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TO CLASSIFY THE ETIOPATHOGENESIS OF ABNORMAL UTERINE BLEEDING BY PALM-COEIN CLASSIFICATION IN WOMEN OF REPRODUCTIVE AGE GROUP IN A TERTIARY CENTRE IN SOUTH KERALA POPULATION

Obstetrics & Gynaecology

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ABSTRACT

Background Abnormal uterine bleeding (AUB) is a highly prevalent complaint among women in the reproductive and perimenopausal age group. Determining an accurate etiopathogenic diagnosis is essential for guiding clinical decision-making and selecting appropriate medical or surgical interventions.

Objectives

- Primary Objective: To categorize the structural and non-structural aetiologies of AUB using the standardized FIGO PALM-COEIN classification system among women aged 19–55 years.
- Secondary Objectives: To evaluate the histopathological patterns of the endometrium, correlate clinical/ultrasonographic mappings with histopathology, and assess the prevalence of associated medical risk factors (such as anaemia, diabetes, hypertension, and thyroid dysfunction).

Methods An observational study was conducted over a two-year period (January 2020 to August 2021) at a tertiary care medical college hospital in South Kerala. A total of 145 women aged 19–55 years who presented with non-gravid AUB and met the inclusion criteria were enrolled. Clinical parameters, menstrual cycles evaluated via the Pictorial Blood Loss Assessment Chart (PBAC), and systemic risk profiles were catalogued. Diagnostic modalities included pelvic transvaginal/transabdominal ultrasonography (USG), endometrial biopsy, and final histopathological examination (HPE) of surgical or curettage specimens. Data analysis was executed using SPSS. **Results** The cohort's mean age was 44.8±5.9years, with 67.6%concentrated between 41 and 50 years. Multiparity was highly prevalent, with Para 2 Live 2 (62.7%) representing the majority. Comorbidities included Type 2 Diabetes Mellitus (8.9%), Hypertension (5.6%), and Thyroid Dysfunction (2.8%). Increased BMI was prominent: 44.8%were overweight and 28.9%were obese. The clinical diagnosis assigned AUB-L (Leiomyoma) as the primary cause in 54.5%of cases, followed by AUB-O (Ovulatory Dysfunction) in 24.1%. Pelvic USG attributed structural causes to AUB-L in 63.4%. On final HPE-based allocation, structural pathology was verified with AUB-L remaining the most dominant single etiology at 46.2%, followed by AUB-O (17.2%), and AUB-E (11.7%). Complex multi-etiological expressions like compound AUB-A, L were verified in 7.6%of patients. **Conclusion** Uterine Leiomyoma (AUB-L) is the leading etiopathogenic factor causing AUB within this South Kerala population, followed by Ovulatory Dysfunction (AUB-O). This study highlights a significant relationship between high body mass index (BMI), multiparity, metabolic comorbidities, and the occurrence of AUB. Utilizing a combination of pelvic imaging and targeted endometrial histopathology provides accurate categorization within the structural (PALM) and non-structural (COEIN) matrix, allowing for tailored medical or surgical treatments.

KEYWORDS

Abnormal Uterine Bleeding; Palm-coein Matrix; Leiomyoma; Ovulatory Dysfunction; Histopathology.

INTRODUCTION

Abnormal uterine bleeding (AUB) remains one of the most common complaints presenting to gynecology clinics worldwide, accounting for nearly 30%of all outpatient reproductive healthcare visits.It is a significant cause of hysterectomy and thus is a major health problem(1). It causes significant social, physical, and emotional burden, impairs quality of life, and is a leading indicator for surgical procedures, including hysterectomies (2).

The perimenopausal phase-spanning the 2 to 8 years preceding menopause and the immediate year following the final menses—is marked by unpredictable and variable follicular development. This fluctuation leads to erratic estrogen secretion and an increased rate of anovulatory cycles, making these women highly susceptible to severe bleeding episodes. AUB can present in acute or chronic forms and is broadly defined as any uterine corpus bleeding that deviates from standard parameters in volume, regularity, frequency, or duration, in the absence of pregnancy.

To standardize the terminology and diagnostic frameworks for non-gravid reproductive-age women, the International Federation of Gynecology and Obstetrics (FIGO) introduced the PALM-COEIN classification framework(3).

The structural components (PALM) can be visually measured and confirmed using pelvic imaging (such as transvaginal ultrasonography or MRI) and histopathological confirmation. The functional components (COEIN) involve underlying systemic, biochemical, or endocrinological disturbances that are not defined by structural anomalies.

Because underlying organic conditions are common in perimenopausal women, ruling out endometrial hyperplasia with atypia and occult endometrial carcinoma is vital. Endometrial tissue testing remains a primary choice for managing perimenopausal AUB. It provides precise diagnoses that distinguish simple physiological variations from atypical mutations or sub-clinical neoplasms, guiding hormonal or surgical treatment.

According to Royal College of Obstetricians and Gynaecologists (RCOG) consensus, endometrial tissue validation is indicated for all symptomatic females over 35 years, as well as younger patients with known systemic metabolic risks. This institutional study evaluates the diagnostic classification and distribution of AUB causes in a tertiary facility in South Kerala using the FIGO matrix.

METHODS

Study Design and Population

This prospective, institutional observational study was conducted in the Department of Obstetrics and Gynaecology at Dr. S.M.C.S.I. Medical College Hospital, Karakonam, Thiruvananthapuram, Kerala. Following institutional ethics approval, patient enrollment was carried out over a 2-year period, with data collection spanning from January 2020 to August 2021. The study population comprised 145 consecutive women presenting to the gynecology outpatient department (OPD) and casualty clinics who satisfied the specific inclusion criteria and provided written informed consent.

Selection Criteria

Inclusion Criteria: Non-pregnant women aged 19 to 55 years presenting with acute or chronic manifestations of AUB, including parameters deviating from standard limits: cycle lengths <24days or >38days; cycle-to-cycle variation >20days; bleeding duration >8days or <4days; or total monthly volume estimates >80mL or <5mL.

Exclusion Criteria:

Bleeding associated with active pregnancy or gestational complications; lower genital tract pathologies (such as cervicitis, vaginitis, or cervical malignancy); true postmenopausal status; current use of exogenous sex steroids or hormonal modulators within the preceding 6 to 12 months; and unmarried status.

Clinical Procedure and Tools

Participants completed a detailed clinical interview to document their demographic features, lifestyle patterns, and full medical, surgical, and therapeutic history. Menstrual volume loss was monitored quantitatively using a standardized Pictorial Blood Loss Assessment Chart (PBAC). Systemic vital signs, height, weight, and Body Mass Index (BMI) were calculated for each patient.

A thorough bimanual pelvic examination was performed to check uterine dimensions, contour changes, positioning, and adnexal anomalies. Based on these initial findings, patients were given a preliminary clinical assignment within the PALM-COEIN matrix.

Diagnostic Framework

All patients underwent high-resolution transvaginal or transabdominal pelvic ultrasonography (USG) to evaluate endometrial thickness, cavity consistency, and structural abnormalities like leiomyomas or localized polyps. Systemic laboratory testing was performed for each patient, including:

- Hemoglobin estimation
- Thyroid Function Tests (TFT
- Glycated Hemoglobin (HbA1C) / Random Blood Sugar (RBS
- Fasting Lipid Profiles

Definitive diagnostic categorization was established via histopathological examination (HPE). Endometrial biopsy specimens, fractional curettage samples, and complete hysterectomy specimens (where clinically indicated) were evaluated by the pathology department to confirm the final diagnoses.

Statistical Analysis

Data extraction was compiled via Microsoft Excel, and structural statistical evaluation was carried out via the SPSS software platform. Continuous demographic variables are reported as mean ±standard deviation (Mean±SD), while discrete qualitative measurements are presented as absolute distribution counts and relative sample percentages (%).

RESULTS

Demographic and Anthropometric Profiles

A total of 145 women were evaluated. The cohort's mean age was 44.8±5.9years, with 67.6%(n=98) clustered within the 41–50 age range. Analysis of educational backgrounds showed that 57.2%(n=83) had completed high school, and 79.3%(n=115) identified their occupation as homemakers. Most participants (59.3%, n=86) reported average household income levels between 1,000 and 3,000 INR per month.

Multiparity was highly prevalent, with Para 2 Live 2 (62.7%, n=91) and Para 3 Live 3 (11.0%, n=16) accounting for most of the study population. Nutritional assessment via BMI revealed that only 23.4%(n=34) maintained a normal body mass index, while 44.8%(n=65) were overweight and 28.9%(n=42) met the criteria for obesity. The mean BMI for the cohort was 26.5±4.6 kg/m^2.

Clinical Presentation and Metabolic Comorbidities

Evaluation of menstrual symptoms showed that 74.5%(n=108) experienced objective heavy menstrual blood loss (>80mL), and 46.9%(n=68) had prolonged bleeding episodes lasting more than 8 days. Quantitative tracking via PBAC scores showed that 66.2%(n=96) had values ≥150, with a mean cohort PBAC score of 293.3±19.7. Laboratory screening identified anemia in 79.3%(n=115) of the patients. Metabolic and endocrine comorbidities included Type 2 Diabetes Mellitus (8.9%, n=13), Chronic Hypertension (5.6%, n=8), and biochemical Thyroid Dysfunction (2.8%, n=4).

Diagnostic Mapping and PALM-COEIN Distribution

The diagnostic categorization was tracked across three phases: initial clinical assessment, pelvic ultrasonography, and final histopathological examination (HPE).

FIGO Classification Category	Clinical Assignment: (%)	Pelvic Ultrasonography: (%)	Final Histopathology (HPE): (%)
AUB - L (Leiomyoma)	79 (54.5%)	92 (63.4%)	67 (46.2%)
AUB - O (Ovulatory Dysfunction)	35 (24.1%)	30 (20.7%)	25 (17.2%)
AUB - E (Endometrial Dysfunction)	9 (6.2%)	8 (5.5%)	17 (11.7%)
AUB - A, L (Adenomyosis + Leiomyoma)	8 (5.5%)	2 (1.4%)	11 (7.6%)
AUB - P (Polyp)	6 (4.1%)	4 (2.8%)	7 (4.8%)
AUB - L, P (Leiomyoma + Polyp)	3 (2.1%)	0 (0.0%)	5 (3.4%)
AUB - L, E (Leiomyoma + Endometrial)	0 (0.0%)	0 (0.0%)	4 (2.8%)
AUB - A (Adenomyosis)	4 (2.8%)	9 (6.2%)	3 (2.1%)
AUB - O, L (Ovulatory + Leiomyoma)	0 (0.0%)	0 (0.0%)	3 (2.1%)
AUB - A, E (Adenomyosis + Endometrial)	0 (0.0%)	0 (0.0%)	1 (0.7%)
AUB - A/O (Adenomyosis / Ovulatory mix)	0 (0.0%)	0 (0.0%)	1 (0.7%)
AUB - P, A (Polyp + Adenomyosis)	0 (0.0%)	0 (0.0%)	1 (0.7%)
AUB - O, E (Ovulatory + Endometrial)	1 (0.7%)	0 (0.0%)	0 (0.0%)
Total Cohort	145 (100%)	145 (100%)	145 (100%)

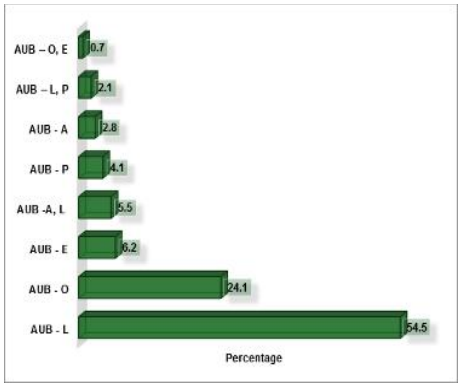

Figure 1: Clinical diagnosis (%)

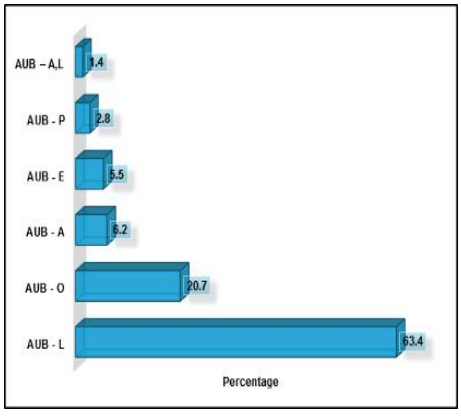

Figure 2: USG findings (%)

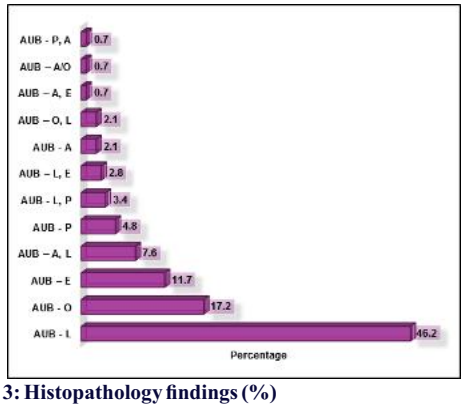

Figure 3: Histopathology findings (%)

On final histopathological evaluation, structural conditions (the PALM group) were confirmed as the primary cause of AUB. Uterine

leiomyomas (AUB-L) were the most common structural finding (46.2%). The most common non-structural finding was ovulatory dysfunction (AUB-O), which was confirmed in 17.2%of cases.

Histopathology also identified complex, multi-etiological cases that were not fully captured by clinical assessment or ultrasound alone. These included combined adenomyosis and leiomyomas (AUB-A, L) in 7.6%of cases, and concurrent leiomyoma and localized polyp tissue changes (AUB-L, P) in 3.4%of the cohort.

DISCUSSION

Evaluating and managing abnormal uterine bleeding requires a reliable classification system to guide targeted therapies. In this study of 145 symptomatic women in South Kerala, structural pathologies (the PALM group) were the predominant cause of AUB, with uterine leiomyomas (AUB-L) being the most common single diagnosis.

This high prevalence of leiomyomas (46.2% on final HPE) aligns with several structural evaluations in the literature. For example, Minal Kalambe et al. identified leiomyomas as the primary cause of AUB in 31.6%of their cohort, followed by ovulatory disturbances (23.4%)(4). Similarly, Archana Singh et al. found that structural PALM features caused 69.96%of AUB cases, with leiomyomas accounting for 36.75%and ovulatory conditions for 26%(5). These studies support our finding that benign smooth muscle neoplasms are a major driver of heavy menstrual bleeding during the peak reproductive and perimenopausal years.

However, the distribution of AUB causes can vary across different geographic populations. Cross-sectional data from Yu Sun et al. in a Chinese cohort showed that non-structural ovulatory dysfunction (AUB-O) was the most common cause (57.7%), while endometrial polyps (AUB-P, 16.2%) were the most frequent structural finding, ahead of fibroids (12%)(6). This contrast underscores how regional variations, demographic factors, and diagnostic approaches can influence the reported prevalence of AUB etiologies.

Our study also highlights the value of histopathology in identifying co-existing pathologies. Clinical assessment and ultrasound sometimes fail to detect multiple conditions, which are later revealed during microscopic examination of tissue specimens. We observed significant rates of combined conditions, such as concurrent adenomyosis and leiomyomas (AUB-A, L: 7.6%) and overlapping fibroids with endometrial polyps (AUB-L, P: 3.4%). This matches the findings of Devanshi Mishra et al., who noted that final histopathology often reveals a higher proportion of structural components—and complex, multi-factorial cases—than initial clinical impressions suggest(7).

Additionally, this study confirms a strong correlation between elevated body mass index, systemic metabolic risks, and abnormal uterine bleeding. Over 73%of our cohort fell into the overweight or obese categories. Excess adipose tissue increases peripheral aromatization of androgens into estrogens. This persistent estrogenic stimulation, without balanced progesterone regulation, can cause endometrial proliferation, anovulatory cycles, and heavy bleeding.

Ansari et al found that frequency of structural causes was polyp (6.7%), adenomyosis (23.5%),Leiomyomata(53.7%) and Malignancy (16.1%). Non-structural causes were Coagulation Disorders (5.6%), Ovulatory (37.6%), Endometrial Dysfunction(3.4%), Iatrogenic (15.7%) and Not-yet-classified (12.4%)(8).

The high prevalence of iron-deficiency anaemia (79.3%) in our participants also emphasizes the systemic impact of chronic, unmonitored uterine bleeding. This underscores the need for early, structured screening and comprehensive management strategies.

CONCLUSION

This study demonstrates that structural uterine pathologies—primarily uterine leiomyomas (AUB-L)—are the leading cause of abnormal uterine bleeding in this South Kerala population, followed by non-structural ovulatory dysfunction (AUB-O). Our findings show that AUB is highly prevalent among multiparous women and is strongly associated with elevated body mass index (BMI) and metabolic comorbidities like Type 2 Diabetes and chronic hypertension.

While pelvic ultrasonography is an effective initial screening tool, final histopathological examination remains essential for accurate diagnosis. HPE is highly reliable for identifying compound pathologies (such as combined leiomyoma and adenomyosis) and for ruling out atypical changes or occult endometrial malignancies.

Using the standardized FIGO PALM-COEIN framework ensures consistent diagnostic tracking. This structural approach allows clinicians to move away from outdated terms like "dysfunctional uterine bleeding" and design targeted, effective treatment strategies for women in their reproductive and perimenopausal years.

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