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Research Article

Evaluation of Heavy Menstrual Bleeding in Adolescents

Kontbay Çetin T and Keskin Sarılar Z. Heavy Menstrual Bleeding in Adolescents

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What is already known on this topic?
Heavy menstrual bleeding (HMB) is a common issue among adolescents, with differential diagnoses ranging from anovulation to coagulopathy. Excessive menstrual blood loss can severely impact both emotional and physical quality of life. Currently, there are no specific guidelines for managing adolescent HMB, though cases involving heavy bleeding require immediate intervention.

What this study adds?
Anovulatory cycles are the primary cause of HMB in adolescents; however, other potential causes must also be considered. The initial treatment for adolescent HMB typically involves hormonal or hemostatic therapies. Additionally, this study demonstrated that adolescents with severe uterine bleeding but no anemia were successfully treated with tranexamic acid monotherapy.

Abstract
Objective: Heavy menstrual bleeding (HMB) in adolescents often manifests as "excessive bleeding" and may result in acute anemia requiring emergency treatment. This study aimed to evaluate the diagnostic and management options for adolescents with HMB.
Methods: Retrospective data were collected from the patients' medical records. Adolescents were classified based on the degree of anemia: Group 1 included patients with hemoglobin (Hb) levels of <8 g/dL; Group 2, Hb levels of 8–10 g/dL; Group 3, Hb levels of 10–12 g/dL; and Group 4, Hb levels of ≥12 g/dL. Admission and follow-up characteristics were compared across groups.
Results: The cohort consisted of 122 adolescents with a mean age of 13.7 ± 1.9 years, 42.7% of whom experienced menstrual irregularity within 2 years of menarche. The mean duration of bleeding was 16 days (range: 10–30 days). Anovulation was identified in 57.8% of patients. Polycystic ovary syndrome was diagnosed in 32 (25%) adolescents, hypothyroidism in 6 (4.7%), uterine structural anomalies in 3 (2.3%), and hyperprolactinemia in 3 (2.3%), 2 of whom had microprolactinoma. One adolescent was diagnosed with von Willebrand disease following a hematological evaluation.
Conclusion: Primary care providers must understand normal menstrual cycle patterns and be adept at identifying HMB. Early recognition of the underlying etiology in adolescents facilitates timely diagnosis, helping to prevent severe anemia and hospitalization.
Keywords: Heavy menstrual bleeding, adolescent, abnormal uterine bleeding

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Introduction

Heavy menstrual bleeding (HMB) is defined by both the American College of Obstetricians and Gynecologists (ACOG) and the International Federation of Gynecology and Obstetrics (FIGO) as excessive menstrual blood loss that negatively affects a woman's physical, emotional, social, and material quality of life (1, 2). ACOG further specifies that HMB refers to menstrual bleeding lasting more than 7 days and/or resulting in blood loss exceeding 80 mL per cycle (2).

The ACOG and the American Academy of Pediatrics highlight the menstrual cycle as a "vital sign" for girls, urging clinicians to educate adolescents and caregivers about typical menstrual patterns (2). Menarche is deemed normal between the ages of 10.5 and 15.5 years (3), while a typical adolescent menstrual cycle ranges from 21 to 45 days, with periods lasting 3 to 7 days (4).

Normal menstrual flow typically involves the use of three to six pads per day. However, research indicates that relying on pad counts may not accurately reflect menstrual flow, particularly in adolescents. This is due to factors such as unreliable reporting, the use of products with varying absorbency levels, or changing products before they are fully saturated (5, 6).

Menstruation remains a taboo subject in some cultures, where it may not be discussed at all (7). Consequently, some young women may never have received education about menstruation. Even in high-income countries, both adolescents and their parents frequently report discomfort discussing the topic, contributing to poor menstrual health literacy (8). HMB is often under-reported among adolescents because its definition relies on subjective experiences without clear reference points and is influenced by individual perceptions of what is considered "normal." This can result in delays in identifying heavy or prolonged menstrual bleeding, increasing the risk of associated morbidity.

FIGO recommends classifying HMB according to the PALM-COEIN system, which includes polyp, adenomyosis, leiomyoma, malignancy and hyperplasia, coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, and not otherwise classified categories (1). In adolescents, non-structural causes of abnormal bleeding patterns are significantly more common than structural ones, with ovulatory dysfunction accounting for 90% of HMB cases in this population (9). HMB frequently affects adolescents, with unpredictable and prolonged periods often occurring shortly after menarche (4). Among Swedish adolescents, the prevalence of HMB was documented at 37%, representing a significant source of distress (10). HMB in adolescents often necessitates urgent medical intervention. Many adolescents, both with and without underlying bleeding disorders, present to emergency departments with HMB. However, limited information is available about the management decisions made for these patients (11). While several reports address the treatment of HMB, there remains a lack of robust evidence-based guidance for its diagnosis and management (7, 12, 13).

In our single-center retrospective study, we analyzed the clinical characteristics and management options of adolescent patients referred to a pediatric endocrinologist for the evaluation and treatment of their HMB, with or without associated iron deficiency anemia.

Methods

A retrospective chart review was conducted to identify eligible patients, defined as girls younger than 18 years who were referred to a tertiary care hospital for HMB between 8 February 2021 and 30 June 2024.

Data collected for analysis included patient demographics, age at referral, age at menarche, average duration of bleeding, laboratory workup results, ultrasound findings, the presence of other medical conditions or medication use, and family history of HMB or thrombosis. The selected treatment and final diagnosis were also documented. Additionally, for patients with hemoglobin (Hb) levels of <10 g/dL, the time to recovery of the Hb and ferritin levels was recorded. Patients were excluded from the study if they had a pre-existing diagnosis of a coagulation or bleeding disorder or had not yet reached menarche.

The parameters defining HMB included a menstrual duration of at least 7 days, with patients reporting either "flooding," bleeding through a pad in ≤2 hours during most periods, or the use of highly absorbent products (2).

Laboratory tests were performed for all patients to evaluate the severity of bleeding and to identify potential underlying causes of HMB. At our institution, patients presenting with HMB undergo a first tier of laboratory investigations, which includes a complete blood count, ferritin level, prothrombin time, activated partial thromboplastin time, bleeding time, thyroid function tests (including free thyroxine and thyroid-stimulating hormone), prolactin, progesterone, total testosterone, and beta human chorionic gonadotropin. For patients in the present study with a significant bleeding history or those on oral hormone therapy where initial laboratory tests appear normal, the hematologist repeated the von Willebrand disease (vWD) panel. Any abnormal laboratory results were retested at least twice for confirmation.

Anovulation was defined based on the following two criteria: menstrual bleeding occurring more frequently than every 21 days or being excessive in nature, and a serum progesterone level of <0.5 ng/mL at the time of diagnosis and/or the exclusion of other identified causes of HMB (9,14).

All adolescents were classified according to the degree of anemia. Group 1 included patients with Hb levels of <8 g/dL (severe anemia), while Group 2 consisted of those with Hb levels of 8–10 g/dL (heavy anemia). Group 3 included patients with Hb levels of 10–12 g/dL (moderate anemia), and Group 4 comprised patients with Hb levels of ≥12 g/dL (mild or no anemia). Admission and follow-up characteristics were compared across the four groups.

The primary clinical goal in managing HMB was to restore hemodynamic stability by addressing anemia while determining the underlying cause. Patients with Hb levels of <7 g/dL or those with Hb levels of <10 g/dL accompanied by active bleeding were admitted to the hospital. Patients with hemodynamic instability were transfused with erythrocyte suspension. For those treated with combined oral contraceptives (COCs), pills containing at least 30 mcg of ethinyl estradiol were preferred and administered every 6 to 8 hours until the bleeding ceased. Once the bleeding stopped, the dosage was gradually reduced to once daily and continued until Hb levels exceeded 10 g/dL. Cyclic treatment was then initiated. For patients with Hb levels of 10–12 g/dL, iron supplementation with 100 mg of elemental iron per day was prescribed to address persistent blood loss. Patients with regular menstrual cycles but heavy bleeding episodes each month were treated with oral tranexamic acid (10 mg/kg/day) to reduce menstrual flow.

Descriptive statistics were used to analyze the data. Selection bias was minimized by including all adolescents referred to our institution for the evaluation of HMB during the study period.

The study was approved by the Ethical Committee of Samsun University (approval number: 2024/4/15).

Statistical analysis

All statistical analyses were performed using SPSS Version 25 (IBM Corp., Armonk, NY, USA). Data are expressed as mean ± standard deviation or median (25th–75th percentile). The Kolmogorov–Smirnov test was used to assess the normality of the variables. Descriptive analyses are presented as mean ± standard deviation for variables with a normal distribution. Student's t-test was used to compare the means of continuous variables with a normal distribution. The Mann–Whitney U test, with appropriate confidence intervals, was used for non-parametric measurements. A p-value of <0.05 was considered statistically significant in all analyses.

Results

In total, 122 patients met the study criteria. The mean age at the time of referral was 13.7 ± 1.9 years, and the body mass index standard deviation score was 0.5 (range: −0.7 to 1.47). The mean age at menarche was 11.9 ± 1.1 years. From the onset of menarche, HMB was observed in 42% of patients. The prevalence of HMB from the onset of menarche in Groups 1, 2, 3, and 4 was 23%, 41%, 46.7%, and 48%, respectively, although the differences were not statistically significant. Additionally, HMB occurring within the first 2 years after menarche was reported in 68% of patients.

The mean duration of bleeding was 16 days (range: 10–30 days). The mean Hb level among these patients was 11.07 ± 2.18 g/dL, while the mean ferritin level was 12 ng/dL (range: 5.9–20 ng/dL). Additionally, 18% (n = 23) of these adolescents required hospitalization for the acute management of HMB. Excluding transfused patients, the recovery times for Hb and ferritin were 2±1.18 (2-3) months and 3.96±1.77 (2-6) months, respectively. However, no statistically significant differences were observed between the groups. Clinical and laboratory characteristics of patients with heavy menstrual bleeding are shown in Table 1.

Taking both groups together, anovulation was identified as the primary cause of HMB in 57.8% of patients. Among the cohort, 32 (25%) adolescents were diagnosed with polycystic ovary syndrome (PCOS), 6 (4.7%) with hypothyroidism, and 3 (2.3%) with uterine structural anomalies (uterus didelphys). Additionally, three (2.3%) adolescents were diagnosed with hyperprolactinemia, two of whom had microprolactinoma. One girl was diagnosed with vWD following a hematological evaluation. No cases of other factor deficiencies or platelet dysfunction/structure were identified. Two patients had a family history of thrombosis; genetic testing in one of these patients revealed a homozygous *PAI* gene mutation.

The distribution of diagnoses across groups is detailed in Table 2.

When the groups were evaluated together, 28 (21%) adolescents were found to have a comorbidity. These included euthyroid chronic lymphocytic thyroiditis in 10 patients, autism in 4, hearing impairment in 2, cystic fibrosis in 1, asthma in 1, epilepsy in 1, and gastritis in 1. Four (3.1%) adolescents were using COCs prescribed for hirsutism. Additionally, four were taking levothyroxine, two were taking metformin, one was using an inhaled steroid, one was taking levetiracetam, and one was using a proton pump inhibitor. None of these medications were found to contribute to bleeding. All serum beta human chorionic gonadotropin levels were <0.1 IU/L. No adolescents had a history of anorexia or bulimia.

Treatment procedures

Management of HMB was tailored to the underlying etiology and the severity of bleeding. When all groups were analyzed together, 10 (8%) adolescents received transfusions with erythrocyte suspension, 100 (76%) were treated with iron supplementation, 62 (53%) received COCs, and 56 (42%) were treated with tranexamic acid. Sixteen (12%) patients were monitored without any specific treatment. One patient, who presented at the age of 10.1 years, had menarche before the age of 10 years and had experienced continuous bleeding since menarche; this patient was treated with leuprolide acetate. Table 3 outlines the treatment differences across the groups.

Two adolescents with normal pelvic ultrasound (PUS) findings did not respond to a combination of COCs and tranexamic acid therapy. Pelvic magnetic resonance imaging was performed for these patients, and the findings were normal.

Discussion

Ensuring timely and adequate access to appropriate care is critical in the management of HMB, as delays in treatment can lead to severe anemia, reduced quality of life, and increased rates of depression and anxiety. In a population-based study of 1,000 healthy Swedish girls, 73% reported menstrual problems, with 37% experiencing HMB (10). Similarly, other population-based studies reported that 12.1% and 17.9% of girls in Nigeria and Hong Kong, respectively, experienced HMB (14, 15).

An immature hypothalamic-pituitary-ovarian axis during the peri-menarchal period can result in anovulatory cycles and heavy, irregular menstrual bleeding. Within the first 2 years after menarche, anovulatory cycles are common and are considered part of normal physiological

development (4). Studies have shown that 60% to 80% of adolescents have regular cycles within 3 years after menarche, while it may take up to 5 to 6 years for 95% of women to achieve normal cycles (12). The findings of this study align with existing evidence, demonstrating that anovulation is the most common cause of HMB in adolescents (2).

Endocrine disorders that can cause anovulation include PCOS, thyroid dysfunction, adrenal insufficiency, Cushing's syndrome, hyperprolactinemia, and diabetes mellitus (4). In our study, PCOS was identified in 32% of participants. By comparison, a study of adolescents with abnormal uterine bleeding revealed a PCOS prevalence of 16% (9). Additionally, long-term studies indicate that up to 59% of adolescents with abnormal uterine bleeding meet the diagnostic criteria for PCOS (16). The higher detection rate of PCOS in our study may be attributed to the large sample size and the routine use of PUS and testosterone measurements for all patients with HMB. Furthermore, the increasing prevalence of obesity in our society may contribute to a rise in PCOS cases, making it a more common cause of HMB.

In our study, hypothyroidism was identified in six (4.7%) patients. This frequency aligns closely with existing literature (12). Because both hypothyroidism and hyperthyroidism can contribute to HMB, thyroid function tests should be included in the initial evaluation of patients with HMB.

In our study, hyperprolactinemia was identified in three (2.3%) patients, two of whom were treated with cabergoline following a diagnosis of prolactinoma. By contrast, two previous studies from Türkiye with sample sizes of 22 and 79 patients, respectively, reported no cases of hyperprolactinemia (9, 12). The higher rate observed in our study may be attributable to the larger number of patients included. We recommend that prolactin levels be monitored in all patients presenting with HMB, ideally before initiating treatment with COCs.

Structural causes of HMB, such as endometrial and cervical polyps, adenomyosis, and uterine abnormalities, are uncommon in adolescents (4). One study reported that structural causes were found in only 1.3% of adolescents who underwent pelvic ultrasound for HMB evaluation (17). In the present study, three (2.3%) cases of uterine abnormalities were identified, a rate consistent with the literature. Endometrial causes of HMB in adolescents are also rare, accounting for <10% of HMB cases (6). Endometritis due to pelvic inflammatory disease is the most common cause of endometrial bleeding in adolescents (4). In our study, one case of an endometrial polyp was found, but no cases of pelvic inflammatory disease were observed, aligning with the findings reported in the literature.

Iatrogenic causes of HMB include anticoagulants, hormonal contraception, and other drugs that affect ovulation, such as antipsychotics (18). Hormone therapy is the most common iatrogenic cause of HMB. Both COCs and progesterone-only pills can contribute to HMB, with irregular bleeding being more frequent in patients using progesterone-only pills (5, 7). In this study, four (3.1%) cases of prolonged menstrual bleeding were associated with the use of COCs prescribed for hirsutism. Proper administration of COCs—such as taking the pill consistently at the same time daily, avoiding missed doses, and refraining from concurrent use of drugs that alter estrogen metabolism—may help reduce or prevent HMB.

The prevalence of bleeding disorders in the general population is 1% to 2%, but this rate increases significantly to 20% to 33% in adolescents with HMB (19). In our study, one adolescent was diagnosed with vWD, with HMB as her first presenting symptom. vWD, the most common inherited bleeding disorder in women with HMB, is caused by a quantitative or functional defect in von Willebrand factor and affects approximately 1% of the general population (20). While the severity of vWD varies, nearly all affected women experience HMB (3). The literature indicates that bleeding disorders are the second most common cause of HMB in adolescents after anovulation and are particularly prevalent in females presenting with HMB at menarche (19). Coagulopathy may be suspected as the etiology if bleeding is cyclical but excessive in volume or duration (4). However, in our study, the patient with vWD experienced prolonged menstrual bleeding that began after menarche, and her anemia was not severe. These findings suggest that any patient with prolonged menstrual bleeding should be evaluated for a bleeding diathesis, even if there is no family history of severe anemia or coagulopathy.

Treatment of HMB frequently involves hormone therapy, and it is important to evaluate for contraindications to COCs, including a family history of thromboembolic events (21). The prevalence of homozygous *MTHFR* mutation in the Turkish population reportedly ranges from 3% to 6% (22). In our study, no cases of homozygous *MTHFR* mutation were identified among patients with a family history of thrombosis. However, a homozygous *PAI* gene mutation was detected in one adolescent. These findings underscore the importance of screening for thrombophilic gene mutations in patients with a family history of thromboembolic events before initiating hormone therapy.

The initial approach to treating HMB involves medical management using hormonal therapy, hemostatic agents, or a combination of both. Treatment options include COCs, oral progestins, antifibrinolytics, non-steroidal anti-inflammatory drugs (NSAIDs), gonadotropin-releasing hormone analogs, and, where possible, addressing the underlying pathology (18). Although various hormonal therapies have been shown to effectively stop menstrual bleeding, there is limited evidence to suggest the superiority of one option over another (4).

In this study, treatment decisions were primarily guided by the degree, duration, and pattern of anemia. Except for patients in Group 4, all others received COCs and iron supplementation. Two patients with prolactinoma were treated with cabergoline, while a gonadotropin-releasing hormone analog was used for a patient with early menarche and heavy uterine bleeding. NSAIDs were not utilized as a first-line treatment in any patient. Because NSAIDs can affect platelet function (23), they were not administered before completing a hematological evaluation.

Ferritin levels serve as a key indicator of the body's iron status, with low serum ferritin levels being predictive of excessive menstrual blood loss. The threshold for low ferritin is typically defined as <15 µg/L (3). In this study, the average ferritin level was 12 µg/L. Iron deficiency, even without anemia, has been associated with increased muscle fatigue, impaired memory, and learning difficulties in adolescents, while fatigue is commonly reported by young women with HMB (24). Iron supplementation should continue until anemia resolves and for an additional 3 months to replenish iron stores (3). A review of clinical guidelines for managing iron deficiency and iron-deficiency anemia in HMB—although not specifically focused on adolescents—recommends oral iron therapy as the preferred treatment for individuals with mild anemia or non-anemic iron deficiency (indicated by low ferritin levels). This approach is also suggested for patients at high risk of developing iron deficiency (25). Adolescents with severe uterine bleeding should be monitored for iron status even after bleeding has ceased. In our study, the mean ferritin recovery time (to 20 µg/L) was 3.96□1.77(2-6) months, emphasizing the importance of long-term follow-up and the prevention of recurrent bleeding.

In this study, tranexamic acid therapy was used in combination with iron or COCs in 44% of patients and as monotherapy in 16% of patients within Group 4. No side effects related to tranexamic acid were observed. Tranexamic acid therapy is particularly suitable for patients with regular cycles and long or heavy bleeding. It is also a preferred option for those where concerns about potential impacts on height from COCs treatment exist. Tranexamic acid, an antifibrinolytic agent, is a viable option for non-hormonal treatment or as an adjunct to hormonal therapy for HMB when monotherapy is ineffective (21). The medication is approved for use in patients with HMB and is typically administered orally every 8 hours for 5 days during menstruation, regardless of whether the patient has a bleeding disorder. Although tranexamic acid has been associated with a potentially increased risk of thrombosis, clinical studies indicate that the incidence of thrombosis in women treated with tranexamic acid is comparable to the spontaneous incidence in untreated women (23, 26). One study evaluated the efficacy of tranexamic acid in adolescents with HMB through an open-label, prospective, multicenter trial involving 32 adolescents aged 10 to 19 years. Participants were treated with 1,300 mg of tranexamic acid orally three times daily for the first 5 days of their menstrual cycle and were followed for 4 months. The study demonstrated a reduction in mean blood loss and an improvement in quality-of-life scores (27). Consistent with the literature, patients with severe uterine bleeding but no anemia were successfully treated with tranexamic acid monotherapy in our study.

Many existing guidelines recommend PUS as a first-line diagnostic tool for assessing HMB (28). ACOG also states that the decision to order a PUS for abnormal or heavy bleeding is at the provider's discretion (23).

In our clinical experience,PUS is typically sufficient for imaging pelvic structures and assessing endometrial thickness. In this study, uterine abnormalities were identified in three patients, and endometrial polyps were found in one patient. Similar findings were reported in the study by Kızılcan et al. (9). Two patients were further evaluated with magnetic resonance imaging because of a lack of response to treatment and normal findings on ultrasound. Given that structural causes are uncommon in the etiology of severe uterine bleeding in adolescents, more invasive imaging options may be reserved for selected cases. Surgical treatment of HMB in adolescents should be avoided unless absolutely necessary for life-saving interventions because it poses a significant risk to future fertility (18).

Study limitations

Because of the retrospective nature of the study, reliance on information documented in medical records was necessary, which may have introduced limitations in data accuracy and completeness. Another limitation of the study is the small sample size, which may restrict the generalizability of the findings. Larger studies are needed to provide more robust and generalized results.

Conclusion

Primary care providers should be well-informed about the characteristics of a normal menstrual cycle and capable of identifying HMB. Early recognition of the etiology of HMB in adolescents is crucial because it facilitates timely intervention, potentially preventing severe anemia, hospitalization, and prolonged school absences. Early detection also helps reduce psychological impacts associated with HMB. For adolescents, anovulatory cycles are the most common cause of HMB, but other potential causes should be thoroughly investigated. Hormonal and hemostatic therapies are the primary treatment options for managing adolescent HMB. Effective management of HMB in adolescents requires a personalized approach, including a thorough evaluation of the underlying cause, prompt acute treatment when needed, and a long-term plan to promote regular menstrual cycles and overall well-being.

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Table 1. Clinical and laboratory features of cases with heavy menstrual bleeding.

	Total	**Group 1 (Hb<8 g/dL) (n=13)**	**Group 2 (Hb:8-10 g/ dL)** (n=18)	**Group 3 (Hb:10-12 g/dL** (n=30)	**Group 4 (Hb>12 g/dL)** (n=61)	p
Age (years)	13.7□1.9	13.9□2.03	14.2□1.8	13.8□1.9	13.37□2.1	0.33
Menarche age	11.9□1.1	11.4□1.04	12□0.8	12□0.9	11.6□1.19	0.25
HMB from menarche **(%)**	42.7 (n=56)	23.1 (n=3)	33.3 (n=6)	46.7 (n=14)	48.4 (n=30)	
Irregularity after menarche >2 year **(%)**	32 (n=41)	46.2 (n=6)	38.9 (n=7)	23.3 (n=7)	29.5 (n=18)	
BMI SDS	0.5 (-0.7-1.55)	0.6 (-1.17-2.4)	0.5 (-1.1-1.4)	1.1 (-0.57-1.9)	0.6 (-0.75-1.45)	0.72
Bleeding duration (day**)**	16 (10-30)	21.5 (13-40.2)	17 (10-21)	15 (8.5-27)	17.5 (10-30.7)	0.26
Hemoglobin (g/dL)	11.1.06□2.18	6.67□0.9[a]	8.8□0.56[b]	11□0.6[c]	12.7□0.73[d]	**<0.001***
Platelets (per µL)	315.9□72.2	358□79.[a]	324□96[ab]	340.4□57.4[ab]	297.7□63.4[b]	**0.02***
Ferritin (ng/dL)	12 (5.9-20)	4 (2-7)[ac]	5 (3.7-10.1)[c]	11 (6.2-17)[b]	16 (9-23)	**<0.001***
Progesterone (ng/ml)	0.37 (0.1-1.95)	0.35 (0.17-1.8)	0.4 (0.3-1.75)	0.2 (0.09-1.8)	0.4 (0.14-2.2)	0.6
Hb recovery time (month)	2□1.18 (2-3)	2□0.81 (1.25-2.75)	2.1□0.7 (2-3)	2.1□1.34 (1-2.5)		0.24
Ferritin recovery time (month)	3.96□1.77 (2-6)	2□2 (2-5)	4□1.7 (2.7-6)	3□1.9 (2.25-6)		0.45
PCOM **(%)**	18 (n=23)	7.7(n=1)	16.7 (n=3)	23.3 (n=7)	17.7 (n=11)	
Endometrial thickness (mm)	7 (5-10,2)	6 (5-10)	10 (6.7-12.2)	6 (5-7.6)	8 (4-12)	**0.092***

Table 2: Differential diagnosis of cases with heavy menstrual bleeding

Diagnosis	Total	**Group 1 (Hb<8 g/dL) (n=13)**	**Group 2 (Hb:8-10 g/ dL)** (n=18)	**Group 3 (Hb:10-12 g/dL** (n=30)	**Group 4 (Hb>12 g/dL)** (n=61)	p
Anovulatory cycle (%)	57.8(n=74)	76.9(n=10)	55.6 (n=10)	46.7 (n=14)	57.4 (n=35)	
PCOS (%)	25(n=32)	7.7(n=1)	27.8 (n=5)	30 (n=9)	26.2 (n=16)	
Hypothyroidism(%)	4.7(n=6)			10 (n=3)	4.9 (n=3)	
Iatrogenic	3.1(n=4)		5.6 (n=1)	6.7(n=2)	1.6 (n=1)	
Hyperprolactinemia	2.3(n=3)		5.6 (n=1)		3.3(n=2)	
Uterine anomaly	2.3(n=3)			3.3 (n=1)	3.3 (n=2)	
Others	2.3(n=3)	7.7(n=1)	5.6(n=1)	3.3(n=1)		
Endometrial causes	0.8(n=1)	7.7(n=1)				
Bleeding disorder	0.8(n=1)				1.6 (n=1)	

PCOS: polycystic ovary syndrome

Table 3: Treatment of cases with heavy menstrual bleeding

Treatment	Total	**Group 1 (Hb<8 g/dL) (n=13)**	**Group 2 (Hb:8-10 g/ dL)** (n=18)	**Group 3 (Hb:10-12 g/dL** (n=30)	**Group 4 (Hb>12 g/dL)** (n=61)	p
I **(%)**	75.8 (n=97)	100 (n=13)	100 (n=18)	100 (n=30)	49.2 (n=30)	
COCs therapy **(%)**	51.6 (n=66)	100 (n=13)	100 (n=18)	50 (n=15)	27.9 (n=17)	
T **(%)**	43 (n=55)	69.2 (n=9)	55 (n=11)	36.7 (n=11)	36.1 (n=22)	
Erythrocyte suspension therapy **(%)**	7.8 (n=10)	38.5 (n=5)	22.2 (n=4)	0	0	
Only I (%)	15.6 (n=20)	0	0	33.3 (n=10)	14.8 (n=9)	
I+COCs (%)	26.6 (n=34)	30.8 (n=4)	44.4 (n=8)	30 (n=9)	18 (n=11)	
I+COCs+T (%)	22.7 (n=29)	69.2 (n=9)	55.6 (n=10)	20 (n=6)	4.9 (n=3)	
I+T (%)	11.7 (n=15)	0	0	16.7 (n=5)	13.1(n=8)	
Only T (%)	7.8 (n=10)	0	0	0	16.4 (n=10)	
COCs+ T (%)	0.8 (n=1)	0	0	0	1.6(n=1)	
Untreated follow-up	12.5 (n=15)	0	0	0	26.2 (n=15)	

COCs: combined oral contraceptives, T: Tranexamic acid therapy, I:Iron therapy