



## Association Between Subjective Assessment of Menstrual Bleeding and Measure of Iron Deficiency Anemia in Women

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### Declaration

#### Authors' Contribution

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### ABSTRACT

**Introduction:** Menstrual blood loss is the most common cause of iron deficiency anemia (IDA) in women of reproductive age. However, clinical quantification of menstrual bleeding remains challenging in routine practice and is often based on subjective reporting. Understanding the relationship between perceived menstrual blood loss and laboratory measures of iron status can help guide earlier identification and management of IDA. **Objective:** To assess the association between women's subjective assessment of menstrual bleeding and laboratory-confirmed iron deficiency anemia. **Methods:** A cross-sectional study was conducted at Combined Military Hospital, Malir, Karachi from 2 June to 2 Sep 2023, involving 155 women of reproductive age. Participants completed a structured questionnaire designed to assess menstrual characteristics, including cycle length, duration, and subjective bleeding volume categorized as light, normal, or heavy. **Results:** Among 155 women, 39 (25.2%) reported heavy menstrual bleeding, while 52 (33.5%) reported normal and 64 (41.3%) reported light flow. The prevalence of iron deficiency anemia was significantly higher in women reporting heavy menstruation (66.7%,  $p < 0.001$ ), compared to 23.1% in the normal group and 9.4% in the light group. Mean hemoglobin and ferritin levels were lowest among the heavy bleeding group (Hb:  $10.4 \pm 1.3$  g/dL; Ferritin:  $11.6 \pm 4.8$  ng/mL). Subjective bleeding volume was moderately correlated with laboratory markers (Spearman's  $r = -0.49$  for Hb,  $r = -0.53$  for ferritin). **Conclusion:** Women's subjective assessment of menstrual bleeding volume is significantly associated with the presence of iron deficiency anemia. This finding highlights the clinical utility of simple history-taking to guide early screening and prevention of IDA in menstruating women.

### INTRODUCTION

Iron deficiency anemia (IDA) remains one of the most common nutritional disorders globally, disproportionately affecting women of reproductive age [1]. According to the World Health Organization, approximately 30–50% of women in low- and middle-income countries are anemic, with iron deficiency accounting for the majority of cases [2]. This condition has far-reaching consequences, including fatigue, cognitive impairment, reduced work capacity, poor pregnancy outcomes, and compromised immune function [3]. In women of childbearing age, menstrual blood loss is widely recognized as the most frequent cause of iron depletion, especially in settings where dietary iron intake is inadequate and supplementation is rare [4]. Despite its clinical relevance, quantifying menstrual blood loss remains a significant challenge. Objective methods like the alkaline hematin technique are accurate but impractical for routine use. Visual assessment using tools such as the Pictorial

Blood Assessment Chart (PBAC) has been validated but is underutilized due to time constraints, lack of awareness, and variability in interpretation [5-6]. As a result, clinicians often depend on subjective assessments how a woman perceives the volume, frequency, and impact of her menstruation. This includes asking about the number of pads or tampons used, duration of bleeding, passage of clots, and any disruption to daily life [7]. These subjective indicators, though convenient, are rarely integrated systematically into screening algorithms for iron deficiency [8].

Heavy menstrual bleeding (HMB) is commonly defined as blood loss exceeding 80 mL per cycle, though most women are unable to quantify their loss in such terms [9]. Instead, many report their flow as "heavy" based on experience and its interference with normal activities. Studies have shown that women with HMB are at significantly higher risk of developing IDA, yet this relationship is often underappreciated, especially in



primary care settings [10]. Moreover, many women tend to normalize their symptoms, leading to delayed diagnosis and treatment. A growing body of research suggests that self-reported heavy bleeding is strongly correlated with objective markers of anemia, and can thus serve as a valuable screening tool, particularly in resource-constrained environments [11-13]. Another critical but often overlooked factor is the sociodemographic influence on menstrual health reporting. Women with lower education levels or limited health literacy may be less likely to recognize the symptoms of anemia or report abnormal bleeding patterns, despite experiencing significant physiological effects [14]. In such contexts, integrating simple, validated history-based assessments into clinical practice may help identify at-risk individuals earlier and prompt timely investigation and intervention. In this study, we aimed to explore the association between women's subjective perception of menstrual bleeding and laboratory-confirmed iron deficiency anemia, using hemoglobin, serum ferritin, and transferrin saturation as objective measures. By doing so, we seek to evaluate the validity of subjective menstrual assessment as a clinical tool for early identification of iron deficiency and to inform practical strategies for anemia screening and prevention among women in everyday healthcare settings.

### Objectives

To assess the association between women's subjective assessment of menstrual bleeding and laboratory-confirmed iron deficiency anemia.

### METHODOLOGY

A cross-sectional study was conducted at A cross-sectional study was conducted at Combined Military Hospital, Malir, Karachi from 2 June to 2 Sep 2023, involving 155 women of reproductive age.

### Inclusion Criteria

- Women aged 15 to 49 years with regular menstrual cycles.
- Not currently pregnant or lactating.
- Provided informed consent for participation.

### Exclusion Criteria

- Women with known bleeding disorders or chronic illnesses (e.g., kidney disease, malignancy).
- Those who had received iron supplementation or blood transfusions in the past 3 months.
- Use of intrauterine devices or hormonal contraceptives affecting menstrual flow.

### Data Collection

Data were collected from 155 women of reproductive age who met the inclusion criteria and provided informed consent. Participants completed a structured questionnaire designed to assess menstrual characteristics, including cycle length, duration, and subjective bleeding volume categorized as light, normal, or heavy. Additional details such as the number of sanitary products used per day, passage of clots, and disruption of daily activities were documented. Following the questionnaire, venous blood samples were obtained to measure hemoglobin levels, serum ferritin, and transferrin

saturation. Iron deficiency anemia was diagnosed based on WHO criteria: hemoglobin less than 12 g/dL and serum ferritin less than 15 ng/mL. All data were recorded on a predesigned form for analysis.

### Statistical Analysis

Data were analyzed using SPSS version 26. Descriptive statistics were used to summarize demographic variables and menstrual characteristics. Continuous variables like hemoglobin and ferritin were expressed as mean  $\pm$  standard deviation, while categorical variables such as bleeding category and anemia status were reported as frequencies and percentages. The association between subjective menstrual bleeding and presence of iron deficiency anemia was assessed using the Chi-square test. A p-value  $< 0.05$  was considered statistically significant.

### RESULTS

Among the 155 women studied, the average age was  $29.4 \pm 6.8$  years. About two-thirds (65.8%) were married, and the mean BMI was  $23.8 \pm 3.2$  kg/m<sup>2</sup>. Women reporting heavy menstrual bleeding had a slightly higher average age ( $30.1 \pm 6.4$  years) and BMI ( $24.4 \pm 2.9$  kg/m<sup>2</sup>), though these differences were not statistically significant. However, only 43.6% of women in the heavy bleeding group had education above matric, compared to 61.2% in the normal/light group a significant difference ( $p = 0.04$ ).

**Table 1**

*Demographic Characteristics by Bleeding Severity*

Characteristic	Total (n=155)	Heavy Bleeding (n=39)	Normal/Light (n=116)	p-value
Mean Age (years)	29.4 $\pm$ 6.8	30.1 $\pm$ 6.4	29.2 $\pm$ 6.9	0.42
Marital Status (Married/Single)	102 / 53	28 / 11	74 / 42	0.79
BMI (kg/m <sup>2</sup> )	23.8 $\pm$ 3.2	24.4 $\pm$ 2.9	23.6 $\pm$ 3.3	0.08
Education Level (Above Matric)	88 (56.8%)	17 (43.6%)	71 (61.2%)	0.04

Women who reported heavy bleeding had longer durations of menstrual flow (average  $6.5 \pm 1.1$  days vs.  $5.6 \pm 1.1$  days) and used more sanitary pads per day ( $6.3 \pm 1.2$  vs.  $4.5 \pm 1.6$ ) compared to those with normal or light flow. Clot passage was reported by 72% of women in the heavy bleeding group, compared to just 15% in the other group. All differences in duration, pad usage, and clot passage were statistically significant ( $p < 0.001$ ).

**Table 2**

*Menstrual History and Subjective Bleeding Volume*

Menstrual Parameter	Total (n=155)	Heavy Bleeding (n=39)	Normal/Light (n=116)	p-value
Cycle Length (days)	28.3 $\pm$ 2.6	27.8 $\pm$ 2.3	28.4 $\pm$ 2.7	0.14
Duration of Bleeding (days)	5.8 $\pm$ 1.2	6.5 $\pm$ 1.1	5.6 $\pm$ 1.1	<0.001
Pad Usage per Day	4.9 $\pm$ 1.3	6.3 $\pm$ 1.2	4.5 $\pm$ 1.6	<0.001
Passage of Clots	45 (29.0%)	28 (71.8%)	17 (14.7%)	<0.001

Women with heavy bleeding had significantly lower mean hemoglobin (10.4 g/dL), serum ferritin (11.6 ng/mL), and

transferrin saturation (14.1%) compared to those with normal/light bleeding (hemoglobin 12.1 g/dL, ferritin 21.2 ng/mL, and saturation 21.4%). These findings were all statistically significant ( $p < 0.001$ ), strongly supporting an association between heavy menstrual bleeding and reduced iron status.

**Table 3***Hematologic Indices by Bleeding Category*

Lab Parameter	Total (n=155)	Heavy Bleeding (n=39)	Normal/Light (n=116)	p-value
Hemoglobin (g/dL)	11.7 ± 1.4	10.4 ± 1.3	12.1 ± 1.1	<0.001
Serum Ferritin (ng/mL)	18.6 ± 8.9	11.6 ± 4.8	21.2 ± 7.6	<0.001
Transferrin Saturation (%)	19.5 ± 7.3	14.1 ± 5.1	21.4 ± 6.9	<0.001

66.7% of those who reported heavy bleeding had laboratory-confirmed iron deficiency anemia, compared to only 23.1% of those with normal bleeding and 9.4% with light bleeding. The difference was highly significant ( $p < 0.001$ ), suggesting that subjective menstrual assessment is a valuable clinical indicator of anemia risk.

**Table 4***Prevalence of IDA by Subjective Bleeding Assessment*

Subjective Bleeding Category	Number of Women	Iron Deficiency Anemia Cases (n, %)	p-value
Light	64	6 (9.4%)	<0.001
Normal	52	12 (23.1%)	
Heavy	39	26 (66.7%)	

Heavy menstrual bleeding had a substantial impact on daily functioning. Nearly 90% of women in the heavy bleeding group reported fatigue during menstruation, and 59% missed work or school. Additionally, 77% experienced interruption in daily activities. These were all significantly more common than in women with normal/light bleeding, where fewer than half reported fatigue and less than 20% reported disruption to daily life. These findings highlight the broader physical and social burden of heavy menstrual bleeding.

**Table 5***Functional Impact of Menstruation by Bleeding Category*

Impact Domain	Total (n=155)	Heavy Bleeding (n=39)	Normal/Light (n=116)	p-value
Fatigue during menses	85 (54.8%)	35 (89.7%)	50 (43.1%)	<0.001
Missed work/school	39 (25.2%)	23 (59.0%)	16 (13.8%)	<0.001
Daily activity interruption	52 (33.5%)	30 (76.9%)	22 (19.0%)	<0.001

Spearman's correlation analysis showed a moderate negative correlation between bleeding severity and hemoglobin ( $r = -0.49$ ), serum ferritin ( $r = -0.53$ ), and transferrin saturation ( $r = -0.45$ ), all with  $p$ -values  $< 0.001$ . This means that as self-reported menstrual flow increases, iron status markers significantly decrease, further validating the use of subjective bleeding assessment as a screening tool.

**Table 6***Correlation Between Bleeding Severity and Lab Markers*

Correlation With Bleeding Severity	Spearman's r	p-value
Hemoglobin	-0.49	<0.001
Serum Ferritin	-0.53	<0.001
Transferrin Saturation	-0.45	<0.001

**DISCUSSION**

This study aimed to evaluate whether women's subjective assessment of their menstrual bleeding correlates with laboratory-confirmed iron deficiency anemia (IDA). The findings reveal a strong and statistically significant association between perceived heavy menstrual bleeding and reduced iron status, as measured by hemoglobin, serum ferritin, and transferrin saturation. Among the 155 women included, 39 (25.2%) reported heavy menstrual bleeding, and notably, 66.7% of these women were found to have IDA. This is consistent with previous studies that identified heavy menstrual bleeding (HMB) as the leading cause of IDA in women of reproductive age. For instance, a study conducted by Fraser et al. reported that over 60% of women with HMB had depleted iron stores, regardless of dietary intake, and emphasized the role of bleeding volume in driving iron loss [15]. Our analysis showed that women who self-reported heavy bleeding also had longer menstrual durations, increased pad use, and higher rates of clot passage all surrogate markers of excessive blood loss. These clinical findings align with literature such as the work by Higham et al., who developed the Pictorial Blood Loss Assessment Chart (PBAC) to objectively quantify menstrual bleeding and found strong correlations between PBAC scores and iron deficiency indicators [16]. From a hematologic perspective, women with heavy bleeding in this study had significantly lower mean hemoglobin (10.4 g/dL) and serum ferritin (11.6 ng/mL) compared to those with normal or light flow. These results support the pathophysiological link between chronic menstrual blood loss and iron depletion. Similar findings were reported by Kouides et al., who demonstrated that even mild reductions in hemoglobin and ferritin could result in fatigue and reduced productivity in women with untreated HMB [17]. Functional consequences of heavy bleeding were also evident. Women with HMB reported significantly more fatigue (89.7%), missed work or school (59.0%), and disruption in daily activities (76.9%), highlighting the social and occupational burden of unrecognized IDA. These results are consistent with global data from the WHO and other studies that show how undiagnosed anemia can lead to reduced quality of life, impaired cognitive function, and absenteeism among women in their reproductive years. Importantly, Spearman's correlation analysis revealed moderate but statistically significant negative correlations between perceived bleeding severity and all three iron markers, particularly serum ferritin ( $r = -0.53$ ). These findings are mirrored in work by Al-Farsi et al., who noted that women with lower education levels were less likely to seek treatment for menstrual symptoms or recognize the signs of anemia [18-19]. While our study provides important insights, some limitations should be noted. The reliance on self-reported data introduces the potential for recall or reporting bias. Moreover, we did not include

objective menstrual volume measurement tools such as PBAC, which could have added precision. Nonetheless, our results demonstrate that subjective perception of menstrual bleeding is a clinically valuable and low-cost method to identify women at risk of IDA, particularly in primary care or low-resource settings.

## CONCLUSION

It is concluded that there is a significant association between women's subjective assessment of menstrual bleeding and laboratory-confirmed iron deficiency anemia. Women who perceived their menstrual flow as

heavy were substantially more likely to exhibit reduced hemoglobin, serum ferritin, and transferrin saturation levels. The findings highlight that subjective menstrual history particularly reports of prolonged bleeding, increased pad usage, and clot passage can serve as a practical and reliable indicator for early detection of iron deficiency. Incorporating simple menstrual bleeding assessments into routine clinical evaluations may enable earlier diagnosis, timely intervention, and prevention of anemia-related complications, especially in resource-limited settings.

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