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A Cross-Sectional Study on the Correlation Between Thyroid Dysfunction and Abnormal Uterine Bleeding in Women of Reproductive Age

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ABSTRACT

Background: Abnormal uterine bleeding (AUB) is one of the most common gynecological complaints among reproductive-age women, often resulting from hormonal imbalances. Thyroid hormones play a crucial role in maintaining menstrual regularity and endometrial stability. This study aimed to assess the correlation between thyroid dysfunction and AUB patterns in women of reproductive age.

Methods: A hospital-based cross-sectional study was conducted on 150 women aged 15-45 years presenting with AUB at a tertiary care center. Detailed clinical history, menstrual pattern, physical examination, and ultrasonographic findings were recorded. Serum T3, T4, and TSH levels were estimated using enzyme-linked immunosorbent assay (ELISA). Patients were categorized as euthyroid or having thyroid dysfunction (subclinical hypothyroidism, overt hypothyroidism, or hyperthyroidism). Data were analyzed using SPSS v25 with appropriate statistical tests, and $p<0.05$ was considered significant.

Results: The overall prevalence of thyroid dysfunction among women with AUB was 36.0% (95% CI: 28.8-43.9%). Subclinical hypothyroidism (18.7%) was the most common abnormality, followed by overt hypothyroidism (12.0%) and hyperthyroidism (5.3%). Women with thyroid dysfunction had significantly higher BMI (27.2 ± 3.9 vs. 24.9 ± 3.6 kg/m²; $p<0.001$), lower hemoglobin (11.1 ± 1.6 vs. 11.9 ± 1.4 g/dL; $p=0.002$), and higher PBAC scores (198 ± 74 vs. 142 ± 58; $p<0.001$) compared to euthyroid women. Oligomenorrhea was significantly associated with hypothyroidism (30.4% vs. 14.6%; $p=0.026$). TSH showed a positive correlation with menstrual blood loss ($r=+0.41$; $p<0.001$) and cycle-length variability ($r=+0.35$; $p<0.001$).

Conclusion: Thyroid dysfunction, particularly subclinical hypothyroidism, is prevalent among women with AUB and contributes significantly to menstrual irregularities and heavy bleeding. Routine thyroid function testing should be incorporated into the diagnostic evaluation of AUB to ensure early detection, cost-effective management, and prevention of long-term complications.

Keywords: Thyroid dysfunction, Abnormal uterine bleeding, Subclinical hypothyroidism.

INTRODUCTION

Abnormal uterine bleeding (AUB) is one of the most frequent gynecological complaints among women of reproductive age and represents a significant cause of morbidity and health-care burden globally. It is defined as any variation from the normal menstrual cycle in terms of regularity, frequency, duration, or volume of flow, and may include menorrhagia, metrorrhagia, polymenorrhea, or oligomenorrhea. The etiological spectrum of AUB is broad, encompassing structural, hormonal, and systemic causes. The International Federation of Gynecology and Obstetrics (FIGO) introduced the PALM-COEIN classification system to categorize AUB etiologies as structural (Polyp, Adenomyosis, Leiomyoma, Malignancy) and non-structural (Coagulopathy, Ovulatory dysfunction, Endometrial, Iatrogenic, not yet classified) causes. Among these, endocrine abnormalities-particularly thyroid dysfunction-play a critical role in ovulatory regulation and endometrial homeostasis.[1]

Thyroid hormones have a profound influence on reproductive physiology through their effects on metabolism, gonadotropin-releasing hormone (GnRH) pulsatility, ovarian function, and sex hormone-binding globulin levels. Both hypothyroidism and hyperthyroidism are known to cause menstrual irregularities, anovulatory cycles, and fertility disturbances. In hypothyroidism, increased levels of thyrotropin-releasing hormone (TRH) stimulate prolactin secretion, which inhibits gonadotropin release, resulting in luteal phase defects or anovulation. Conversely, hyperthyroidism may shorten the menstrual cycle due to elevated estrogen metabolism and altered gonadotropin feedback mechanisms.[2]

The prevalence of thyroid dysfunction among women with AUB varies widely in different studies, ranging from 15% to 40%, depending on population characteristics and diagnostic thresholds. Early identification of thyroid abnormalities in women presenting with AUB offers an opportunity for reversible management and may prevent unnecessary invasive diagnostic procedures. Despite its clinical importance, thyroid screening is often underutilized in the initial evaluation of AUB, especially in resource-limited settings.[3]

Indian studies have highlighted the high burden of undiagnosed thyroid disorders among reproductive-age women. The increasing prevalence of subclinical hypothyroidism in the Indian population underscores the need to evaluate thyroid function as an integral part of the diagnostic workup for menstrual disorders. Given the diverse dietary, environmental, and genetic factors influencing thyroid health in India, region-specific data remain crucial to guide clinical protocols.[4]

Therefore, this study was undertaken to assess the correlation between thyroid dysfunction and various patterns of abnormal uterine bleeding in women of reproductive age. By identifying the prevalence and spectrum of thyroid disorders in AUB cases, the study aims to emphasize the importance of simple hormonal assessment in the early detection and management of AUB, potentially improving reproductive health outcomes.[5]

AIM:

To determine the correlation between thyroid dysfunction and abnormal uterine bleeding in women of reproductive age.

OBJECTIVES:

1. To estimate the prevalence of thyroid dysfunction among women presenting with abnormal uterine bleeding.
2. To analyze the patterns of abnormal uterine bleeding in relation to different thyroid disorders.
3. To establish the correlation between thyroid hormone levels and clinical characteristics of AUB.

MATERIAL AND METHODOLOGY

- **Source of Data:** The study data were obtained from women presenting with complaints of abnormal uterine bleeding at the Department of Obstetrics and Gynecology, at Bidar Institute of Medical

Sciences, Bidar a tertiary care teaching hospital, situated in North Karnataka, India.

- **Study Design:** This was a hospital-based cross-sectional observational study.
- **Study Location:** The study was conducted in the Department of Obstetrics and Gynecology at tertiary care teaching hospital, India.
- **Study Duration:** The study was carried out over a period of 18 months.
- **Sample Size:** A total of 150 women of reproductive age (15-45 years) presenting with abnormal uterine bleeding were enrolled.

Inclusion Criteria:

- Women aged 15-45 years presenting with abnormal uterine bleeding of any pattern.
- Patients willing to give informed written consent.
- Patients not on hormonal therapy for at least three months prior to recruitment.

Exclusion Criteria:

- Women with known coagulation disorders or systemic diseases such as diabetes, hepatic or renal dysfunction.
- Patients with intrauterine devices, fibroids, or structural uterine pathologies confirmed on ultrasonography.
- Pregnant and postpartum women within six months of delivery.

Procedure and Methodology: All eligible women underwent a detailed history and clinical examination, including menstrual pattern, duration, frequency, and flow characteristics. Relevant obstetric, medical, and drug histories were recorded. Routine investigations such as complete blood count, fasting blood sugar, and pelvic ultrasonography were done to rule out structural causes of AUB. Thyroid function tests (serum T3, T4, and TSH) were performed for all participants using enzyme-linked immunosorbent assay (ELISA) kits. Based on test results, patients were categorized into euthyroid, hypothyroid (overt or subclinical), and hyperthyroid groups. The menstrual abnormalities were classified according to FIGO guidelines.

Sample Processing: Venous blood samples (5 mL) were collected under aseptic precautions, centrifuged, and serum aliquots analyzed for T3, T4, and TSH using standardized ELISA kits in the hospital's biochemistry laboratory. Internal and external quality control procedures were followed throughout testing.

Data Collection: All data were entered in a pre-designed proforma capturing sociodemographic details, menstrual patterns, thyroid profile, and clinical findings.

Statistical Methods: Data were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Descriptive statistics were expressed as mean ± SD and percentages. Associations between thyroid status and types of AUB were evaluated using Chi-square or Fisher's exact test. Continuous variables were compared using independent t-tests. A p-value <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

Table 1 - Baseline profile and key AUB characteristics by thyroid status (N=150)

Measure	Euthyroid (n=96) Mean ± SD / n (%)	Thyroid dysfunction† (n=54) Mean ± SD / n (%)	Unpaired t-test	95% CI	p-value
Age (years)	28.1 ± 4.1	29.4 ± 4.3	Mean diff = +1.30; Welch t=1.81 (df≈141)	-0.11 to +2.71	0.071
BMI (kg/m²)	24.9 ± 3.6	27.2 ± 3.9	Mean diff = +2.30; Welch t=3.56 (df≈106)	+1.03 to +3.57	0.00037

Hemoglobin (g/dL)	11.9 ± 1.4	11.1 ± 1.6	Mean diff = -0.80; Welch t=-3.07 (df≈103)	-1.31 to -0.29	0.0021
PBAC score	142 ± 58	198 ± 74	Mean diff = +56; Welch t=4.79 (df≈97)	+33.10 to +78.90	1.6×10^{-6}
Cycle-length variability (days)	5.1 ± 3.3	8.4 ± 4.6	Mean diff = +3.30; Welch t=4.64 (df≈98)	+1.91 to +4.69	3.4×10^{-6}
Endometrial thickness (mm)	8.6 ± 2.4	9.8 ± 2.8	Mean diff = +1.20; Welch t=2.65 (df≈103)	+0.31 to +2.09	0.0081
Anemia (<12 g/dL)	32 (33.3%)	28 (51.9%)	RR = 1.56; χ^2 (1) =4.94	1.06 to 2.28	0.026

†Thyroid dysfunction includes subclinical hypothyroidism, overt hypothyroidism, and hyperthyroidism.

Table 1 compares the demographic and clinical characteristics of women with abnormal uterine bleeding (AUB) based on thyroid function status and unpaired t-test was applied. Out of 150 participants, 96 were euthyroid and 54 had thyroid dysfunction (including subclinical hypothyroidism, overt hypothyroidism, and hyperthyroidism). Women with thyroid dysfunction were slightly older (mean age 29.4 ± 4.3 years) than the euthyroid group (28.1 ± 4.1 years), though the difference was not statistically significant (p=0.071). The mean body mass index (BMI) was significantly higher among those with thyroid dysfunction (27.2 ± 3.9 kg/m²) compared to euthyroid women (24.9 ± 3.6 kg/m²), with a mean difference of +2.3 (95% CI: +1.03 to +3.57, p=0.00037).

Hemoglobin levels were significantly lower in the thyroid dysfunction group (11.1 ± 1.6 g/dL) than in the euthyroid group (11.9 ± 1.4 g/dL), indicating a greater prevalence of anemia among hypothyroid and hyperthyroid women (p=0.0021). Similarly, menstrual blood loss, as measured by the Pictorial Blood Assessment Chart (PBAC), was notably higher in women with thyroid dysfunction (198 ± 74) compared to euthyroid counterparts (142 ± 58), a highly significant finding (p<0.001). Cycle-length variability was also greater in thyroid-affected women (8.4 ± 4.6 vs. 5.1 ± 3.3 days; p<0.001), reflecting irregular ovulatory cycles associated with hormonal imbalance. Endometrial thickness measured on ultrasonography was significantly higher among those with thyroid dysfunction (9.8 ± 2.8 mm vs. 8.6 ± 2.4 mm; p=0.0081). Additionally, anemia (Hb <12 g/dL) was more prevalent among thyroid-dysfunction cases (51.9%) than euthyroid women (33.3%), with a relative risk of 1.56 (95% CI: 1.06-2.28; p=0.026).

Table 2. percentage distribution of thyroid dysfunction among women with AUB (N=150)

Category	n (%)
Any thyroid dysfunction	54 (36.0%)
Subclinical hypothyroidism	28 (18.7%)
Overt hypothyroidism	18 (12.0%)
Hyperthyroidism	8 (5.3%)
Age <30 y (n=77): any dysfunction	22 (28.6%)
Age ≥30 y (n=73): any dysfunction	32 (43.8%)

Table 2 presents the distribution and prevalence of thyroid disorders among the 150 women studied. The overall prevalence of thyroid dysfunction was 36.0% (95% CI: 28.8-43.9), which is consistent with the reported prevalence in Indian reproductive-age cohorts. Subclinical hypothyroidism was the most common abnormality (18.7%), followed by overt hypothyroidism (12.0%) and hyperthyroidism (5.3%). When stratified

by age, thyroid dysfunction was more frequent among women aged ≥30 years (43.8%) compared to those aged <30 years (28.6%). The relative risk for thyroid dysfunction in the ≥30 years group was 1.53 (95% CI: 0.99-2.38; χ^2=3.79, p=0.052), indicating a trend toward higher prevalence with advancing age, though not reaching statistical significance. These data suggest that screening for thyroid function should be particularly emphasized in women above 30 years presenting with AUB.

Table 3. AUB pattern distribution by thyroid subtype (N=150)

AUB pattern	Euthyroid (n=96)	Subclinical hypo (n=28)	Overt hypo (n=18)	Hyper (n=8)	Chi-square test
Heavy menstrual bleeding (HMB)	38 (39.6%)	10 (35.7%)	9 (50.0%)	2 (25.0%)	$\chi^2(12)=14.27$, p=0.284
Oligomenorrhea	14 (14.6%)	9 (32.1%)	5 (27.8%)	1 (12.5%)	
Polymenorrhea	18 (18.8%)	3 (10.7%)	1 (5.6%)	3 (37.5%)	
Amenorrhea	6 (6.3%)	3 (10.7%)	2 (11.1%)	0 (0.0%)	
Intermenstrual bleeding	20 (20.8%)	3 (10.7%)	1 (5.6%)	2 (25.0%)	

Oligomenorrhea, hypothyroid (subclinical+overt, n=46) vs euthyroid (n=96): 14/46 (30.4%) vs 14/96 (14.6%); RR=2.09; 95% CI 1.09-4.01; χ^2 (1) =4.94; p=0.026 (significant enrichment of oligomenorrhea in hypothyroidism).

Table 3 delineates the various patterns of abnormal uterine bleeding observed in euthyroid and thyroid-dysfunction subgroups. Heavy menstrual bleeding (HMB) was the most frequent presentation across all groups, affecting 39.6% of euthyroid and 35.7-50% of hypothyroid women. Oligomenorrhea was notably more common among women with hypothyroidism-both subclinical and overt-accounting for 30.4% of these cases compared to 14.6% among euthyroid participants. The difference was statistically significant (RR=2.09; 95% CI: 1.09-4.01; p=0.026). Polymenorrhea was more frequent in hyperthyroid women (37.5%) compared to euthyroid or hypothyroid participants. Amenorrhea and intermenstrual bleeding occurred in smaller proportions without significant differences between groups (p>0.05). Although the omnibus chi-square test (χ^2=14.27, p=0.284) did not indicate an overall significant distribution difference among all thyroid subtypes.

Table 4. Correlation of thyroid hormones with clinical characteristics of AUB (N=150)

Pair (continuous variables)	Correlation (r)	95% CI	Test statistic	p-value
TSH vs PBAC score	+0.41	+0.27 to +0.54	t (148) =5.47	4.5×10^{-8}
TSH vs cycle-length variability (days)	+0.35	+0.20 to +0.48	t (148) =4.55	5.5×10^{-6}
TSH vs endometrial thickness (mm)	+0.19	+0.03 to +0.34	t (148) =2.35	0.0186
FT4 vs PBAC score	-0.29	-0.43 to -0.14	t (148) =-3.69	0.00023
FT4 vs hemoglobin (g/dL)	+0.22	+0.06 to +0.37	t (148) =2.74	0.0061

Table 4 illustrates the correlation coefficients between thyroid hormone levels (TSH and FT4) and clinical parameters of AUB. A strong positive correlation was observed between TSH and PBAC score (r=+0.41, p<0.001), indicating that higher TSH levels are associated with increased menstrual blood loss. Similarly, TSH positively correlated with cycle-length variability (r=+0.35, p<0.001) and endometrial thickness (r=+0.19, p=0.0186), suggesting that thyroid dysfunction contributes to both heavier and more irregular menstrual cycles. Conversely, FT4 levels showed a negative correlation with PBAC score (r=-0.29, p=0.00023), implying that reduced thyroid hormone levels (as seen in hypothyroidism) are linked to heavier bleeding. FT4 also showed a positive correlation with hemoglobin (r=+0.22, p=0.0061), reinforcing the observation that hypothyroid women are more prone to anemia.

DISCUSSION

Data show that women with thyroid dysfunction presenting with AUB had higher BMI, heavier bleeding, greater cycle-length variability, thicker endometrium, and more anemia than euthyroid women. The BMI gap (+2.30 kg/m²; p<0.001) mirrors the well-described link between hypothyroidism and weight gain, insulin resistance, and anovulatory dysfunction reported in endocrine-reproductive reviews by Maryam T et al. (2020) [6]. The significantly lower hemoglobin in the dysfunction group (-0.80 g/dL; p=0.002) is consistent with clinical observations that both overt and subclinical hypothyroidism predispose to iron-deficiency and functional anemia through menorrhagia and altered erythropoiesis, as synthesized by Tamilarasi S et al. (2020) [7]. The bleeding burden (PBAC +56 points; $p \approx 1.6 \times 10^{-6}$) and higher endometrial thickness (+1.2 mm; p=0.008) align with Indian series demonstrating heavier bleeding and proliferative endometrium among hypothyroid AUB patients Jaiswal P et al. (2022) [8]. These findings reinforce the PALM-COEIN framework's ovulatory-dysfunction arm (the "O" in COEIN), wherein endocrine causes-particularly thyroid disease-drive irregular and heavy bleeding. Our anemia prevalence difference (RR 1.56; p=0.026) is directionally similar to prior cohorts, where thyroid-related HMB was a dominant pathway to low hemoglobin Chowdhury N et al. (2021) [9].

In Table 2, the overall prevalence of any thyroid dysfunction was 36.0% (95% CI 28.8-43.9), with subclinical hypothyroidism (18.7%) more common than overt hypothyroidism (12.0%) and hyperthyroidism (5.3%). This pattern matches Indian epidemiology highlighting a high burden of subclinical hypothyroidism among reproductive-age women, particularly those with menstrual complaints Maryam T et al. (2020) [6]. While general population estimates for overt disease are lower, the TRIAD study and related Indian surveys have emphasized a substantial pool of subclinical hypothyroidism that becomes clinically relevant in gynecologic settings Adan AA et al. (2025) [10]. The age-stratified trend toward greater dysfunction in women ≥30 years (RR 1.53; p=0.052) echoes the age-related rise in thyroid abnormalities noted in community cohorts and infertility clinics. et al. (20)[11].

Table 3 dissects bleeding phenotypes across thyroid subtypes. Although the omnibus distribution did not differ overall (p=0.284), a prespecified comparison showed oligomenorrhea was significantly enriched in hypothyroidism (30.4% vs 14.6%; RR 2.09; p=0.026). This is mechanistically plausible: elevated TRH and secondary hyperprolactinemia blunt GnRH pulsatility, yielding anovulation and longer, irregular cycles-well documented by Begum M. (2021) [12]. The higher proportion of polymenorrhea in hyperthyroidism (37.5%) is also biologically coherent, given shortened follicular phases and heightened estrogen turnover reported in thyrotoxicosis. That heavy menstrual bleeding remained common across groups is compatible with clinical series from Indian tertiary centers, where both euthyroid and thyroid-dysfunction patients frequently present with HMB, but the pattern tilt (oligo/amenorrhea in hypothyroid; poly/frequent bleeding in hyperthyroid) differentiates endocrine subtypes Uma V et al. (2025) [13].

Table 4 demonstrates coherent hormone-phenotype coupling. Higher TSH correlated positively with PBAC (r=+0.41; $p<10^{-7}$) and cycle-length variability (r=+0.35), while FT4 correlated inversely with PBAC (r=-0.29) and positively with hemoglobin (r=+0.22). These moderate correlations map onto the pathophysiology of ovulatory dysfunction and endometrial instability in hypothyroidism. The weak-moderate association of TSH with endometrial thickness (r=+0.19; p=0.019) further supports a hormonal influence on endometrial dynamics and bleeding severity, compatible with PALM-COEIN's emphasis on systematic evaluation for endocrine contributors Rai A et al. (2020) [14].

CONCLUSION

The present cross-sectional study demonstrated a significant correlation between thyroid dysfunction and abnormal uterine bleeding (AUB) in women of reproductive age. Among the 150 women studied, 36% exhibited some form of thyroid dysfunction, with subclinical hypothyroidism being the most prevalent. Women with thyroid abnormalities showed higher BMI, lower hemoglobin levels, greater menstrual blood loss, and wider cycle-length variability compared to euthyroid counterparts. Oligomenorrhea was notably more frequent among hypothyroid women, whereas polymenorrhea was observed more commonly in hyperthyroid cases. A positive correlation between TSH and both menstrual blood loss and cycle irregularity, along with a negative correlation between FT4 and PBAC scores, underlined the strong hormonal influence of thyroid function on menstrual physiology. The findings emphasize the need for routine thyroid screening in women presenting with AUB, as early identification and management of thyroid dysfunction can prevent unnecessary invasive interventions, correct menstrual irregularities, and improve overall reproductive health outcomes. This study thus highlights the endocrine-gynecologic interplay and supports integrating thyroid function evaluation into the standard diagnostic protocol for AUB.

Limitations

This study had several limitations. First, being a cross-sectional study, it could only establish correlation and not causation between thyroid dysfunction and AUB. Second, the sample size, although adequate for preliminary analysis, was confined to a single tertiary care center and may not represent broader population diversity. Third, potential confounders such as stress, obesity, polycystic ovarian syndrome, and other endocrine disorders were not exhaustively controlled. Fourth, histopathological confirmation of endometrial changes was not performed in all cases, which could have further validated hormonal influences on endometrial morphology. Lastly, follow-up assessments post-treatment for thyroid abnormalities were not included, limiting the understanding of long-term therapeutic effects on menstrual regulation.

Declaration by Authors

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