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Original Research Article

Cinical and histo-pathological correlation of various causes of Abnormal Uterine Bleeding (AUB): A cross sectional study

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Abstract:

Introduction: Abnormal uterine bleeding (AUB) is a common gynaecological complaint among reproductive and perimenopausal women and is associated with significant physical and psychological morbidity. Traditional symptom-based terminology lacked etiological correlation and often resulted in inconsistent diagnosis and management.

The International Federation of Gynecology and Obstetrics (FIGO) introduced the PALM-COEIN classification system for categorizing structural and non-structural causes of AUB. However, evidence regarding its applicability in the Indian clinical setting, particularly in Rajasthan, remains limited.

Aim and Objectives: To evaluate clinical and histo-pathological correlation of various causes of AUB.

Materials and Methods: This cross-sectional observational study was conducted in the Department of Obstetrics and Gynaecology of a tertiary care centre after institutional ethical approval. A total of 235 women aged 20-49 years presenting with abnormal uterine bleeding were included, excluding pregnancy-related causes. Detailed history, clinical examination, haematological investigations, ultrasonography, and histopathological evaluation were performed. Cases were classified according to the FIGO PALM-COEIN system. Data were analysed using SPSS version 25, with $p<0.05$ considered statistically significant.

Results and Discussion: The mean age of the study participants was 38.94 ± 7.52 years, with 65.96% belonging to the perimenopausal age group. Heavy menstrual bleeding was the most common presenting complaint (58.72%). Most women were multiparous, from rural areas (80.0%), and belonged to low socioeconomic status (60.0%). Anaemia was the most common comorbidity (73.62%). On ultrasonography, fibroid uterus was the most frequent finding (25.5%), followed by ovarian cysts/polycystic ovaries (16.6%), adenomyosis (15.7%), and endometrial polyps (14.0%). According to the FIGO PALM–COEIN classification, structural causes accounted for 65.53% of cases, with leiomyoma (28.1%), adenomyosis (20.9%), and endometrial polyp (14.0%) being the predominant etiologies. Among the non-structural causes, ovulatory dysfunction (15.3%) was the most common. High clinicopathological concordance was observed for adenomyosis (98.0%), leiomyoma (97.0%), and endometrial polyp (90.9%), supporting the diagnostic utility of the PALM–COEIN classification system.

Conclusion: There was a good clinicopathological correlation in various causes of AUB using the FIGO PALM-COEIN classification system.

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Introduction

Abnormal uterine bleeding (AUB) has been extensively studied across diverse populations due to its high prevalence, heterogeneous etiology, and significant contribution to gynaecological morbidity. Rather than representing a single disease entity, AUB encompasses a wide spectrum of clinical presentations arising from structural, hormonal, endometrial, systemic, and iatrogenic causes.[1] Consequently, research literature on AUB has evolved from symptom-based descriptions toward etiologically driven frameworks that allow meaningful comparison across studies.[2] Epidemiological investigations consistently demonstrate that AUB constitutes a major

proportion of gynaecology outpatient visits globally and in India, with a disproportionate burden among perimenopausal women.[3] Literature further highlights that while clinical presentation may be similar, the underlying causes of AUB vary considerably depending on age, reproductive status, diagnostic approach, and healthcare setting.[4] This variability underscores the importance of structured classification systems in interpreting and synthesizing evidence from different studies.[5] The majority of affected women belong to the perimenopausal age group, reflecting the hormonal and structural changes associated with this stage of life. AUB is thus a major cause of morbidity among Indian women, contributing to anemia, fatigue, reduced work capacity, and poor quality of life.[6]

The introduction of the FIGO PALM-COEIN classification has provided a standardized framework for organizing existing literature on AUB based on underlying etiology rather than bleeding pattern alone.[7] Recent studies increasingly utilize this system to describe disease distribution, evaluate diagnostic concordance, and guide management strategies.[6,8] Accordingly, the present review synthesizes available global and Indian literature on abnormal uterine bleeding with particular emphasis on etiological patterns, diagnostic correlations, and evidence generated using the PALM-COEIN classification system.[9,10]

However, data evaluating its applicability in different Indian regions remain limited. Therefore, the present study was undertaken at a tertiary care centre in Rajasthan to assess the clinical and histopathological correlation of various causes of AUB.

Aim and Objectives: To evaluate clinical and histopathological correlation of various causes of AUB.

Methodology: It was a Cross-Sectional Study done in Department of Obstetrics and Gynaecology at a tertiary care institute in Southern Rajasthan over a period of 18 months after taking approval of IRB and IEC. 235 women presenting to the Gynaecology Outpatient Department (OPD) of age group 20-49 with complaints of abnormal uterine bleeding (AUB) were evaluated and included based on eligibility. A detailed history, clinical examination, and relevant investigations (haematological tests, ultrasonography, and/or histopathological examination) were performed to establish the diagnosis.

Inclusion Criteria: Women of reproductive and perimenopausal age group (20-49 years) presenting with abnormal uterine bleeding to the gynaecology OPD.

Exclusion Criteria: Women with bleeding due to pregnancy-related causes such as abortion, ectopic pregnancy, gestational trophoblastic disease, or other obstetric causes.

All women underwent detailed general, systemic, and gynaecological examinations, which included assessment of vital signs and evaluation of overall nutritional status and body mass index (BMI). Clinical signs such as pallor, jaundice, and edema were noted, and lymph nodes were examined to identify any systemic involvement. A complete systemic evaluation was carried out, including cardiovascular, respiratory, abdominal, and neurological examinations, to detect underlying medical conditions that might contribute to abnormal uterine bleeding.

In gynecological examination, per-abdominal examination assessed the size, shape, position, consistency, mobility of the uterus, and the presence of any palpable mass or tenderness. This was followed by a per-speculum examination to visualize the cervix for any abnormalities such as erosion, hypertrophy, cervical polyps, or growths, and to observe the presence and nature of vaginal discharge or bleeding. A per-vaginal examination was then conducted to further evaluate uterine characteristics, detect adnexal masses, assess tenderness, and determine uterine mobility.

Haematological tests included a complete blood count, thyroid function profile, and coagulation studies where indicated. Ultrasonography was carried out to evaluate uterine size, endometrial thickness, adnexal structures, and to identify any structural abnormalities contributing to AUB. Histopathological examination through endometrial sampling/biopsy/hysterectomy was undertaken in cases where tissue diagnosis was required to confirm or exclude specific etiologies. All women were categorized according to the FIGO PALM-COEIN classification, which divides causes of AUB into:

- Structural causes (PALM): Polyp, Adenomyosis, Leiomyoma, Malignancy/Hyperplasia
- Non-structural causes (COEIN): Coagulopathy, Ovulatory dysfunction, Endometrial causes, Iatrogenic, Not yet classified

The final diagnosis was based on combined findings from clinical evaluation, ultrasonography, and histopathology.

Statistical Analysis was done using Statistical Package for Social Sciences (SPSS) version 25.A p-value <0.05 was considered statistically significant.

Results and Discussion

The mean age of the study participants was 38.94 ± 7.52 years (median 42 years). The 41-45 years age group was the most frequently represented, accounting for 70 women (29.79%), followed by the 46-50 years group with 33 women (14.04%). A large

majority of women were from rural areas (n = 188; 80.0%), reflecting the predominantly rural catchment population of the study centre. Urban residents constituted 20.0% (n = 47). Rohidas et al. (2020)[11] reported a higher proportion of women in the 31–40 years age range, with 25.0% belonging to the 31–35 years group and 20.0% to the 36–40 years group. In contrast, Patil et al. (2024) [12] observed a younger age distribution, with the majority of participants (45.0%) belonging to the 21–30 years age group **(Table 1)**.

Heavy menstrual bleeding (HMB) was the single most common presenting symptom, reported by 138 women (58.72%). This was followed by intermenstrual bleeding (35 women; 14.89%), irregular bleeding/menometrorrhagia (33 women; 14.04%), prolonged bleeding (22 women; 9.36%), and infrequent bleeding/oligomenorrhoea (7 women; 2.98%). Kahveci et al. (2021) [13] documented that among 515 women, menometrorrhagia (47.8%) and hypermenorrhoea (26.6%) together constituted the majority of presentations; menorrhagia accounted for 14.4% constituted the majority of symptom-based presentations when described under classical terminology, yet simultaneously emphasised that symptom-based classification alone is an inadequate basis for etiological diagnosis under PALM-COEIN. Areeb et al. (2024) [14], in a large retrospective study from King Khalid University Hospital in Saudi Arabia, found that irregular cycles were the most common presentation (53.3%), followed by heavy bleeding (12.8%), suggesting that the predominant bleeding pattern may vary across populations and healthcare settings.

Regarding duration of symptoms, the largest proportion presented within 4-6 months of symptom onset (28.51%), followed by 7-12 months (22.98%), 1-3 months (20.0%), less than 1 month (14.89%), and more than 1 year (13.62%). The majority of participants were multiparous, with P3 and above accounting for 114 women (48.51%) and P1-P2 for 104 women (44.26%) of the cohort. Nulliparous women constituted 7.23% (n = 17). Normal vaginal delivery was the predominant mode of delivery (n = 175; 74.47%), with caesarean section in 18.30% (n = 43).

Approximately 71.06% of participants had no significant medical comorbidity. Among those with associated illness, hypertension (alone) was most common (10.21%, n = 24), followed by hypothyroidism (5.53%, n = 13), other conditions including asthma, rheumatic heart disease, cholelithiasis, allergy, and obesity (5.11%, n = 12), combined hypertension with diabetes mellitus (3.40%, n = 8), diabetes mellitus alone (2.55%, n = 6), and severe anaemia (2.13%, n = 5). Hypothyroidism as a comorbidity was particularly relevant in women with ovulatory dysfunction. Overall, metabolic disorders (hypertension, diabetes, obesity) were present in approximately 16% of the cohort. Vaidya et al. (2022) [15] specifically examined the association between comorbidities and AUB categories; in their retrospective study, hypertension was the most frequent comorbidity (30.2%) and thyroid disorders showed a statistically significant association with AUB-O and AUB-E categories.

Per-abdominal examination was normal (soft, non-tender) in 91.49% of women (n = 215). Abdominal distension or swelling was present in 20 cases (8.51%), predominantly corresponding to enlarged fibroid uteri or ovarian masses. Surgical scars (tubal ligation, LSCS, or other) were noted in 50 women (21.28%). On per-speculum examination, cervical hypertrophy was the most common finding (44.68%, n = 105), indicative of chronic cervicitis in a majority of cases. A healthy cervix was observed in 42.98% (n = 101). Nabothian cysts were noted in 6.38% (n = 15). Cervical polyp was visible in 2.98% (n = 7) and cervical ectropion in a further 2.98% (n = 7). On examination, the uterus was of normal size in 49.79% of women. Mildly enlarged uteri (equivalent to 9-10 cm or 6-8 weeks size) were noted in 29.36%, moderately enlarged in 12.34%, and grossly enlarged (greater than 14 weeks equivalent) in 8.51%, the latter group primarily comprising women with large fibroid uteri. Uterine consistency was soft in 34.47% (n = 81), firm in 51.49% (n = 121), and hard in 14.04% (n = 33) - the firm and hard categories corresponding predominantly to fibroid and adenomyotic uteri. The uterus was anteverted in 96.17% and mobile in 96.60%. Retroversion was noted in 9 cases (3.83%) and fixity in 8 cases (3.40%), the latter suggestive of endometriosis or pelvic adhesions. PAP smear was performed in all 235 women. The vast majority demonstrated NILM findings (91.06%, n = 214), indicating no significant intraepithelial lesion or malignancy at the cervical level. In accordance with the 2014 Bethesda System, reactive cellular changes associated with inflammation were classified as NILM with inflammatory/reactive changes, observed in 5.53% (n = 13).

Ultrasonographic evaluation revealed fibroid uterus as the most common finding, detected in 60 women (25.5%). Ovarian cysts/polycystic ovaries were identified in 39 women (16.6%), while adenomyosis was observed in 37 women (15.7%). Endometrial polyps were present in 33 women (14.0%). Combined pathologies were noted in 22 women (9.4%), and endometrial malignancy was detected in 4 women (1.8%). No mass lesion was identified on ultrasonography in 40 women (17.0%). The majority of participants had a normal or thin endometrium (<8 mm), accounting for 112 women (49.78%). Mild endometrial thickening (8–12 mm) was observed in 85 women (37.78%), while

significant endometrial thickening (>12 mm) was present in 28 women (12.44%). USG co-relation with HPR and comparison with other studies, Choudhary et al. [16] and Prabhudev et al. [17] has been shown in **Table 2**.

Application of the FIGO PALM–COEIN classification revealed that structural causes (PALM) predominated, accounting for 154 of 235 cases (65.53%), whereas non-structural causes (COEIN) accounted for 81 cases (34.47%). This predominance of PALM lesions is comparable to the findings of Vaidya et al. [15] (77.6%) and Patil et al. [12] (68.5%), both of whom reported a higher prevalence of structural causes among women with AUB. In contrast, Rattan et al. [18] reported a predominance of COEIN causes (60%), whereas Ilhan Oruc et al. [19] observed an almost equal distribution between PALM and COEIN categories (49.4% vs 50.6%). These variations may be attributed to differences in age distribution, study design, and inclusion criteria.

Among the structural causes, leiomyoma (AUB-L) was the most common etiology, identified in 66 women (28.1%), followed by adenomyosis (AUB-A) in 49 women (20.9%). Endometrial polyps (AUB-P) were observed in 33 women (14.0%), while malignancy/hyperplasia (AUB-M) was the least common structural cause, detected in 6 women (2.6%). Among the non-structural causes, ovulatory dysfunction (AUB-O) was the most prevalent etiology, accounting for 36 cases (15.3%). Endometrial causes (AUB-E) and causes not otherwise classified (AUB-NOS) each contributed 16 cases (6.8%). Iatrogenic causes (AUB-I) were identified in 8 women (3.4%), whereas coagulopathy (AUB-C) was the least common etiology, occurring in 5 women (2.1%). Comparison with other studies like Ratnani et al. [20] and Mishra et al. [21] have been shown in **Table 3**.

Histopathological examination revealed secretory endometrium as the most common finding, observed in 140 women (59.6%), followed by proliferative endometrium in 55 women (23.4%). Proliferative endometrium with gland dilatation was identified in 18 cases (7.7%). Endometrial hyperplasia was present in 10 women (4.3%), while adenocarcinoma was diagnosed in 2 women (0.9%). Atrophic endometrium was observed in 7 cases (3.0%), and chronic endometritis was identified in 3 cases (1.3%). Overall, benign endometrial patterns, represented predominantly by secretory and proliferative endometrium, constituted the majority of histopathological findings, whereas premalignant and malignant lesions accounted for a relatively small proportion of cases. Leiomyoma was the most common diagnosis, identified in 68 women (28.9%), followed by adenomyosis in 50 women (21.3%). Endometrial causes accounted for 37 cases (15.7%), while endometrial polyps were observed in 30 women (12.8%). Ovulatory disorders were diagnosed in 20 women (8.5%), and malignancy/hyperplasia was identified in 3 women (1.3%). In 27 women (11.5%), no definitive histopathological diagnosis corresponding to a PALM-COEIN category could be established, and these cases were categorized as Not Applicable (NA). A diagnosis was not available or could not be classified (NA) in 27 women (11.5%). Ovulatory disorders were identified in 20 women (8.5%), whereas malignancy and hyperplasia constituted the least common category, accounting for 3 cases (1.3%) **(Table-4).**

Clinico-pathological concordance analysis demonstrated the highest agreement for adenomyosis (AUB-A), with a concordance of 98.0%, followed by leiomyoma (AUB-L) with a concordance of 97.0%, and endometrial polyp (AUB-P) with a concordance of 90.9%. Moderate concordance was observed for endometrial causes (AUB-E) and ovulatory disorders (AUB-O), with concordance rates of 57.1% and 55.5%, respectively. Malignancy and hyperplasia (AUB-M) showed a concordance of 50.0%, while lower concordance rates were observed for not otherwise specified causes (AUB-NOS) (43.7%), coagulopathy (AUB-C) (20.0%), and iatrogenic causes (AUB-I) (12.5%). Concordance for AUB-E was also statistically significant ($p < 0.05$). In contrast, concordance for AUB-M, AUB-C, and AUB-I was not statistically significant ($p > 0.05$). Histopathological examination identified 27 cases categorized as Not Applicable (NA), in which a definitive PALM-COEIN histopathological diagnosis could not be be established. Comparison with other studies like Singh et al. [22] and Arthi Ekambaram et al. [23] have been shown in (**Table 5)**.

Table 1: Age distribution of AUB patients

Age Group (Years)	Present Study (%)	Rohidas et al., 2020 [11] (%)	Patil et al., 2024 [12] (%)
≤20	0.43	7.0	11.0
21–25	7.23	23.0	45.0
26–30	12.34	22.0	
31–35	14.04	25.0	28.5
36–40	22.13	20.0	
41–45	29.79	3.0	11.25
46–50	14.04	-	
>50	-	-	4.25

Table 2: Ultrasonographic and Histopathological Correlation

USG Finding	Present Study (%)	Choudhary et al. [16] (%)	Prabhudev et al. [17] (%)	Patil et al. [12] (%)
Fibroid Uterus	25.5	26.0	18.1	26.5*
Adenomyosis	15.7	21.0	23.6	19.3*
Endometrial Polyp	14.0	8.0	8.3	17.0*
Ovarian Cyst / PCO	16.6	2.0	-	-
Endometrial Malignancy / Hyperplasia	1.8	14.0**	1.4	5.8*
Normal / No Mass Identified	17.0	29.0	18.1	-

Table 3: PALM-COEIN distribution

Etiology	Present Study (%)	Vaidya et al. [15] (%)	Patil et al. [12] (%)	Ratnani et al. [20] (%)	Mishra et al. [21] (%)	Rattan et al. [18] (%)
AUB-P	14.0	13.3	17.0	13.3	7.0	12.5
AUB-A	20.9	21.7	19.3	20.0	29.7	4.6
AUB-L	28.1	39.1	26.5	35.0	30.0	27.3
AUB-M	2.6	3.5	5.8	21.6	5.0	2.9
AUB-O	15.3	9.7	14.0	20.0	26.7	8.0
AUB-E	6.8	8.8	6.8	4.0	15.0	44.6
AUB-I	3.4	2.2	3.5	1.0	—	—
AUB-N	6.8	0	3.8	1.0	—	—

Table 4: Final histopathological categorization

Histopathological Diagnosis	Number (n)	Percentage (%)
Endometrial Polyp	30	12.8%
Adenomyosis	50	21.3%
Leiomyoma	68	28.9%
Malignancy and Hyperplasia	3	1.3%
Ovulatory disorder	20	8.5%
Endometrial	37	15.7%
NA	27	11.5%
Total	**235**	**100.0%**

Table 5: Histopathological Correlation with PALM-COEIN classification

Category	Present Study (%)	Mishra et al. [21] (%)	Singh et al. [22] (%)	Rattan et al. [18] (%)	Arthi Ekambaram et al. [23] (%)
AUB-P	90.9	2.96 vs 3.81	90.0	10.36 vs 12.50	11.2 vs 12.2
AUB-A	98.0	3.81 vs 8.47	90.9	3.04 vs 4.64	20.0 vs 46.8
AUB-L	97.0	41.1 vs 37.28	91.0	24.11 vs 27.32	38.0 vs 39.0
AUB-M	50.0	2.54 vs 10.16	55.6	2.50 vs 2.86	0 vs 2.0
AUB-C	20.0	NR	NR	NR	NR
AUB-O	55.5	37.28 vs 30.5	NR	26.43 vs 8.04	27.3 vs 26.8
AUB-E	57.1	12.28 vs 5.5	0 vs 7	33.57 vs 44.64	5.9 vs 7.3
AUB-I	12.5	NR	NR	NR	NR
AUB-NOS	43.7	NR	NR	NR	NR

Conclusion

A high degree of clinicopathological concordance was observed for structural PALM categories, particularly adenomyosis (93.9%), leiomyoma (90.9%), and endometrial polyp (90.9%), indicating good agreement between clinical assessment and histopathological diagnosis. In contrast, lower concordance was observed for non-structural causes, especially ovulatory dysfunction, highlighting the challenges associated with diagnosing functional etiologies of AUB.

The findings of this study support the routine use of the PALM–COEIN classification system in clinical practice as it facilitates standardized diagnosis, improves communication among clinicians, and enables uniform reporting of research data. Accurate clinical assessment supported by ultrasonography and histopathological evaluation remains essential for establishing the underlying cause of abnormal

uterine bleeding and guiding appropriate management.

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