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**Original Research Article**

# Association of Thyroid Disorders in Patients having Abnormal Uterine Bleeding due to Ovulatory Dysfunction (AUB-O): A Case-Control Study

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## Abstract

***Background:*** Abnormal uterine bleeding due to ovulatory dysfunction (AUB-O) is a common gynaecological problem in women of reproductive age. Thyroid hormones influence the hypothalamic-pituitary-ovarian axis, ovarian steroidogenesis, sex hormone-binding globulin, and endometrial response. Therefore, both overt and subclinical thyroid dysfunction may present with menstrual disturbances. ***Objective:*** To determine the association between thyroid disorders and AUB-O, compare serum thyroid-stimulating hormone (TSH) and free thyroxine (FT4) levels between cases and controls, and describe the pattern of menstrual abnormality in relation to thyroid status. ***Methods:*** This case-control study was conducted in the Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2015 to November 2016. Sixty (60) women aged 18-45 years with diagnosed AUB-O were compared with 60 matched controls with normal menstrual patterns. Serum TSH and FT4 were measured by chemiluminescent immunoassay. Data were analyzed and compared by statistical tests. ***Results:*** Thyroid dysfunction was significantly more frequent among cases than controls (50.0% versus 21.7%; OR 3.62, 95% CI 1.52-8.69; p= 0.001). Mean serum TSH was higher in cases than controls (12.6±10.6 versus 6.4±21.2 mIU/L; p= 0.045), and mean serum FT4 was also significantly higher (2.4±3.6 versus 1.3±0.7 ng/dl; p= 0.021). Menorrhagia was the commonest complaint (46.7%). Hypothyroidism and subclinical hypothyroidism were mainly associated with menorrhagia, whereas hyperthyroidism and subclinical hyperthyroidism were mainly associated with oligomenorrhoea. Anaemia was significantly more common in cases than controls (60.0% versus 15.0%; p= 0.001). ***Conclusion:*** Thyroid dysfunction was significantly associated with AUB-O in reproductive-age women. Routine thyroid function assessment, particularly serum TSH and FT4, should be included in the evaluation of women with AUB-O to support targeted medical treatment and reduce unnecessary hormonal or surgical intervention.

**Keywords:** Abnormal Uterine Bleeding (AUB); Abnormal Uterine Bleeding Ovulatory Dysfunction (AUB-O); Thyroid Dysfunction; Hypothyroidism; Hyperthyroidism.



## 1. INTRODUCTION

Abnormal uterine bleeding (AUB) is one of the most frequent reasons for gynaecological consultation among women of reproductive age. It affects physical health, daily activity, emotional well-being, and reproductive planning. To standardize terminology and diagnosis, the International Federation of Gynecology and Obstetrics introduced the PALM-COEIN classification, which divides AUB into structural causes (polyp, adenomyosis, leiomyoma, malignancy and

hyperplasia) and non-structural causes (coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, and not otherwise classified) [1, 2]. AUB due to ovulatory dysfunction (AUB-O) is typically characterized by irregular, unpredictable, heavy, or prolonged bleeding in the absence of identifiable structural pathology [2, 3]. Thyroid hormones have important regulatory effects on female reproductive physiology. They influence gonadotropin-releasing hormone pulsatility, prolactin secretion, ovarian follicular development, luteal function, sex hormone-binding globulin, and peripheral estrogen metabolism [4]. Disturbance in thyroid function may therefore produce anovulation, luteal phase defect, altered endometrial maturation, and menstrual irregularity [3, 4]. Hypothyroidism is commonly associated with heavy or prolonged bleeding, while hyperthyroidism is more often associated with scanty flow, oligomenorrhoea, or amenorrhoea [4, 5. Subclinical dysfunction may also be relevant because menstrual disturbance may precede overt clinical features of thyroid disease [4, 5]. Several studies from South Asia have reported a clinically important burden of thyroid dysfunction among women presenting with AUB or menstrual disorders [6-11]. Hypothyroidism, including the subclinical form, is usually the predominant abnormality. Because thyroid dysfunction is often treatable, early recognition can prevent repeated empirical hormonal therapy, avoid unnecessary surgery, and improve menstrual and reproductive outcomes. Bangladesh has a substantial burden of thyroid disease and nutritional vulnerability in women. Rural residence, dietary iodine status, obesity, and limited access to early screening may contribute to undiagnosed thyroid dysfunction [12, 13]. However, data specifically evaluating the association between thyroid dysfunction and AUB-O in Bangladeshi women are limited. This study was undertaken to compare thyroid function between women with AUB-O and matched controls with normal menstruation, and to observe the menstrual patterns associated with different thyroid disorders.

## 2. MATERIALS AND METHODS

### 2.1 Study design and setting

This case-control study was conducted in the Department of Obstetrics and Gynaecology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh, from July 2015 to November 2016.

### 2.2 Study population and grouping

The study included 120 women aged 18-45 years. The case group comprised 60 women diagnosed with AUB-O who attended the outpatient or inpatient department for gynaecology services. The control group comprised 60 women with normal menstrual patterns. Controls were matched with cases for age, parity, socioeconomic status, and body mass index (BMI) as far as practicable.

### 2.3 Eligibility criteria

Women of reproductive age with AUB-O who willingly provided written informed consent were included as cases. Women of similar reproductive age with normal menstrual pattern were included as controls. Exclusion criteria were delivery within the preceding one year, lactation, puberty menorrhagia, structural pelvic pathology such as fibroid uterus, adenomyosis, or endometrial hyperplasia, unclear menstrual history, abortion within three months, use of intrauterine contraceptive device or oral contraceptive pills, known genital tract malignancy, and refusal to participate.

### 2.4 Sample size and sampling technique

The sample size was calculated using a formula for comparison of two means based on previously reported mean thyroid-stimulating hormone (TSH) values [9]. The minimum required sample was 56 in each group. To allow for better comparison, 60 cases and 60 controls were finally enrolled. Purposive sampling technique was applied according to availability of eligible participants.

### 2.5 Data collection and clinical assessment

Data were collected using a predesigned structured questionnaire. Detailed history was taken regarding age, residence, parity, socioeconomic status, menstrual pattern, duration and amount of bleeding, obstetric history, medical history, drug history, and symptoms suggestive of thyroid dysfunction. General physical examination, body mass index (BMI) assessment, evaluation for anaemia and oedema, abdominal examination, per speculum examination, bimanual pelvic examination, and thyroid gland examination were performed accordingly. Structural pelvic causes were excluded clinically and by relevant investigations where indicated.

### 2.6 Laboratory assessment and operational definitions

Five milliliter (5 ml) of venous blood was collected under aseptic precautions from each participant. Serum was separated and stored at -35°C until analysis. Serum TSH and free thyroxine (FT4) were measured by chemiluminescent immunoassay. Reference ranges were TSH: 0.35-5.5 mIU/L and FT4: 0.8-1.8 ng/dl. Hypothyroidism was defined as TSH >5.5 mIU/L and/or FT4 <0.8 ng/dl. Hyperthyroidism was defined as TSH <0.35 mIU/L and/or FT4 >1.8 ng/dl. Subclinical hypothyroidism and subclinical hyperthyroidism were defined by abnormal TSH with FT4 within the reference range.

### 2.7 Statistical analysis

Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Continuous variables were expressed as mean with standard deviation (±SD), and categorical variables were expressed as frequency and percentage. Means were compared using the unpaired t-test, while categorical

variables were compared using the chi-square test. Odds ratio (OR) with 95% confidence interval (CI) was calculated to estimate association. A p value <0.05 was considered statistically significant.

### 2.8 Ethical consideration

Ethical clearance was obtained from the Institutional Review Board (IRB) of BSMMU. Written informed consent was obtained from all participants after explaining the purpose and procedure of the study. Confidentiality and anonymity were maintained throughout data collection, analysis, and reporting. Participation was voluntary, and participants were free to withdraw from the study at any time without affecting their treatment.

## 3. RESULTS

A total of 120 women were enrolled: of them 60 women with AUB-O and 60 matched controls with normal menstrual patterns. The age range was 18-45 years in both groups.

### 3.1 Menstrual complaints among cases

Menorrhagia was the most common presenting complaint, reported by 46.7% women, followed by metrorrhagia (36.7%) and menometrorrhagia (28.3%). Some participants reported more than one bleeding pattern (Table- 1).

**Table 1: Distribution of menstrual complaints in the case group (n= 60)**

| Chief complaint* | Frequency | Percentage (%) |
|---|---|---|
| Menorrhagia | 28 | 46.7 |
| Metrorrhagia | 22 | 36.7 |
| Menometrorrhagia | 17 | 28.3 |
| Polymenorrhoea | 10 | 16.7 |
| Oligomenorrhoea | 7 | 11.7 |
| Metropathia haemorrhagica | 3 | 5.0 |
| Polymenorrhagia | 2 | 3.3 |
| Amenorrhoea | 2 | 3.3 |

*Note: Patients may have presented with multiple complaints.

### 3.2 Demographic and clinical characteristics

Most cases were aged 21-30 years (38.3%), followed by 31-40 years (35.0%). Mean age was 33.05±7.88 years in cases and 31.05±6.89 years in controls, with no statistically significant difference (p= 0.141). Rural residence was more common among cases (70.0%) than controls (56.7%), but the difference was not statistically significant (p= 0.129). Overweight status and anaemia were significantly (p<0.05) more frequent in the case group (Table- 2).

**Table 2: Demographic and clinical characteristics of study participants (N= 120)**

| Characteristic | Case (n=60) | Control (n=60) | p value |
|---|---|---|---|
| **Age group** | | | |
| Age ≤20 years | 4 (6.7) | 4 (6.7) | |
| Age 21-30 years | 23 (38.3) | 29 (48.3) | |
| Age 31-40 years | 21 (35.0) | 21 (35.0) | |
| Age >40 years | 12 (20.0) | 6 (10.0) | |
| Mean±SD age, years | 33.05±7.88 | 31.05±6.89 | 0.141* |
| **Residence** | | | |
| Rural | 42 (70.0) | 34 (56.7) | 0.129** |
| Urban | 18(30.0) | 26 (43.3) | |
| **Body mass index (BMI)** | | | |
| Normal: 19.0-24.9 kg/m² | 18 (30.0) | 40 (66.7) | 0.001** |
| Overweight: 25.0-29.9 kg/m² | 32 (53.3) | 15 (25.0) | |
| Obese: ≥30 kg/m² | 10 (16.7) | 5 (8.3) | |
| **Anaemia** | 36 (60.0) | 9 (15.0) | 0.001** |

Values are expressed as n (%) and Mean±SD, *unpaired t-test and **chi-square test were performed

### 3.3 Thyroid function test parameters

Mean serum TSH and FT4 levels were significantly higher among women with AUB-O compared with controls (Table- 3).

**Table 3: Comparison of thyroid function tests between cases and controls (N= 120)**

| Parameter | Case (n=60) mean±SD | Control (n=60) mean±SD | p value |
|---|---|---|---|
| Serum TSH (mIU/L) | 12.6±10.6 | 6.4±21.2 | 0.045 |
| Serum FT4 (ng/dl) | 2.4±3.6 | 1.3±0.7 | 0.021 |

Values are expressed as Mean±SD, unpaired t-test was performed

### 3.4 Distribution of thyroid function status

Euthyroid status was less common in cases than controls (50.0% versus 78.3%). Overt and subclinical hypothyroidism together were present in 38.3% of cases compared with 15.0% of controls (Table- 4).

**Table 4: Distribution of thyroid function status in the study groups (N= 120)**

| Thyroid status | Case (n=60) | Control (n=60) | p value |
|---|---|---|---|
| Euthyroid | 30 (50.0) | 47 (78.3) | 0.028 |
| Hypothyroid | 12 (20.0) | 4 (6.7) | |
| Hyperthyroid | 5 (8.3) | 3 (5.0) | |
| Subclinical hypothyroid | 11 (18.3) | 5 (8.3) | |
| Subclinical hyperthyroid | 2 (3.3) | 1 (1.7) | |

Values are expressed as n (%), chi-square test was performed

### 3.5 Association between thyroid dysfunction and AUB-O

Thyroid dysfunction was found in 30 cases (50.0%) and 13 controls (21.7%). The association was statistically significant (OR 3.62, 95% CI 1.52-8.69; p= 0.001), indicating that women with thyroid dysfunction had 3.62 times higher odds of AUB-O than euthyroid women (Table- 5).

**Table 5: Association between thyroid dysfunction and AUB-O (n=120)**

| Thyroid dysfunction | Case (n=60) | Control (n=60) | OR | 95% CI | p value |
|---|---|---|---|---|---|
| Present | 30 (50.0) | 13 (21.7) | 3.62 | 1.52-8.69 | 0.001 |
| Absent | 30 (50.0) | 47 (78.3) | | | |

Values are expressed as n (%), chi-square test was performed

### 3.6 Pattern of menstrual abnormality according to thyroid dysfunction

Among cases with thyroid dysfunction, menorrhagia was mainly associated with hypothyroid and subclinical hypothyroid states. Oligomenorrhoea was mainly associated with hyperthyroid and subclinical hyperthyroid states. Metropathia haemorrhagica occurred among overt hypothyroid patients (Table- 6).

**Table 6: Menstrual abnormality patterns among cases with thyroid dysfunction (n= 60)**

| Pattern | Total n (%) | Hypothyroid n (%) | Hyperthyroid n (%) | SC-hypothyroid n (%) | SC-hyperthyroid n (%) |
|---|---|---|---|---|---|
| Menorrhagia | 15 (25.0) | 8 (53.3) | 0 (0.0) | 7 (46.7) | 0 (0.0) |
| Oligomenorrhoea | 6 (10.0) | 0 (0.0) | 4 (66.7) | 0 (0.0) | 2 (33.3) |
| Metrorrhagia | 3 (5.0) | 1 (33.3) | 0 (0.0) | 2 (66.7) | 0 (0.0) |
| Metropathia haemorrhagica | 3 (5.0) | 3 (100.0) | 0 (0.0) | 0 (0.0) | 0 (0.0) |
| Polymenorrhagia | 2 (3.3) | 0 (0.0) | 0 (0.0) | 2 (100.0) | 0 (0.0) |
| Amenorrhoea | 1 (1.7) | 0 (0.0) | 1 (100.0) | 0 (0.0) | 0 (0.0) |

SC = subclinical, thirty (30) cases were euthyroid, values are expressed as n (%)

## 4. DISCUSSION

This case-control study found a significant association between thyroid dysfunction and AUB-O among reproductive-age women. Thyroid dysfunction was present in 50.0% of cases compared with 21.7% of controls, and women with thyroid dysfunction had 3.62 times higher odds of AUB-O. This finding supports the biological and clinical relationship between thyroid status and menstrual regulation. The PALM-COEIN system emphasizes that ovulatory dysfunction is a non-structural cause of AUB [1, 2]. In women without structural pathology, endocrine disorders should be carefully considered. Thyroid dysfunction is particularly relevant because it is common, may be clinically silent, and can often be corrected medically. The significantly higher TSH level among cases in this study suggests that hypothyroid and subclinical hypothyroid states contributed substantially to the observed bleeding abnormalities.

Menorrhagia was the commonest presenting complaint in the present study. This is consistent with Nair *et al.,* who found menorrhagia to be the most common bleeding pattern among women with AUB and

thyroid dysfunction [9]. Similar observations were reported by Kundu *et al.,* Padmaleela *et al.,* and Pahwa *et al.,* where hypothyroid and subclinical hypothyroid states were frequently associated with menorrhagia or polymenorrhoea [8, 10, 11]. Ajmani *et al.,* also reported menorrhagia as a leading menstrual presentation in women with thyroid dysfunction [14]. These findings support the clinical value of thyroid screening in women who present with heavy menstrual bleeding.

The pathophysiological link between hypothyroidism and heavy menstrual bleeding is multifactorial. Reduced thyroid hormone activity may alter gonadotropin secretion, impair follicular development and cause anovulation [8]. Anovulation produces prolonged unopposed estrogenic stimulation of the endometrium, leading to irregular shedding and heavy bleeding [8]. Hypothyroidism may also influence prolactin secretion, sex hormone-binding globulin, and haemostatic function [9]. These mechanisms explain why overt hypothyroidism and subclinical hypothyroidism were mainly associated with menorrhagia and metrorrhagia in this study.

Hyperthyroidism was less frequent than hypothyroidism but showed a distinct bleeding pattern. In the present study, oligomenorrhoea was predominantly associated with hyperthyroid and subclinical hyperthyroid states. This agrees with Kundu *et al.,* who observed oligomenorrhoea in hyperthyroid cases [8], and with other studies reporting lighter or less frequent menstrual flow in hyperthyroid women [4, 14]. Increased thyroid hormone levels may alter gonadotropin responsiveness and sex steroid metabolism, resulting in menstrual irregularity with reduced frequency or volume of bleeding.

The high frequency of anaemia among cases is another important clinical finding. Anaemia was present in 60.0% of cases compared with 15.0% of controls. This is expected in women with heavy or prolonged bleeding and is comparable to findings by Nair *et al.,* [9]. Anaemia may worsen fatigue, reduce quality of life, and increase perioperative risk if surgical treatment is later required. Identifying thyroid-related AUB at an early stage may reduce menstrual blood loss and help prevent or correct anaemia.

Overweight status was significantly more frequent among cases. Thyroid dysfunction and BMI may interact in both directions. Hypothyroidism can reduce basal metabolic rate and promote weight gain, while increased adiposity may influence thyroid hormone metabolism. Solanki *et al.,* reported a positive relationship between serum TSH and BMI in adults [13], and Bhattacharjee *et al.,* observed thyroid disorders among women attending obstetrics and gynaecology services in central India [15]. Although the present study was not designed to establish causality between BMI and thyroid dysfunction, the association suggests that weight assessment should be included during evaluation of AUB-O.

The prevalence of thyroid dysfunction in the present study was higher than that reported by some regional studies. For example, Subedi *et al.,* reported thyroid dysfunction in 10.6% of women with dysfunctional uterine bleeding [16], while Kundu *et al.,* reported 23% [8]. Variation may be explained by differences in study design, population characteristics, diagnostic cut-off values, inclusion criteria, iodine status, and whether subclinical disease was included. The present study specifically included women with AUB-O and used matched controls, which may partly explain the stronger association observed.

The study has important implications for gynaecological practice in Bangladesh. Women with AUB-O are often treated empirically with hormonal therapy, and some may eventually undergo invasive procedures if the underlying endocrine disorder is missed. Serum TSH and FT4 testing is relatively simple and can identify treatable thyroid dysfunction. Incorporating thyroid evaluation into the routine work-up of AUB-O may improve patient care, reduce recurrence of bleeding symptoms, and avoid unnecessary intervention. Overall, the findings indicate that thyroid disorders, particularly overt and subclinical hypothyroidism, are common among women with AUB-O. Menorrhagia should alert clinicians to possible hypothyroidism, while oligomenorrhoea should raise suspicion of hyperthyroid states. A systematic approach that combines clinical assessment, exclusion of structural causes, and thyroid function testing is therefore recommended.

## 5. CONCLUSION

Thyroid dysfunction was significantly associated with abnormal uterine bleeding due to ovulatory dysfunction among reproductive-age women. Women with AUB-O had higher serum TSH and FT4 levels and were more likely to have thyroid dysfunction than women with normal menstrual patterns. Hypothyroidism and subclinical hypothyroidism were mainly associated with menorrhagia, while hyperthyroid states were more commonly associated with oligomenorrhoea. Thyroid function assessment, including serum TSH and FT4, should be included in the evaluation of AUB-O to facilitate early diagnosis, appropriate medical management, correction of anaemia, and avoidance of unnecessary surgical intervention.

**Limitations of the study**

This study was conducted in a single tertiary-care center, which may limit the generalizability of the findings. Although the sample size was adequate to fulfill the study objectives, it remained relatively modest. The use of purposive sampling technique may also have introduced selection bias. In addition, the study design allowed identification of associations only and could not

establish causal relationships. Certain relevant parameters, including anti-thyroid peroxidase antibody, Free triiodothyronine (FT3), prolactin levels, and treatment response on follow-up were not evaluated.

**Recommendations**

Routine assessment of serum TSH and FT4 should be considered in women with AUB-O, particularly those with menorrhagia, oligomenorrhoea, obesity, anaemia, or clinical features of thyroid dysfunction. Identified thyroid disorders should be managed appropriately with multidisciplinary support when required. Larger multicentre prospective studies are recommended to validate these findings, while future research should incorporate thyroid autoantibodies, FT3, prolactin, endometrial correlation, and menstrual outcomes following treatment of thyroid dysfunction.

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