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Thyroid dysfunction and menstrual disorders in reproductive-age women: A prospective observational study in a tertiary hospital in Andhra Pradesh, India.

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Abstract

Background

Thyroid dysfunction can disturb the hypothalamic-pituitary-ovarian axis and cause menstrual irregularities in reproductive-age women; early detection is important for accurate diagnosis and timely management. Objectives: To estimate the prevalence of thyroid dysfunction among reproductive-age women presenting with menstrual disorders and to evaluate the association between thyroid hormone categories and specific bleeding patterns.

Methods

A prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Maharajah's Institute of Medical Sciences (MIMS), Nellimarla, Vizianagaram, Andhra Pradesh, India, from August 2023 to February 2025. Women aged 18–45 years with menstrual irregularities were enrolled (n=160) after applying eligibility criteria and obtaining written consent. Clinical evaluation, pelvic examination, haemoglobin estimation, and transabdominal ultrasonography were performed. Menstrual blood loss was assessed using the pictorial blood loss assessment chart. Serum T3, T4, and thyroid-stimulating hormone (TSH) were measured, and participants were classified as euthyroid, hyperthyroid, hypothyroid, or subclinical hypothyroid. Associations were tested using the chi-square test.

Results

Overall, 33/160 women (20.62%) had thyroid dysfunction: hypothyroidism 22 (13.75%), subclinical hypothyroidism 8 (5.00%), and hyperthyroidism 3 (1.88%). Menorrhagia was the leading menstrual disorder (54, 33.75%), followed by amenorrhoea (47, 29.38%) and polymenorrhoea (36, 22.51%). Parity was significantly associated with thyroid status ($p=0.04$). Menstrual pattern showed strong associations with T3 ($p<0.001$), T4 ($p<0.001$), and TSH ($p<0.001$) categories; elevated TSH clustered with menorrhagia and polymenorrhoea, whereas low TSH was observed mainly among amenorrhoeic women. Weight gain and constipation were common hypothyroid-suggestive symptoms, while weight loss and fatigue suggested hyperthyroidism.

Conclusion

One in five women with menstrual disorders had biochemical thyroid dysfunction, predominantly hypothyroidism. Thyroid hormone derangements were significantly linked to the type of menstrual disturbance.

Recommendations

Thyroid function testing should be incorporated into the first-line evaluation of menstrual disorders in routine clinic practice, particularly heavy or frequent bleeding and persistent amenorrhoea.

Keywords: *Abnormal uterine bleeding; Menstrual disorder; Hypothyroidism; Subclinical hypothyroidism; Thyroid-stimulating hormone; India.*

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Introduction

Menstrual disorders and abnormal uterine bleeding (AUB) are leading reasons for gynaecology consultations and account for a substantial share of outpatient visits, contributing to anaemia, reduced productivity, and diminished quality of life [1]. FIGO has standardised symptom terminology and aetiologic classification using the PALM–COEIN framework, which guides clinicians to exclude pregnancy, identify structural pathology, and consider systemic contributors such as ovulatory and endocrine disorders early in the work-up [2,3].

Thyroid hormones modulate the hypothalamic–pituitary–ovarian axis, folliculogenesis, luteal function, and endometrial responsiveness. Consequently, both overt and subclinical thyroid dysfunction can alter cycle regularity and bleeding volume through effects on gonadotropin pulsatility, sex hormone-binding globulin, prolactin interplay, and haemostatic balance [4]. In hypothyroidism, menstrual disturbances include heavy or prolonged bleeding, oligomenorrhoea, and anovulatory cycles, although the pattern varies with severity and duration of disease [5]. Hyperthyroidism has been linked with reduced bleeding, oligomenorrhoea, and amenorrhoea, yet many women remain "cycle normal" until biochemical derangements become marked [6]. Large clinic-based assessments across thyroid phenotypes similarly confirm that menstrual abnormalities occur across Graves' disease, hypothyroidism, thyroiditis, and even in euthyroid autoimmune states [7].

In everyday practice, menstrual complaints may precede overt thyroid symptoms, and symptom-based triage alone can miss biochemical dysfunction. This matters because thyroid-related menstrual disorders are potentially reversible with timely endocrine correction, reducing prolonged empirical therapy and avoidable invasive evaluation. Estimates of thyroid dysfunction in AUB cohorts still vary by setting due to differing age profiles and recruitment thresholds, so centre-specific data are useful for designing locally appropriate screening pathways.

In India, iron deficiency anaemia related to heavy bleeding remains common, and women frequently present late after months of self-medication. A simple biochemical test that identifies an endocrine trigger can often change management rapidly. Moreover, thyroid dysfunction may coexist with non-structural AUB categories, so testing can complement ultrasonography rather than replace it in busy outpatient clinics.

Against this background, the present study estimated the prevalence of thyroid dysfunction among reproductive-age women presenting with menstrual disorders in a tertiary-care hospital in coastal Andhra Pradesh and examined the association between serum T3, T4, and TSH categories and specific menstrual patterns.

Materials and methods

Study design and setting

This hospital-based prospective observational study was conducted in the Department of Obstetrics and Gynecology at Maharajah's Institute of Medical Sciences (MIMS), Vizianagaram, Andhra Pradesh, India, over 18 months, from August 2023 to February 2025. MIMS is a tertiary care teaching hospital affiliated with Maharajah's Institute of Medical Sciences Medical College and functions as a major referral center for northern Andhra Pradesh and neighboring regions of Odisha. The institution provides comprehensive health-care services across multiple specialties, including general medicine, pediatrics, general surgery, obstetrics and gynecology, orthopedics, and other specialty and super-specialty departments. The hospital has a large inpatient capacity and caters to patients from urban, semi-urban, and rural communities within its broad catchment area. Women presenting with menstrual complaints to the gynecology outpatient department during the study period were screened for eligibility, and those fulfilling the study criteria were enrolled after obtaining informed consent.

Participants and sampling method

A total of 160 women of reproductive age presenting with menstrual disorders were included in the study. Participants were selected using a consecutive sampling technique, in which all eligible patients attending the gynecology outpatient department during the study period were recruited until the required sample size was achieved.

Eligibility criteria

Inclusion criteria

Women aged 15–45 years presenting with menstrual disorders such as menorrhagia, oligomenorrhea, polymenorrhea, hypomenorrhea, or secondary amenorrhea who provided written informed consent were included in the study.

Exclusion criteria

Women with known thyroid disease on treatment, pregnancy, lactation, polycystic ovarian syndrome diagnosed previously, use of hormonal medications, or systemic illnesses affecting menstrual cycles were excluded from the study.

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Study size (Sample size calculation)

The sample size was calculated using the formula for estimating prevalence in a cross-sectional study:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Where
n = required sample size
Z = standard normal deviate at 95% confidence level (1.96)
p = expected prevalence of thyroid dysfunction among women with menstrual disorders
(assumed 25% based on previous studies)
q = 1 – p
d = allowable error (7%)
Substituting the values:

$$n = \frac{(1.96)^2 \times 0.25 \times 0.75}{(0.07)^2} \approx 147$$

After adjusting for possible incomplete data and non-response, the final sample size was rounded to 160 participants, who were included in the present study.

Clinical assessment

A structured history and examination were performed. BMI was calculated and categorised as underweight (<18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25–29.9 kg/m²), or obese (≥30 kg/m²).

Investigations

All participants underwent haemoglobin estimation and a coagulation profile. Transabdominal ultrasonography was performed to assess the uterus and adnexa. Menstrual blood loss was assessed using the PBAC [8]. Evaluation and initial bleeding management aligned with standard guidance for heavy menstrual bleeding [9].

Thyroid function testing

Serum T3, T4 and TSH were measured. Thyroid status was classified as euthyroid, hyperthyroid, hypothyroid, or subclinical hypothyroid using institutional reference ranges and clinical context.

Outcome measures

The primary outcome was the prevalence of thyroid dysfunction among women with menstrual disorders. Secondary outcomes were associations between thyroid status or thyroid hormone categories and menstrual patterns, parity, and BMI.

Bias control

Several measures were adopted to minimize potential sources of bias. Consecutive patient recruitment was performed to reduce selection bias. Standardized clinical evaluation and laboratory investigations were applied uniformly to all participants to avoid measurement bias. Data collection was conducted using a structured proforma to ensure consistency and completeness of clinical information. In addition, laboratory analysis of thyroid function tests was performed using standardized biochemical methods in the institutional laboratory.

Statistical analysis

Categorical variables are summarised as frequencies and percentages. Associations were evaluated using the chi-square test. A p-value <0.05 was considered statistically significant.

Ethical considerations

Institutional ethics approval was obtained from the Institutional Ethics Committee of Maharajah's Institute of Medical Sciences (MIMS), Vizianagaram, Andhra Pradesh, India, before the commencement of the study, and confidentiality of all participant information was strictly maintained throughout the study period.

Results

Participant flow

During the study period from August 2023 to February 2025, a total of 214 women presenting with menstrual complaints were assessed for eligibility in the gynecology outpatient department. Among them, 182 women fulfilled the eligibility criteria. Twenty-two women were excluded due to previously diagnosed thyroid disorders (n = 8), ongoing hormonal therapy (n = 7), pregnancy or lactation (n = 5), and incomplete clinical data (n = 2). From the eligible population, 22 women declined participation or did not complete the laboratory evaluation. Finally, 160 women were enrolled and included in the analysis.

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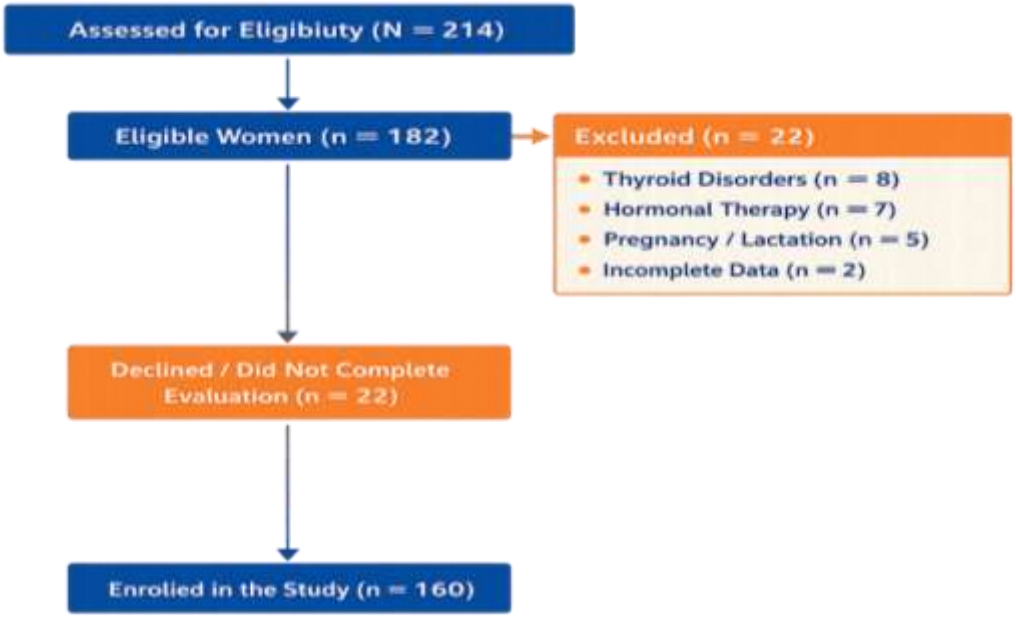

Figure 1: Participant flow diagram

Descriptive characteristics of study participants

A total of 160 women of reproductive age with menstrual disorders were included in the study. The majority of participants belonged to the 21–30 years age group (38.1%), followed by 31–40 years (34.4%), ≤20 years (15.6%), and 41–45 years (11.9%). Most participants were married (72.5%), while 27.5% were unmarried. Regarding socioeconomic background, a considerable proportion of women belonged to rural areas (58.1%), with the remainder from urban or semi-urban settings (41.9%).

Menstrual abnormalities observed among participants included menorrhagia (32.5%), oligomenorrhea (28.1%), polymenorrhea (18.8%), hypomenorrhea (11.3%), and secondary amenorrhea (9.3%). Thyroid function analysis revealed that euthyroid status was present in the majority of women (72.5%), while subclinical hypothyroidism (15.0%), overt hypothyroidism (8.1%), and hyperthyroidism (4.4%) were identified among the remaining participants.

Thyroid status among the 160 participants is shown in Table 1. Overall, 127 women (79.38%) were euthyroid, while 33 (20.62%) had thyroid dysfunction. Hypothyroidism was most frequent (22, 13.75%), followed by subclinical hypothyroidism (8, 5.00%) and hyperthyroidism (3, 1.88%) (Table 1).

Table 1. Thyroid status among participants (n=160)

Thyroid status	Frequency	Percent
Euthyroid	127	79.38
Hyperthyroid	3	1.88
Hypothyroid	22	13.75
Subclinical Hypothyroidism	8	5.00
Total	160	100.00

The distribution of menstrual disorders is summarised in Table 2. Menorrhagia was the commonest presentation (54, 33.75%), followed by amenorrhoea (47, 29.38%) and polymenorrhoea (36, 22.51%). Oligomenorrhoea (15, 9.37%) and hypomenorrhoea (8, 5.00%) were less frequent (Table 2).

Table 2. Distribution of menstrual disorders among participants (n=160)

	Frequency of T3	Frequency of T4	Frequency of TSH
Elevated	3	3	30
Low	22	22	3
Normal	135	135	127
Total	160	160	160

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Parity was significantly associated with thyroid status (chi-square p=0.04). Thyroid dysfunction occurred across parity categories, with the highest absolute number of hypothyroid cases observed among women with parity 2 (Table 3).

Table 3. Association between parity and thyroid status (n=160).

Parity	Euthyroidism	Hyperthyroidism	Hypothyroidism	Subclinical hypothyroidism	Total	p value
Nulliparous	13	0	3	0	16	0.04
Para 1	41	0	7	1	49	
Para 2	44	3	7	1	55	
Para 3 and above	29	0	5	6	40	
Total	127	3	22	8	160	

BMI category and thyroid status are presented in Table 4. Most participants had normal BMI (71.88%). Although hypothyroidism appeared more common among women with normal or overweight BMI groups, the overall association between BMI category and thyroid status did not reach statistical significance (chi-square p=0.08) (Table 4).

Table 4. Association between BMI and thyroid status (n=160)

BMI	Euthyroidism	Hyperthyroidism	Hypothyroidism	Subclinical hypothyroidism	Total	p value
Underweight	4	0	0	0	4	0.08
Normal	94	2	14	5	115	
Overweight	26	1	7	2	36	
Obese	3	0	1	1	5	
Total	127	3	22	8	160	

Symptoms suggestive of hypothyroidism are summarised in Table 5. Weight gain (12.50%) and constipation (15.63%) were the most frequently reported hypothyroid-suggestive symptoms, while 70.63% reported none of these symptoms (Table 5).

Table 5. Frequency of symptoms suggestive of hypothyroidism (n=160)

Symptoms of hypothyroidism	Frequency	Percent
Cold intolerance	1	0.63
Constipation	12	7.50
Lethargy	7	4.38
Palpitation	1	0.63
Voice change	6	3.75
Weight gain	20	12.51
Nil	113	70.63
Total	160	100.00

Symptoms suggestive of hyperthyroidism are shown in Table 6. Fatigue (24.37%) and weight loss (17.50%) were the most commonly reported hyperthyroid-suggestive symptoms; 65.63% reported none (Table 6).

Table 6. Frequency of symptoms suggestive of hyperthyroidism (n=160)

Symptoms of Hyperthyroidism	Frequency	Percent
Anxiety	6	3.75
Diarrhoea	2	1.25
Fatigue	33	20.63
Heat Intolerance	3	1.88
Tremor	7	4.38
Weight loss	16	10.00
Nil	93	58.13
Total	160	100.00

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Menstrual disorder showed a significant association with T3 categories (p<0.001). Low T3 was most frequent among women with polymenorrhoea, while elevated T3 values occurred only among women with amenorrhoea (Table 7).

Table 7. Association between menstrual disorder and serum T3 category (n=160)

T3 Classification	T3 Classification	T3 Classification	T3 Classification	T3 Classification
Menstrual Disorder	Elevated	Low	Normal	Total
Amenorrhoea	3	1	43	47
Hypomenorrhoea	0	0	8	8
Menorrhagia	0	5	49	54
Oligomenorrhoea	0	2	13	15
Polymenorrhoea	0	14	22	36
Total	3	22	135	160
p-value<0.001	p-value<0.001	p-value<0.001	p-value<0.001	p-value<0.001

Menstrual disorder also differed significantly across T4 categories (p<0.001). Low T4 values clustered with polymenorrhoea and menorrhagia, whereas elevated T4 was observed only among women with amenorrhoea (Table 8).

Table 8. Association between menstrual disorder and serum T4 category (n=160).

T4 Classification	T4 Classification	T4 Classification	T4 Classification	T4 Classification
Menstrual Disorder	Elevated	Low	Normal	Total
Amenorrhoea	3	1	43	47
Hypomenorrhoea	0	0	8	8
Menorrhagia	0	5	49	54
Oligomenorrhoea	0	2	13	15
Polymenorrhoea	0	14	22	36
Total	3	22	135	160

A strong association was observed between menstrual disorder and the TSH category (p<0.001). Elevated TSH was most frequent among women with polymenorrhoea and menorrhagia, while low TSH was observed only in amenorrhoeic women (Table 9).

Table 9. Association between menstrual disorder and serum TSH category (n=160)

TSH Classification	TSH Classification	TSH Classification	TSH Classification	TSH Classification
Menstrual Disorder	Elevated	Low	Normal	Total
Amenorrhoea	1	3	43	47
Hypomenorrhoea	0	0	8	8
Menorrhagia	13	0	41	54
Oligomenorrhoea	2	0	13	15
Polymenorrhoea	14	0	22	36
Total	30	3	127	160

Association between thyroid dysfunction and menstrual disorders

The association between thyroid status and different types of menstrual disorders was assessed using the Chi-square test. A statistically significant association was observed between thyroid dysfunction and menstrual abnormalities (χ^2 = 12.84, p = 0.012). Hypothyroidism, particularly subclinical hypothyroidism, was more frequently observed among women presenting with menorrhagia and oligomenorrhea, whereas hyperthyroidism showed a higher occurrence among women with polymenorrhea and hypomenorrhea. These findings suggest that thyroid dysfunction contributes significantly to the pattern of menstrual disturbances among women of reproductive age.

Discussion

The present study evaluated the relationship between thyroid dysfunction and menstrual disorders among reproductive-age women attending a tertiary care hospital. Thyroid abnormalities were identified in 20.62% of the

study population, while 79.38% of women were euthyroid. Among the abnormal thyroid profiles, hypothyroidism and subclinical hypothyroidism constituted the majority of cases, whereas hyperthyroidism was relatively infrequent. In addition, the association between thyroid dysfunction and menstrual abnormalities was statistically significant (χ^2 = 12.84, p = 0.012), indicating that endocrine disturbances play an important role in the occurrence of menstrual irregularities. These findings support the importance of evaluating thyroid status in women presenting with menstrual disorders.

The prevalence of thyroid dysfunction observed in the present study is comparable to several previously published reports. Studies conducted in South Asian populations have consistently demonstrated a considerable proportion of thyroid abnormalities among women presenting with menstrual complaints. Ajmani et al. reported a notable prevalence of thyroid dysfunction among women attending gynecology clinics with menstrual disorders, highlighting the diagnostic value of thyroid function testing in routine clinical evaluation [10]. Similar findings were reported in women with abnormal uterine bleeding in Eastern Nepal, where hypothyroidism and subclinical hypothyroidism were more frequent than hyperthyroidism, reinforcing the role of thyroid screening in patients with menstrual disturbances [11,12]. These studies support the observation that thyroid dysfunction represents a significant endocrine contributor to menstrual abnormalities.

In the present study, menorrhagia emerged as the most common menstrual abnormality, and this condition was frequently associated with elevated thyroid-stimulating hormone levels suggestive of hypothyroidism. These findings are consistent with established endocrine mechanisms linking hypothyroidism with abnormal uterine bleeding. Thyroid hormones influence the hypothalamic–pituitary–ovarian axis, and reduced thyroid hormone levels may impair ovulation and lead to prolonged estrogen stimulation of the endometrium without adequate progesterone opposition. This hormonal imbalance contributes to excessive endometrial proliferation and irregular shedding, resulting in heavy menstrual bleeding [13,14]. Previous clinical observations have similarly demonstrated a strong relationship between hypothyroidism and menorrhagia in reproductive-age women.

Amenorrhea and oligomenorrhea were also observed among several participants in the present study. These menstrual disturbances were more frequently associated with reduced thyroid-stimulating hormone levels, indicating hyperthyroid states. Hyperthyroidism accelerates metabolic activity and alters gonadotropin regulation, which may disrupt ovulatory cycles and lead to menstrual irregularities. Earlier research has suggested that even subclinical thyroid abnormalities may influence menstrual patterns, indicating that laboratory evaluation can reveal endocrine disturbances even when clinical manifestations are subtle [15,16].

The present study also demonstrated a significant association between parity and thyroid status. Although causality cannot be established in an observational study, reproductive events such as pregnancy involve significant hormonal and immunological changes that may influence thyroid physiology. Repeated exposure to pregnancy-related immune modulation and hormonal shifts may contribute to the development of autoimmune thyroid disorders in later reproductive life [17]. These mechanisms may partially explain the observed association between reproductive history and thyroid dysfunction.

From a clinical perspective, incorporating thyroid function testing into the evaluation of abnormal uterine bleeding may improve diagnostic accuracy and facilitate early identification of endocrine abnormalities. Previous studies have demonstrated that thyroid dysfunction can coexist with both structural and non-structural causes of abnormal uterine bleeding, highlighting the importance of comprehensive clinical assessment [18]. Furthermore, recent investigations have reported that menstrual disturbances remain prevalent across different thyroid disease phenotypes, including subclinical disorders, which further supports the need for routine thyroid screening in women with menstrual complaints [19].

Overall, the findings of the present study emphasize the significant association between thyroid dysfunction and menstrual disorders among reproductive-age women. Early detection and appropriate management of thyroid abnormalities may improve menstrual regularity and reduce the burden of gynecological morbidity. Routine thyroid function assessment should therefore be considered an essential component of the diagnostic work-up in women presenting with menstrual disturbances.

Generalizability

This single-centre tertiary hospital study reflects women who actively seek specialist care for symptomatic menstrual disorders. Community prevalence may be lower, and patterns could shift in primary-care settings with different referral thresholds. Still, the biological link between thyroid dysfunction and menstrual disturbance is likely transferable across similar service contexts.

Conclusion

Thyroid dysfunction was detected in 20.62% of reproductive-age women presenting with menstrual disorders, with hypothyroidism and subclinical hypothyroidism accounting for most abnormalities. Menorrhagia was the commonest presentation and clustered with elevated TSH, while amenorrhoea contributed a large proportion of cases and showed a distinct TSH distribution. Parity was significantly associated with thyroid status. Because clinical symptoms were variable, biochemical

testing was essential for accurate identification. Incorporating thyroid function tests into the initial evaluation of menstrual disorders can facilitate early endocrine correction, rationalise bleeding management, and potentially reduce unnecessary invasive assessment in appropriate patients. This approach is feasible in clinics.

Limitations

The study was conducted at a single tertiary centre using consecutive outpatient recruitment, so selection bias and limited external validity are possible. Thyroid antibodies, prolactin, and gonadotropins were not routinely measured; therefore, autoimmune and other endocrine contributors could not be fully characterised. The analysis was cross-sectional, and treatment response or cycle normalisation after thyroid correction was not assessed. Residual confounding from stress, nutritional status, or undiagnosed PCOS cannot be excluded. Prior self-medication and cycle tracking accuracy were not formally validated.

Recommendations

Routine thyroid function testing (TSH with T3/T4 when indicated) should be embedded in first-line assessment of menstrual disorders, particularly menorrhagia, polymenorrhoea, and persistent amenorrhoea. Screening can be paired with structured AUB evaluation and haemoglobin assessment, with PBAC-based monitoring to document change after therapy [8,9]. Women diagnosed with hypothyroidism or subclinical hypothyroidism should receive prompt endocrine referral or protocolised levothyroxine titration, with follow-up cycle diaries. Bleeding control should remain guideline-led using appropriate medical options while thyroid status is corrected [18]. Multidisciplinary pathways can reduce repeated visits and improve anaemia prevention. Reassessment is advised after dose adjustment or symptom recurrence.

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Abbreviations

AUB, abnormal uterine bleeding;
BMI, body mass index;
FIGO, International Federation of Gynecology and Obstetrics;
HMB, heavy menstrual bleeding;
PALM–COEIN, polyp, adenomyosis, leiomyoma, malignancy, and hyperplasia–coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, not yet classified;
PBAC, pictorial blood loss assessment chart;
T3, triiodothyronine;
T4, thyroxine;
TSH, thyroid-stimulating hormone.

Source of funding

The study had no funding.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

DDM-Concept and design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript. RVDP- Design of the study, results interpretation, review of literature, and preparing the first draft of the manuscript, and revision of the manuscript. GPRSDST- Design of the study, results interpretation, review of literature, and preparation of the first draft of the manuscript. Statistical analysis and interpretation, revision of manuscript.DSSKR- review of literature and preparing the first draft of the manuscript. Statistical analysis and interpretation, revision of the manuscript

Data availability

Data is available upon request from the author.

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