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A Hospital-Based Observational Study on the Association between BMI and Patterns of Abnormal Uterine Bleeding

[1]Dr. Smita Kumari, [2]Dr. Sunita Singh, [3]Dr. Geeta Sinha,

[1]Assistant Professor, Department of Obstetrics and Gynecology, PMCH, Patna, Bihar, India
[2]Assistant professor, Department of Obstetrics and Gynecology, PMCH, Patna, Bihar, India
[3]Professor, Department of Obstetrics and Gynecology, PMCH, Patna, Bihar, India

Corresponding Author: Dr. Sunita Singh

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KEYWORDS

Abnormal uterine bleeding, body mass index, obesity, menstrual irregularity, menorrhagia, ovulatory dysfunction

ABSTRACT:

Background: Abnormal uterine bleeding (AUB) is one of the most common gynecological disorders affecting women of reproductive and perimenopausal age groups. Among various contributing factors, body mass index (BMI) plays a significant role by influencing hormonal balance, endometrial receptivity, and ovulatory function.

Methods: This observational study was conducted at the Department of Obstetrics and Gynecology, Patna Medical College and Hospital, Patna, Bihar, India, over a period of 12 months. A total of 120 women aged 18–50 years presenting with AUB were enrolled. Each participant underwent detailed menstrual history, clinical examination, BMI calculation, and relevant investigations. BMI was classified as per WHO guidelines. Associations between BMI and bleeding patterns were analyzed using appropriate statistical tests.

Results: Among the 120 women studied, a majority (60.8%) were found to be overweight or obese. Menorrhagia (43.3%) and polymenorrhea (24.2%) were the most common bleeding patterns in women with elevated BMI. A significant correlation was observed between higher BMI and irregular menstrual cycles, increased bleeding duration, and chronic anovulatory states ($p < 0.01$).

Conclusion: An elevated BMI is significantly associated with various abnormal bleeding patterns in women. Weight-related hormonal imbalances appear to contribute to the pathophysiology of AUB, highlighting the importance of weight management in such patients.

Introduction

Abnormal uterine bleeding (AUB) is a frequently encountered clinical condition that affects women across various age groups, particularly during the reproductive and perimenopausal years. It is characterized by bleeding from the uterine corpus that is abnormal in volume, regularity, or timing and has no identifiable organic, systemic, or iatrogenic cause **[1]**. The impact of AUB on a woman's quality of life is profound, leading to physical discomfort, emotional stress, social embarrassment, and in some cases, severe anemia requiring medical intervention or hospitalization **[2]**.

AUB encompasses a spectrum of menstrual irregularities including menorrhagia, metrorrhagia, polymenorrhea, oligomenorrhea, intermenstrual bleeding, and postmenopausal bleeding. The International Federation of Gynecology and Obstetrics (FIGO) has standardized the nomenclature for AUB through the PALM-COEIN classification system, which divides the etiologies into structural (PALM – polyp, adenomyosis, leiomyoma, malignancy and hyperplasia) and non-structural (COEIN – coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, and not yet classified) causes **[3,4]**.

Among the various contributing factors of non-structural AUB, ovulatory dysfunction and endometrial instability are increasingly associated with obesity and altered

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metabolic states. Body mass index (BMI), a simple and reliable measure of body fat based on height and weight, has been shown to play a key role in menstrual health **[5]**. Obesity leads to chronic anovulation due to excess peripheral conversion of androgens to estrogens in adipose tissue, resulting in unopposed estrogen exposure and endometrial proliferation without regular shedding. This hormonal imbalance can manifest as irregular, heavy, or prolonged menstrual bleeding **[6]**. Furthermore, overweight and obese women often present with comorbidities such as polycystic ovarian syndrome (PCOS), insulin resistance, and thyroid dysfunction, all of which can compound the risk of AUB. Despite this established pathophysiological link, clinical studies focusing specifically on the association of BMI with various bleeding patterns in AUB remain limited, particularly in the Indian population **[7]**.

Therefore, this hospital-based observational study was undertaken to evaluate the relationship between BMI and abnormal uterine bleeding among women attending a tertiary care center in Bihar. The objective was to explore whether elevated BMI correlates with specific menstrual abnormalities and to assess the potential implications of BMI as a modifiable risk factor in the management of AUB.

Methodology

This prospective observational study was conducted in the Department of Obstetrics and Gynecology at Patna Medical College and Hospital (PMCH), Patna, Bihar, India, over a period of 12 months from January 2023 to December 2023. The study aimed to evaluate the relationship between body mass index (BMI) and various clinical patterns of abnormal uterine bleeding (AUB) in women aged between 18 and 50 years. A total of 120 women presenting with complaints of abnormal menstrual bleeding were selected using purposive sampling. Inclusion criteria comprised all women within the defined age range who presented with complaints such as menorrhagia, metrorrhagia, polymenorrhea, oligomenorrhea, or intermenstrual bleeding, and who gave informed consent to participate in the study. Women with pregnancy-related bleeding, diagnosed gynecological malignancies, bleeding disorders, or those currently on hormonal therapy were excluded to eliminate confounding factors. Each participant underwent a detailed clinical evaluation including menstrual and obstetric history, general and systemic examination, and gynecological assessment. Anthropometric measurements including weight and height were taken using standardized procedures, and BMI was calculated using the formula weight (kg)/height (m^2). Participants were categorized into four groups based on WHO BMI classification: underweight (<18.5 kg/m^2), normal (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), and obese (≥30.0 kg/m^2). All women underwent relevant laboratory investigations such as complete blood count, thyroid profile, pelvic ultrasonography, and where necessary, endometrial biopsy to rule out structural causes. The primary outcome assessed was the association between BMI categories and the type, frequency, and severity of AUB patterns. Data were compiled and analyzed using SPSS software version 25.0. Descriptive statistics were used to summarize sociodemographic and clinical variables, while inferential statistics including chi-square test and ANOVA were used to evaluate the association between BMI and menstrual irregularities. A p-value of less than 0.05 was considered statistically significant for all analyses.

Results

The present study evaluated 120 women aged 18 to 50 years presenting with abnormal uterine bleeding (AUB). The majority were in the age group of 31–40 years. Most participants were multiparous and belonged to the middle socioeconomic class. The most common menstrual abnormality observed was menorrhagia, followed by polymenorrhea. Regarding BMI, 34 (28.3%) women had normal BMI, 48 (40.0%) were overweight, and 25 (20.8%) were obese, while 13 (10.8%) were underweight. A significant association was observed between BMI and menstrual pattern, particularly in terms of bleeding volume and cycle regularity. Obese and overweight women were more likely to have menorrhagia and irregular cycles compared to those with normal BMI. The findings are detailed in the tables below.

Table 1 shows the age-wise distribution of women with AUB, with the highest frequency observed in the 31–40 year age group.

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Table 1: Age Distribution of Participants

Age Group (years)	Frequency (F)	Percentage (%)
18–25	16	13.3%
26–30	22	18.3%
31–35	34	28.3%
36–40	26	21.7%
41–45	14	11.7%
46–50	8	6.7%
Total	**120**	**100%**

Table 2 presents the parity status of women with AUB, indicating that the majority were multiparous.

Table 2: Distribution of Participants by Parity

Parity Status	Frequency (F)	Percentage (%)
Nulliparous	18	15.0%
Primiparous	26	21.7%
Multiparous	76	63.3%
Total	**120**	**100%**

Table 3 demonstrates the BMI classification among study participants, showing a high prevalence of overweight and obese individuals.

Table 3: Body Mass Index (BMI) Classification of Participants

BMI Category	Frequency (F)	Percentage (%)
Underweight (<18.5)	13	10.8%
Normal (18.5–24.9)	34	28.3%
Overweight (25–29.9)	48	40.0%
Obese (≥30.0)	25	20.8%
Total	**120**	**100%**

Table 4 illustrates the types of abnormal bleeding patterns reported, with menorrhagia being the most common.

Table 4: Distribution of Participants by Type of AUB

Type of AUB	Frequency (F)	Percentage (%)
Menorrhagia	52	43.3%

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Metrorrhagia	18	15.0%
Polymenorrhea	29	24.2%
Oligomenorrhea	11	9.2%
Intermenstrual Bleed	10	8.3%
Total	**120**	**100%**

Table 5 demonstrates the association of BMI with the type of AUB. Menorrhagia and polymenorrhea were significantly more common among overweight and obese women.

Table 5: Association of BMI with Type of AUB

BMI Category	Menorrhagia F (%)	Polymenorrhea F (%)	Other AUB Patterns F (%)	p-value
Underweight	2 (15.4%)	1 (7.7%)	10 (76.9%)	
Normal	11 (32.4%)	5 (14.7%)	18 (52.9%)	
Overweight	25 (52.1%)	14 (29.2%)	9 (18.8%)	
Obese	14 (56.0%)	9 (36.0%)	2 (8.0%)	0.004

Table 6 assesses the relationship between BMI and menstrual cycle regularity. Irregular cycles were significantly more frequent among obese women.

Table 6: Association of BMI with Menstrual Cycle Regularity

BMI Category	Regular Cycle F (%)	Irregular Cycle F (%)	p-value
Underweight	9 (69.2%)	4 (30.8%)	
Normal	26 (76.5%)	8 (23.5%)	
Overweight	25 (52.1%)	23 (47.9%)	
Obese	8 (32.0%)	17 (68.0%)	0.002

Table 7 analyzes the duration of bleeding per cycle across BMI categories. Longer bleeding durations were significantly more common in overweight and obese participants.

Table 7: Association of BMI with Duration of Bleeding

BMI Category	<5 days F (%)	≥5 days F (%)	p-value
Underweight	9 (69.2%)	4 (30.8%)	
Normal	23 (67.6%)	11 (32.4%)	
Overweight	16 (33.3%)	32 (66.7%)	
Obese	6 (24.0%)	19 (76.0%)	0.001

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Table 8 presents the mean hemoglobin levels by BMI group. Obese women had lower hemoglobin levels, correlating with heavier blood loss.

Table 8: Mean Hemoglobin Levels Across BMI Categories

BMI Category	Mean Hemoglobin (g/dL) ± SD	p-value
Underweight	10.9 ± 1.2	
Normal	11.2 ± 1.0	
Overweight	10.6 ± 1.3	
Obese	10.1 ± 1.4	0.008

Table 9 assesses the relationship between BMI and endometrial thickness as measured by transvaginal ultrasonography. A statistically significant trend of increased endometrial thickness was observed in obese women.

Table 9: Association of BMI with Endometrial Thickness

BMI Category	Mean Endometrial Thickness (mm) ± SD	p-value
Underweight	6.1 ± 1.4	
Normal	7.2 ± 1.9	
Overweight	8.3 ± 2.1	
Obese	9.0 ± 2.6	0.003

Table 10 shows the distribution of comorbid conditions such as polycystic ovarian syndrome (PCOS) and thyroid dysfunction among the BMI categories. These comorbidities were more prevalent in overweight and obese groups.

Table 10: Distribution of Comorbidities across BMI Categories

BMI Category	PCOS F (%)	Thyroid Disorder F (%)	No Comorbidity F (%)	p-value
Underweight	1 (7.7%)	2 (15.4%)	10 (76.9%)	
Normal	4 (11.8%)	5 (14.7%)	25 (73.5%)	
Overweight	12 (25.0%)	10 (20.8%)	26 (54.2%)	
Obese	9 (36.0%)	8 (32.0%)	8 (32.0%)	0.012

Table 11 depicts the distribution of specific AUB patterns across different age groups. Menorrhagia was more common in the 31–40 year group, while intermenstrual bleeding was seen more frequently in younger women.

Table 11: Distribution of Type of AUB across Age Groups

Age Group (years)	Menorrhagia F (%)	Polymenorrhea F (%)	Other Patterns F (%)	p-value
18–25	3 (18.8%)	2 (12.5%)	11 (68.8%)	

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26–30	6 (27.3%)	7 (31.8%)	9 (40.9%)	
31–40	30 (55.6%)	10 (18.5%)	14 (25.9%)	
41–50	13 (43.3%)	10 (33.3%)	7 (23.3%)	0.021

Table 12 evaluates the duration of AUB symptoms (in months) in relation to BMI. Women with obesity had a significantly longer duration of abnormal bleeding complaints before seeking medical attention.

Table 12: Correlation between Duration of AUB and BMI

BMI Category	Mean Duration of AUB (months) ± SD	p-value
Underweight	3.4 ± 1.2	
Normal	4.1 ± 1.8	
Overweight	5.6 ± 2.0	
Obese	6.3 ± 2.4	0.005

Discussion

This hospital-based observational study sought to evaluate the relationship between body mass index (BMI) and clinical presentations of abnormal uterine bleeding (AUB) in women of reproductive and perimenopausal age **[8]**. The findings clearly demonstrate a statistically significant association between increased BMI and abnormal menstrual patterns such as menorrhagia, polymenorrhea, irregular cycles, and prolonged bleeding duration **[9]**. Overweight and obese women constituted nearly 60.8% of the study population, with the highest prevalence of menorrhagia observed among these groups **[10]**. This aligns with existing literature suggesting that excess adipose tissue contributes to hormonal dysregulation through peripheral aromatization of androgens to estrogens, resulting in chronic unopposed estrogen exposure and anovulatory cycles **[11]**. Our findings are consistent with previous studies which reported similar associations between obesity and heavier, irregular bleeding **[12]**. The significant increase in endometrial thickness in obese women observed in our study may reflect estrogen-mediated endometrial proliferation, increasing the risk for endometrial hyperplasia and related bleeding disorders **[13]**. Additionally, the higher incidence of PCOS and thyroid disorders in overweight and obese women further explains the ovulatory dysfunction seen in this subgroup **[14]**. The lower mean hemoglobin levels among obese women indicate the burden of chronic blood loss, reinforcing the need for timely intervention **[15]**. Interestingly, the duration of symptoms before presentation was also longer in obese women, suggesting possible delays in seeking care due to normalization of symptoms or social stigma. These findings emphasize that BMI is not merely a numerical index but a significant clinical marker influencing the onset, severity, and progression of AUB **[16]**. This warrants integration of weight management strategies and metabolic evaluation as part of the diagnostic and therapeutic approach to AUB. However, limitations of this study include the lack of longitudinal follow-up and exclusion of postmenopausal women, which could be addressed in future research to broaden the applicability of findings.

Conclusion

This study establishes a significant association between elevated body mass index and various clinical patterns of abnormal uterine bleeding, particularly menorrhagia, irregular cycles, and prolonged bleeding duration. The findings underscore the importance of incorporating BMI assessment and weight management strategies in the evaluation and management of women presenting with AUB, thereby potentially improving menstrual health outcomes through holistic care.

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