μIU/mL)	Standard deviation
Oligomenorrhea	3.41	±2.08
Menorrhagia	6.27	±2.51
Amenorrhea	4.88	±1.97
Polymenorrhea	2.63	±1.54
Normal cycle	1.89	±0.83

TSH: Thyroid-stimulating hormone

Among hypothyroid participants, a significant proportion were overweight (33.3%) or obese (27.5%), suggesting a possible association between increased BMI and hypothyroidism. In contrast, hyperthyroid individuals were more likely to be underweight (23.8%) or of normal BMI (52.4%). Euthyroid participants predominantly fell within the normal BMI range (66.7%) [Table 6].

Table 6: Correlation between BMI and thyroid dysfunction (n=108)

BMI category (kg/m^2)	Hypothyroid (n=51) (%)	Hyperthyroid (n=21) (%)	Euthyroid (n=36) (%)
<18.5 (underweight)	2 (3.9)	5 (23.8)	1 (2.8)
18.5–24.9 (normal)	18 (35.3)	11 (52.4)	24 (66.7)
25–29.9 (overweight)	17 (33.3)	3 (14.3)	8 (22.2)
≥30 (obese)	14 (27.5)	2 (9.5)	3 (8.3)

BMI: Body mass index

Discussion

In the present study, subclinical and overt hypothyroidism accounted for nearly half (47.2%) of all cases, and the most frequently observed menstrual disorders were oligomenorrhea (31.5%) and menorrhagia (25.9%). This finding aligns with the observations made by Singh *et al*., who reported that 43% of women with menstrual irregularities had thyroid dysfunction, and hypothyroid women most commonly experienced menorrhagia and oligomenorrhea.[13] Similarly, Sinha *et al*. noted that hypothyroidism was significantly associated with heavy and irregular menstrual bleeding, suggesting that even subtle alterations in thyroid function can disrupt the HPO axis.[9] The association between hypothyroidism and menorrhagia found in this study (41.2% of hypothyroid cases) also corroborates the findings of Krassas and Markou, who emphasized that decreased thyroid hormone levels lead to defective estrogen metabolism, anovulation, and impaired coagulation pathways, all of which contribute to prolonged and heavy menstrual bleeding.[1] Furthermore, Poppe and Velkeniers described oligomenorrhea and amenorrhea as common outcomes of hyperthyroidism due to its suppressive effects on GnRH and subsequent estrogen production[3] a trend that was echoed in our study, where oligomenorrhea was seen in 61.9% of hyperthyroid patients. Our findings also reflect the conclusions of Doufas and Mastorakos, who emphasized that both hypothyroid and hyperthyroid states interfere with the pulsatile secretion of GnRH, leading to disruption in LH and FSH release, and thereby contributing to menstrual dysfunction.[4] These hormonal alterations not only disrupt the cycle but can lead to anovulation and fertility issues, further complicating reproductive health. The observed higher TSH levels in patients with menorrhagia and amenorrhea in our study support the hypothesis proposed by Singh *et al*., who demonstrated that abnormal TSH levels correlate with the severity of menstrual irregularities and that these patterns tend to normalize upon achieving euthyroid status.[13] In addition, the predominance of hypothyroid patients among overweight and obese women (60.8%) is consistent with the metabolic effects of thyroid hormone insufficiency reported by Janssen *et al*., who found a significant overlap between subclinical hypothyroidism, obesity, and menstrual disturbances.[10] It is also important to consider regional prevalence data. In our study, 25% of participants were subclinical hypothyroid, a figure that is in agreement with the large epidemiological survey by Unnikrishnan *et al*., who reported a prevalence of subclinical hypothyroidism of around 20–25% among Indian women.[5] These figures suggest that

undetected thyroid dysfunction may account for a substantial burden of gynecological morbidity in the reproductive age group. Moreover, Negro *et al*. emphasized the benefits of early screening and levothyroxine therapy in women with subclinical thyroid disease, which can significantly improve ovulatory function and restore menstrual regularity.[8] Our findings support this clinical approach, especially given that a majority of women with thyroid dysfunction in our cohort were unaware of their condition before testing. Finally, the observed association between thyroid dysfunction and menstrual irregularities in euthyroid women with abnormal TSH levels in our study suggests that routine thyroid screening should be considered in the workup of menstrual abnormalities, even in the absence of overt thyroid symptoms. This echoes the recommendation of Verma *et al*., who emphasized the need for routine thyroid function tests in women presenting with menstrual disorders, regardless of classical signs of thyroid disease.[14]

Limitations of the study

First, it was conducted in a single center with a relatively small sample size (n = 108), which may limit the generalizability of the findings to the broader population. Second, the cross-sectional design prevents assessment of causal relationships between thyroid dysfunction and menstrual irregularities. Third, factors such as stress, lifestyle, dietary habits, and other endocrine disorders (e.g., PCOS, hyperprolactinemia) that may influence menstrual patterns were not controlled for in this analysis.

Conclusion

This study highlights a significant association between thyroid dysfunction and menstrual irregularities in women of reproductive age. Hypothyroidism, particularly the subclinical form, was more prevalent and closely linked to menorrhagia and oligomenorrhea, whereas hyperthyroidism was commonly associated with oligomenorrhea and amenorrhea.

Recommendation

Routine screening of thyroid function should be incorporated into the evaluation of all women of reproductive age presenting with menstrual irregularities. Early diagnosis and appropriate management of thyroid dysfunction can help prevent long-term reproductive complications and improve menstrual and hormonal balance.

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Conflict of Interest

None declared.

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