

ORIGINAL RESEARCH

Etiologies of Abnormal Uterine Bleeding using PALM-COEIN Classification at A Tertiary Care Hospital in North Karnataka- A cross-sectional study

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ABSTRACT

Introduction: Abnormal Uterine Bleeding (AUB) is defined as any deviation from the normal menstrual cycle which is abnormal in frequency, regularity, duration, and volume of flow outside of pregnancy. AUB usually accompanied with lower abdominal pain and discomfort which presents a substantial burden on patient's health, quality of life, society and healthcare system. **Aims and objective:** 1. To describe the distribution of abnormal uterine bleeding (AUB) type according to the Polyp (AUB-P); Adenomyosis (AUB-A); Leiomyoma (AUB-L); Malignancy and Hyperplasia (AUB-M); Coagulopathy (AUB-C); Ovulatory Dysfunction (AUB-O); Endometrial (AUB-E); Iatrogenic (AUB-I); and (AUB-N) Not yet classified according to International Federation of Gynecology and Obstetrics (FIGO) classification system. 2. To find an association between risk factors and type of AUB. **Materials and Methods:** A Hospital-based Cross-sectional study was conducted among 400 women suffering from AUB for six months and who were admitted to the Gynecology ward at RIMS hospital as inpatients and who were willing to participate with informed consent were included for a period of 1 year from June 2023 to May 2024. A Convenience Sampling method was applied to select the calculated sample size of 400 for the study. **Analysis:** A structured interview questionnaire and checklist were administered to collect the data and entered into Microsoft Excel 2010 and further analysis was done with SPSS software 22.0 version. Categorical variables were expressed in percentages. Finally, the association factors that have a p-value of < 0.05 were considered statistically significant. **Results:** In our study 180(45%) belong to the age group of 21 to 30 years, followed by 31-40 years accounts for 114(28.5%). 228(57%) were urban residents 172(43%) were rural residents. As per PALM-COEIN classification majority were structural (Polyp+ Adenomyosis+ Leiomyoma+ Malignancy) causes accounts for 274 (68.5%). Leiomyoma (AUB-L) 106(26.5%) was the most common cause of AUB in this study. In our study, urban residents, married women, multiparous and employed, were found to be the significant risk factors for AUB with p-value <0.05. **Conclusion:** The PALM-COEIN classification system facilitates accurate diagnosis, which in turn helps optimize treatment strategies for AUB patients. By categorizing AUB based on its underlying causes, this classification system is useful in the management of AUB, ensuring that treatment strategies are tailored to the specific cause of the bleeding. Urban residents, married women, and multiparous and employed women show stressful lives among the risk factors for AUB.

Key words: Abnormal Uterine Bleeding (AUB), FIGO PALM-COEIN classification, Leiomyoma, Adenomyosis, Risk factors.

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INTRODUCTION

Abnormal uterine bleeding (AUB) is a common gynecological condition experienced by approximately one-third of women in their lifetime. (1,2) AUB is a broad term that describes irregularities in the menstrual cycle which involves several frequency, duration, and volume of flow outside of pregnancy (3). AUB is diagnosed in both inpatient and outpatient settings, accounting for up to 70% of consultations with gynecologists (4). A reproducible classification system for AUB was created by the International Federation of Gynecology and Obstetrics (FIGO) created in 2011 (5). The nomenclature for this spectrum is commonly known by the acronym PALM-COEIN which categorizes these causes as uterine Polyp, Adenomyosis, Leiomyoma, malignancy and hyperplasia, Coagulopathies, Ovulatory dysfunction, Endometrial dysfunction, Iatrogenic, and Not yet classified. The etiologies correlate to structural disorders such as endometrial/uterine polyp (P), adenomyosis (A), leiomyoma (L), malignant lesions of the uterine body (M); and Non-structural disorders such as coagulopathies (C), ovulatory dysfunction (O), endometrial dysfunction (E), iatrogenic (I), and not yet classified (N). (5)

AUB can lead to severe anaemia and other medical complications and can significantly impact the patient's quality of life. Several medical and surgical therapies are available, and they are personalized depending on the severity of the AUB. Hormonal medications, endometrial ablation, hysteroscopic surgery, hysterectomy, and uterine artery embolization are few commonly employed therapeutic options. This common disorder has high direct and indirect costs to the economic system. (6)

STUDY OBJECTIVES

1. To describe the distribution of abnormal uterine bleeding (AUB) type according to the polyp (AUB-P); adenomyosis (AUB-A); leiomyoma (AUB-L); malignancy and hyperplasia (AUB-M); coagulopathy (AUB-C); ovulatory dysfunction (AUB-O); endometrial (AUB-E); iatrogenic (AUB-I); and not yet classified according to International Federation of Gynecology and Obstetrics classification system.
2. To find an association between risk factors and type of AUB.

MATERIALS AND METHODS

Study area, design, and study period

This cross-sectional study was conducted in the Outpatient Department of Obstetrics and Gynecology at the Raichur Institute of Medical Sciences (RIMS) Hospital in Raichur district, Karnataka, India. The study period is one year, from June 2023 to May 2024. For ethical considerations institutional ethical committee of RIMS, Raichur, provided ethical clearance letter with reference number: RIMS/IEC/2023-24/36 dated 16.06.2023. Patients

were fully informed about the safety and purpose of the study, and informed consent was obtained from each participant. Data collection involved structured interviews using a questionnaire, ensuring the strict confidentiality of patient information.

Sample size calculation

In a study of 2022 by Vaidya R et.al (7). The prevalence of AUB among the patients studied was around 20%. Considering this as reference, sample size was calculated using the formula, Sample size $N = (4pq)/d^2$

Where p- prevalence, q= 1-p, d= relative error= 20% of p by Substituting the values, we got a sample size of $N = 384 \approx 400$, Hence, 400 samples were included in this study.

Data collection tool

Data was collected using semi structured questionnaire which was developed after reviewing different literatures. The questionnaire contained socio-demographic factors, reproductive history, comorbidities and different investigations.

Eligibility and inclusion criteria

All the women suffering from AUB since six months and who got admitted to RIMS hospital Gynecology ward as inpatient and who are willing to participate with the written and informed consent were included till we reach the required sample size of 400 participants.

Exclusion criteria

Women who were suffering from AUB since six months who were seriously ill, those with uncertain menarche or menopausal status, pregnant, breastfeeding women and who attained menopause were excluded.

Statistical analysis

Study data was entered into Microsoft excel sheet and analyzed by using SPSS software. Descriptive statistical measure like percentage and inferential statistical test like Chi-square and Fisher's exact probability test was used wherever applicable. Association of factors were interpreted statistically significant at p-value <0.05. Bivariable logistic regression was used to identify predictors. Independent variables having a p value less than 0.05 in the bivariable analysis was identified as predictors.

Operational definitions¹

The PALM-COEIN classification system was used to establish and categorize the potential etiologies of AUB. The FIGO classification system was used to diagnose Abnormal Uterine Bleeding by few assessments like history of uterine bleeding, Body mass index, general and gynecological examination, pelvic ultrasound, hysteroscopy, blood investigations

and Histo-pathological examination of endometrial biopsy.

P- Polyps are diagnosed based on present or absent based on the history, per speculum examination, ultrasound/ histopathological examination.

A- Adenomyosis was diagnosed based on history, ultrasound findings (appearance of asymmetric myometrium and enlarged uterus).

L- Leiomyoma was diagnosed based on clinical examination and ultrasound findings.

M- If malignancy or pre malignancy was suspected, endometrial biopsy was used for confirmatory diagnosis.

C- Coagulopathy was diagnosed based on medical history and coagulation profile of tests.

O- Ovulatory dysfunction includes AUB cases due to anovulation, attributable to endocrinopathies, polycystic ovarian syndrome, hypo/hyperthyroidism, hyper-prolactinaemia and weight changes.

E- Endometrial causes which includes those AUB cases that have predictable and cyclical bleeding typical to ovulatory cycles. The cause may be endometrial in origin which is a diagnosis of exclusion.

I- Iatrogenic group includes women with inserted intrauterine contraceptive devices, who were taking gonadal steroids, antibiotics, and anticoagulants.

N- Not yet classified, rare pathologies or poorly defined causes which do not fit in the above classes.

Bleeding pattern as defined by FIGO 2018 criteria¹

- Frequency of menses-

- Amenorrhea for a duration of 90 days
- Frequent- cycle length <24 days.
- Infrequent- cycle length >38 days
- Duration-
- Normal duration is ≤ 8 days.
- Prolonged duration >8 days.
- Regularity- Normal or regular (shortest to longest variation $\leq 7-9$ days); Irregular ($\geq 8-10$ days).
- Volume- Patient determined- light, normal & heavy; Heavy Menstrual Bleeding (HMB) volume sufficient to interfere with the woman's quality of life.
- Intermenstrual bleeding- Bleeding between the cyclically regular onset of menses, either random or cyclic.

RESULTS

Sociodemographic characteristics of participants

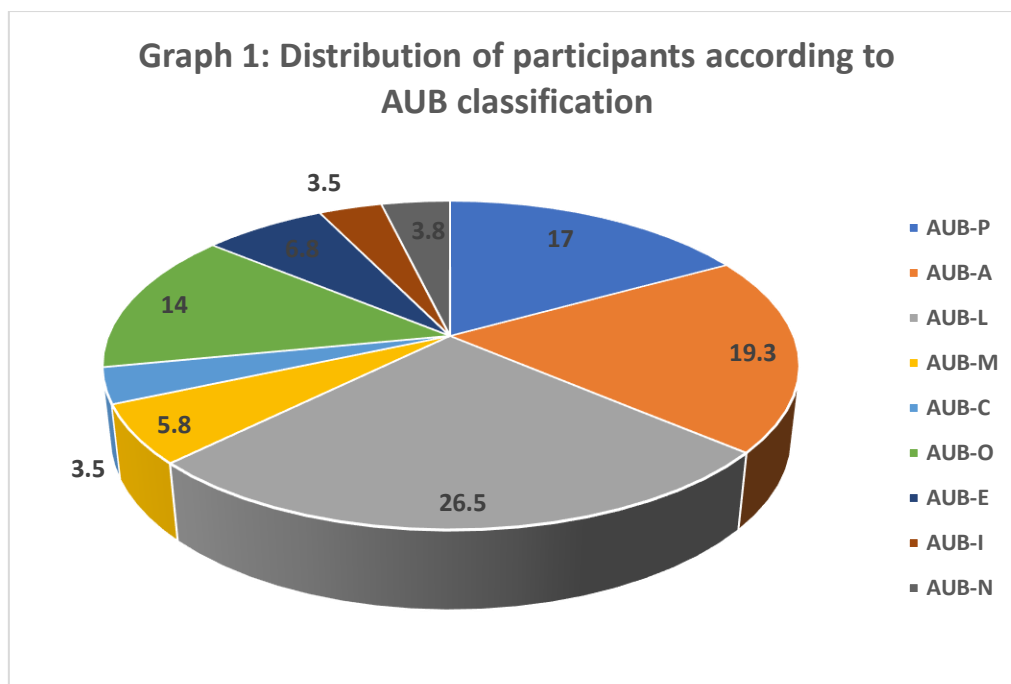
The total number of participants included in this study was 400. In our study, the mean age of the participants was 30.9 years, with a standard deviation of 9.17 years. Out of them, 180 (45%) belong to the age group of 21 to 30 years, followed by 31-40 years accounts for 114 (28.5%) and 17 (4.25%) were aged more than 50 years (Table 1). 228 (57%) were urban residents, 172 (43%) were rural residents, and Most of the study participants were married accounting for 350 (87.5%) with smaller proportions 50 (12.5%) were single / Unmarried. The majority 341 (85.25%) of our study participants were working women.

Table 1: Distribution of study participants based on age group.

Age group in years	Number	%
≤ 20	44	11.00
21-30	180	45.00
31-40	114	28.50
41-50	45	11.25
>50	17	4.25
Total	400	100.00

Table 2: Distribution of causes of abnormal uterine bleeding based on PALM-COEIN classification.

Cause of AUB	Number (%)
AUB-P	68 (17.0%)
AUB-A	77 (19.3%)
AUB-L	106 (26.5%)
AUB-M	23 (5.8%)
AUB-C	14 (3.5%)
AUB-O	56 (14.0%)
AUB-E	27 (6.8%)
AUB-I	14 (3.5%)
AUB-N	15 (3.8%)
Total	400 (%)



In this study, Leiomyoma (AUB-L) was most common cause of AUB comprises 106 cases(26.5%). The next common cause was (AUB-A) Adenomyosis, which accounts for 77 (19.3%) of total AUB cases. The next common cause of abnormal uterine bleeding was AUB-P, attributed to uterine polyps, accounting for 68 cases (17%). Another cause of AUB was AUB-O which is due to ovulatory dysfunction, which accounted for 56 cases (14%). In this study, the least

common causes of abnormal uterine bleeding were AUB-C due to coagulopathies and AUB-I (due to Iatrogenic), each accounting for 14 cases (3.5%) (Table 2).

According to the PALM-COEN classification, the majority of cases 274 (68.5%) were due to structural causes, including Polyp, Adenomyosis, Leiomyoma, and Malignancy. Non-structural causes accounted for the remaining 126 cases (31.5%).

Table 3: Distribution of participants based on comorbidities.

Comorbidities	Number	%
Anemia	295	73.8
Obesity	112	28.0
Hypertension	70	17.5
Diabetes Mellitus	77	19.3
Thyroid disorder	48	12.0

Out of 400 study participants in our AUB study, the most prevalent comorbidity was anemia, affecting 295 individuals (73.8%). (Table 3) Obesity was the next most common comorbidity with 112 individuals (28%). Hypertension and diabetes mellitus were observed in 70 (17.5%) and 77 (19.3%) individuals, respectively. Thyroid disorders were the least common, affecting 48 individuals (12%).

Table 4: Factors associated with causes of AUB

Variable	Category	PALM (Structural causes)	%	COEN (Non-structural causes)	%	χ^2	p-value
Urban Resident	Yes	146	36.50	82	20.50	4.899	0.027
	No	128	32.00	44	11.00		
Married Women	Yes	255	63.75	95	23.75	24.635	<0.001
	No	19	4.75	31	7.75		
Working women	Yes	241	60.25	100	25.00	5.066	0.024
	No	33	8.25	26	6.50		
Multiparous women	Yes	249	62.25	94	23.50	18.704	<0.001
	No	25	6.25	32	8.00		

Anemia	Yes	199	49.75	96	24.00	0.566	0.452
	No	75	18.75	30	7.50		
Obesity	Yes	77	19.25	35	8.75	0.005	0.946
	No	197	49.25	91	22.75		
Hypertension	Yes	43	10.75	27	6.75	1.966	0.161
	No	231	57.75	99	24.75		
Diabetes mellitus	Yes	59	14.75	18	4.50	2.916	0.088
	No	215	53.75	108	27.00		
Thyroid disorder	Yes	32	8.00	16	4.00	0.085	0.771
	No	242	60.50	110	27.50		

Table 4 depicts the factors associated with AUB. Women being urban residents, marital status, employment, and parity with AUB's structural causes (PALM), which are statistically significant with Chi-square p-value less than are associated 0.05. In our study, Anemia, Obesity, Hypertension, Diabetes Mellitus, and Thyroid disorder are not significantly associated with the causes of AUB, Although Diabetes Mellitus is close to significance with a p-

value (0.088) and might require further study AUB among Diabetic women.

In the current study, the above findings indicate that socio-demographic factors like urban residency, marital status, employment status, and parity play a significant role in determining the structural causes of AUB. In contrast, medical conditions such as anemia, obesity, hypertension, diabetes mellitus, and thyroid disorders do not show a strong association.

Table 5: Bivariable analysis of Factors associated with causes of AUB

Variable	Category	PALM (Structural causes)	%	COEIN (Non- structural causes)	%	Odds ratio 95%CI	p-value
Urban Resident	Yes	146	36.50	82	20.50	1.624 (1.030-2.561)	0.037
	No	128	32.00	44	11.00		
Married Women	Yes	255	63.75	95	23.75	0.107 (0.11-0.996)	0.050
	No	19	4.75	31	7.75		
Working women	Yes	241	60.25	100	25.00	0.743 (0.396-1.393)	0.354
	No	33	8.25	26	6.50		
Multiparous women	Yes	249	62.25	94	23.50	2.444 (0.283-21.125)	0.417
	No	25	6.25	32	8.00		
Anemia	Yes	199	49.75	96	24.00	1.027 (0.615-1.715)	0.920
	No	75	18.75	30	7.50		
Obesity	Yes	77	19.25	35	8.75	0.949 (0.573-1.572)	0.839
	No	197	49.25	91	22.75		
Hypertension	Yes	43	10.75	27	6.75	1.476 (0.828-2.633)	0.187
	No	231	57.75	99	24.75		
Diabetes mellitus	Yes	59	14.75	18	4.50	0.600 (0.329-1.094)	0.096
	No	215	53.75	108	27.00		
Thyroid disorder	Yes	32	8.00	16	4.00	1.068 (0.542-2.104)	0.849
	No	242	60.50	110	27.50		

In Bivariable analysis (Table 5), urban residents are more likely to have non-structural causes than structural causes which is statistically significant. Married women: married women are significantly less likely to have non-structural causes than structural causes. Employment status, multiparity, anaemia, obesity, hypertension, diabetes mellitus, and thyroid disorder do not significantly predict the outcome of non-structural causes versus structural causes in this model. Diabetes mellitus shows a p-value close to significance ($p = 0.096$), suggesting it might warrant further investigation in larger studies or with different methodologies.

DISCUSSION

In our study 26.5% cases had leiomyoma which was found to be the leading cause of AUB among our study participants. AUB-O constituted 14%, AUB-P constituted 17%, AUB-A 19.3%, AUB-M constituted 5.3% AUB-E constituted 6.8%, not yet classified constituted 3.8% of total cases. Similar findings were seen in Studies done by Vaidya R et al, Ratnani et al. Also showed leiomyoma as the leading cause of AUB contributing to not less than 20% prevalence, followed by ovulatory cause, various other researchers also supported the study. (7, 8, 9, 10) Interpreting infrequent, irregular, and unpredictable menstrual bleeding, which fluctuates in volume, duration, and

characteristics without a recognizable pattern, can be challenging. On the other hand, regular monthly periods that are heavy or prolonged often indicate a potential anatomical cause or a bleeding disorder.

⁽¹¹⁾This may be because most women in this category with regular heavy periods tend to have no definable cause of abnormal uterine bleeding, this study showed 3.8% of unclassifiable causes.

Causes of AUB		Present study Raichur, 2023-24	Vaidya R et.al. Kozhikode 2022 ⁽⁷⁾	Goel P and Rathore SB, Jaipur 2016 ⁽⁸⁾	Ratnani R and Meena NA, Chhatisgarh 2015 ⁽⁹⁾	Gouri SR et al., Tirupathi 2014-15 ⁽¹⁰⁾
Polyp	P	68(17.0%)	30 (13.3%)	08 (02.7%)	40 (13.3%)	06 (02.0%)
Adenomyosis	A	77(19.3%)	49 (21.7%)	28 (09.3%)	60 (20.0%)	38 (12.7%)
Leiomyoma	L	106(26.5%)	88 (39.1%)	68 (22.7%)	105 (35%)	74 (24.7%)
Malignancy or Hyperplasia.	M	23(5.8%)	8 (3.5%)	08 (02.7%)	65 (21.6%)	15 (05.0%)
Coagulopathy	C	14(3.5%)	3 (1.3%)	03 (01.0%)	02 (00.6%)	09 (03.0%)
Ovulatory dysfunction	O	56(14.0%)	22 (9.7%)	85 (28.3%)	60 (20.0%)	81 (27.0%)
Endometrial	E	27(6.8%)	20 (8.8%)	62 (20.7%)	12 (04.0%)	27 (09.0%)
Iatrogenic	I	14(3.5%)	5 (2.2%)	13 (04.3%)	03 (01.0%)	24 (08.0%)
Not Yet Classified	N	15(3.8%)	Nil	25 (08.3%)	03 (01.0%)	19 (6.3%)

In our study, majority of cases 274 (68.5%) were due to structural causes, including Polyp, Adenomyosis, Leiomyoma, and Malignancy. Non-structural causes accounted for the remaining 126 cases (31.5%). Study done by Vaidya R 2020 at Kozhikode showed Structural causes accounts for 175 (77.6%) cases. ⁽⁷⁾

Risk factors associated with structural causes in our study were urban residency, marital status, employment status, and parity. In our study, comorbidities did not have any statistically significant association. Vaidya R 2020 at Kozhikode in their study showed Hypertension 68 (30.2%), followed by diabetes 32 (14.2%) and thyroid disorders 15 (6.6%) were the risk factors ⁽⁷⁾. Chronic blood loss due to AUB leads to high prevalence of anemia (73.5%) was observed in this AUB study, similar prevalence (73%) was shown by the study done by Rohidas VS, Chavan NN (2020) at Mumbai ⁽¹³⁾

CONCLUSION

The PALM-COEIN classification system facilitates accurate diagnosis, which in turn helps optimize treatment strategies for AUB patients. By categorizing AUB based on its underlying causes, this classification system is useful in the management of AUB, ensuring that treatment strategies are tailored to the specific cause of the bleeding. High prevalence of anemia was observed in this AUB study which may be due to chronic blood loss which needs an attention to address anemia along with AUB. Urban residents, married women, multiparous and employed show stressful life among women is responsible for AUB. Women's health and quality of life can be improved through preventive care, lifestyle modifications, early diagnosis of risk factors or disease and appropriate timely treatment.

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