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**ORIGINAL ARTICLE**

# A Study on Histomorphological Spectrum in Abnormal Uterine Bleeding at a Tertiary Care Center

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## Abstract

**Introduction:** A common gynecological problem that affects women, especially throughout their reproductive and perimenopausal years, is abnormal uterine bleeding (AUB). It includes any alteration in frequency, length, or volume that deviates from typical menstrual rhythms. The PALM-COEIN approach, which incorporates both non-structural factors like coagulopathy and ovulatory dysfunction as well as structural causes including polyps, adenomyosis, leiomyoma, and cancer, is used by the International Federation of Gynecology and Obstetrics (FIGO) to categorize AUB. For chronic AUB that does not respond to conservative management, hysterectomy is still the only effective option. For a precise diagnosis, histopathological examination (HPE) of hysterectomy tissues is essential, particularly in cases where imaging alone cannot provide a definitive answer. **Materials and Methods:** This retrospective cross-sectional study was conducted in the Department of Pathology at KMCH Institute of Health Sciences and Research from July 2023 to June 2024. A total of 150 reproductive-age, peri-menopausal, and post-menopausal women with complaints of abnormal uterine bleeding (AUB) who underwent hysterectomy were included in the study. **Results:** The most common histopathological finding was uterine fibroids, observed in 45.3% of cases, followed by adenomyosis in 19.3%. Among the endometrial abnormalities, non-secretory endometrium and disordered proliferative endometrium were identified in 31.3% and 27.35% respectively. Ultrasonography was effective in detecting fibroids but showed limited sensitivity in diagnosing adenomyosis, which was better confirmed through histopathology. **Conclusion:** Histopathological evaluation plays a vital role in diagnosing the causes of AUB, particularly in cases where imaging does not provide clear results.

**Keywords:** Abnormal uterine bleeding, Histopathological, Hypertension, Anemia, Proliferative endometrium

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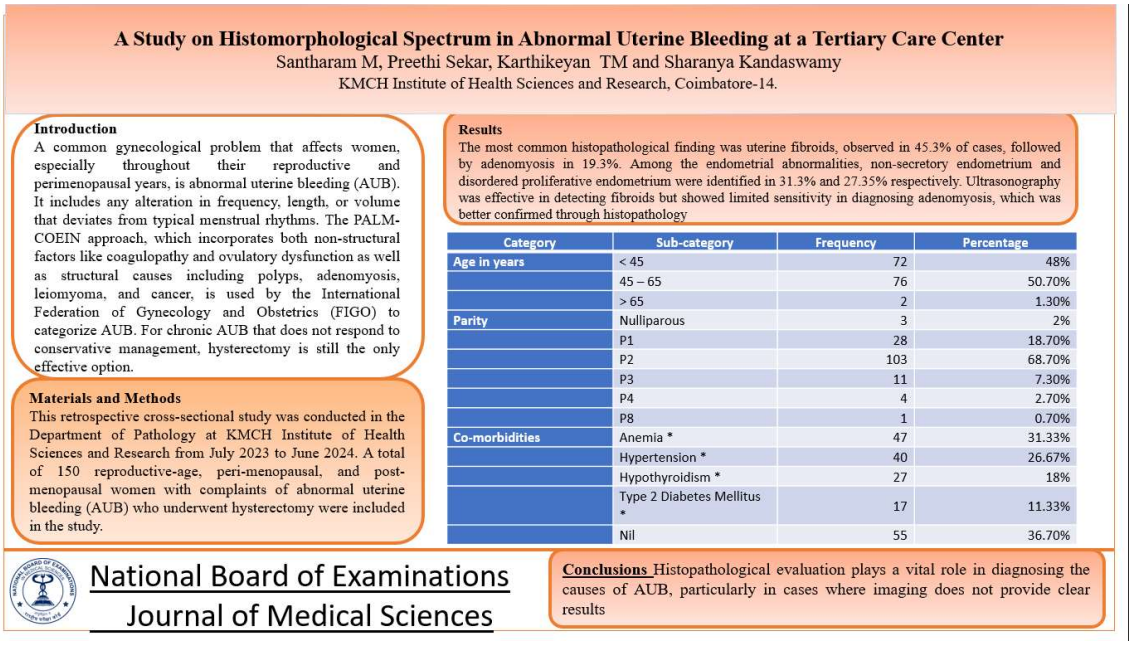
## Graphical Abstract




## Introduction

One of the most prevalent gynecological disorders, abnormal uterine bleeding (AUB) has an adverse effect on women's health, especially throughout the reproductive and perimenopausal years [1,2]. It includes any alteration to the regular menstrual cycle, such as shifts in the volume, frequency, or length of bleeding [1–3]. Polyps, adenomyosis, leiomyoma, and cancer are among the structural causes of AUB, while coagulopathy, ovulatory dysfunction, endometrial, iatrogenic, and not classified are among the non-structural causes, according to the International Federation of Gynecology and Obstetrics (FIGO), which classifies the causes of AUB under the PALM-COEIN system [3,4]. For women with persistent AUB who do not improve with medical care, hysterectomy is still the only effective option [5]. Because of its accessibility and non-invasiveness, ultrasound (USG) is frequently the first diagnostic technique employed [6]. However, the gold standard for verifying the cause of AUB is histopathological examination (HPE) of hysterectomy tissues, particularly in cases where cancer is suspected [7]. The analysis of clinical, radiographic, and pathological data in this study is crucial for creating evidence-based recommendations for the best hysterectomy treatment plans in AUB. In a tertiary care context, the purpose of this study is to assess the histopathological results from hysterectomy tissues and their relationship to preoperative ultrasonographic results.

## Materials and Methods

The Department of Pathology at KMCH Medical College Hospital in Coimbatore conducted this retrospective cross-sectional study between July 2023 and June 2024. IHEC approval and Waiver of consent was acquired. Assessing histopathology results from hysterectomy specimens taken from patients who presented with abnormal uterine bleeding (AUB) and contrasting them with preoperative ultrasound (USG) results were the main objectives of the study. Retrospective data, including clinical

information, USG results, and histopathological examination (HPE) reports, were gathered from hospital records.

150 patients who had hysterectomy for AUB were included in the study; these patients included women of reproductive, perimenopausal, and postmenopausal ages. To guarantee the study's exclusive emphasis on AUB brought on by gynecological diseases, patients with a history of bleeding disorders, pregnancy-related issues, or trauma-induced bleeding were excluded when the case records were scrutinized. Data on patient demographics, age, parity, menstrual history, concomitant conditions, and USG results were analyzed from the clinical records.

In the pathology section, every hysterectomy specimen underwent a thorough gross and microscopic histological examination. Endometrial, myometrial, cervical, and adnexal diseases were assessed in the specimens, which comprised the uterus, cervix, fallopian tubes, and ovaries. Histopathological findings, such as fibroids, adenomyosis, endometrial hyperplasia, chronic cervicitis, and adnexal cysts, were grouped according to the kind and character of abnormalities seen. The results of the ultrasound were also examined, with particular attention paid to the size of the uterus, the thickness of the endometrium, and the existence of fibroids or other anomalies. To evaluate the diagnostic accuracy and uncover any differences, the HPE and USG data were compared.

By anonymizing data during analysis, the study protocol complied with ethical guidelines and guaranteed patient confidentiality. With histopathology acting as the gold standard, the results of HPE and their association with USG results were statistically examined to assess the usefulness of USG in identifying structural and non-structural causes of AUB. Histopathological findings, clinical profiles, and patient demographics were compiled using descriptive statistics. To evaluate the correlation between ultrasonographic and histological findings for endometrial and myometrial abnormalities, chisquare was computed. Statistical significance was defined as a p-value of less than 0.05.

**Results**

According to the age distribution of women who had hysterectomy for AUB, the majority (50.7%) were between the ages of 45 and 65, with those under 45 coming in second (48%). Merely 1.3% of the population was over 65. The majority of patients were P2 (68.7%), according to parity analysis, which showed that most patients were multiparous. Just 2% of women were nulliparous. The most prevalent comorbidity was anemia (31.33%), which was followed by type 2 diabetes mellitus (11.33%), hypertension (26.67%), and hypothyroidism (18%). Interestingly, Table 1 shows that 36.7% of patients did not have any concomitant diseases.

Table 1. Age wise distribution, parity, and co-morbidities of women undergone hysterectomy for AUB

| Category | Sub-category | Frequency | Percentage |
|---|---|---|---|
| **Age in years** | < 45 | 72 | 48% |
| | 45 – 65 | 76 | 50.70% |
| | > 65 | 2 | 1.30% |
| **Parity** | Nulliparous | 3 | 2% |
| | P1 | 28 | 18.70% |
| | P2 | 103 | 68.70% |
| | P3 | 11 | 7.30% |
| | P4 | 4 | 2.70% |
| | P8 | 1 | 0.70% |
| **Co-morbidities** | Anemia * | 47 | 31.33% |
| | Hypertension * | 40 | 26.67% |
| | Hypothyroidism * | 27 | 18% |
| | Type 2 Diabetes Mellitus * | 17 | 11.33% |
| | Nil | 55 | 36.70% |

* Multiple response

According to uterine histopathological analysis, the most prevalent endometrial pathology was non-secretory endometrium (31.3%), which was followed by disorganized proliferative endometrium (27.3%) and secretory endometrium (14.7%). Only 0.7% of cases had endometrial cancer, compared to 8.7% with benign endometrial polyps. The most common finding in the myometrium was leiomyoma (45.3%), and a considerable percentage of cases had both leiomyoma and adenomyosis coexisting (29.3%). 14% of individuals showed just adenomyosis, whilst 11.3% of cases had no noteworthy myometrial abnormalities (Table 2).

Table 2. Histopathological findings of uterus among the women undergone hysterectomy for AUB

| Category | Histopathology findings | Frequency | Percentage |
|---|---|---|---|
| **Endometrium** | Benign Endometrial Polyp | 13 | 8.70% |
| | Disordered Proliferative Endometrium | 41 | 27.30% |
| | Endometrial Hyperplasia Without Atypia | 3 | 2% |
| | Endometrial Carcinoma | 1 | 0.70% |
| | No Specific Pathology | 1 | 0.70% |
| | Non-Secretory Endometrium | 47 | 31.30% |
| | Proliferative Endometrium | 15 | 10% |

| | | | |
|---|---|---|---|
| | Secretory Endometrium | 22 | 14.70% |
| | Senile Cystic Atrophy | 7 | 4.70% |
| **Myometrium** | Adenomyosis | 21 | 14% |
| | Leiomyoma | 68 | 45.30% |
| | Leiomyoma and Adenomyosis | 44 | 29.30% |
| | Unremarkable | 17 | 11.30% |

The majority of endometrial diseases were more accurately diagnosed with HPE when endometrial histopathology findings were compared to USG results. In both normal (30.4%) and thickened (36%), non-secretory endometrium was the most often observed feature on USG. However, HPE offered more diagnostic detail; for example, it detected rare diseases including endometrial cancer (0.7%) and disorganized proliferative endometrium in 27.3% of cases, which USG missed. USG and endometrial histopathology results did not significantly correlate, according to the statistical analysis (Rho = -0.014, P = 0.869, Table 3).

Table 3. Comparison of Histopathological findings of the endometrium and Ultrasonographic Results

| **Histopathology findings** | **USG Findings Endometrium** | | | | **Total** | | **Chisquare Value (P - Value)** |
|---|---|---|---|---|---|---|---|
| | **Normal** | | **Thickened** | | | | |
| | **N** | **%** | **N** | **%** | **N** | **%** | |
| Benign Endometrial Polyp | 9 | 7.20% | 4 | 16.00% | 13 | 8.70% | -0.014 |
| Disordered Proliferative Endometrium | 37 | 29.60% | 4 | 16.00% | 41 | 27.30% | (0.869) NS |
| Endometrial Hyperplasia Without Atypia | 2 | 1.60% | 1 | 4.00% | 3 | 2.00% | |
| Endometrium Carcinoma | 1 | 0.80% | 0 | 0.00% | 1 | 0.70% | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No Specific Pathology | 1 | 0.80% | 0 | 0.00% | 1 | 0.70% | |
| Non-Secretory Endometrium | 38 | 30.40% | 9 | 36.00% | 47 | 31.30% | |
| Proliferative Endometrium | 14 | 11.20% | 1 | 4.00% | 15 | 10.00% | |
| Secretory Endometrium | 19 | 15.20% | 3 | 12.00% | 22 | 14.70% | |
| Senile Cystic Atrophy | 4 | 3.20% | 3 | 12.00% | 7 | 4.70% | |

The most common disorder seen on both USG and HPE, according to a comparison of myometrial findings, was leiomyoma. But in 14% of patients, HPE found adenomyosis, which USG found less consistently. Histopathology revealed that adenomyosis and leiomyoma coexisted in 29.3% of cases, highlighting the limits of USG in identifying overlapping diseases. USG and myometrial histopathology results did not significantly correlate, according to the statistical analysis (Rho = 0.12, P = 0.143, Table 4).

Table 4. Comparison of Histopathological findings of the myometrium and Ultrasonographic Results

| **Histopathology findings** | **USG Findings** | | | | | | **Total** | | **Chi square Value (P - Value)** |
|---|---|---|---|---|---|---|---|---|---|
| | **Adenomyosis** | | **Leiomyoma** | | **Nil** | | | | |
| | **N** | **%** | **N** | **%** | **N** | **%** | **N** | **%** | |
| Benign Endometrial Polyp | 3 | 10.30% | 9 | 9.80% | 1 | 3.40% | 13 | 8.70% | 0.12 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Disordered Proliferative Endometrium | 12 | 41.40% | 23 | 25.00% | 6 | 20.70% | 41 | 27.30% | (0.143) NS |
| Endometrial Hyperplasia Without Atypia | 0 | 0.00% | 1 | 1.10% | 2 | 6.90% | 3 | 2.00% | |
| Endometrium Carcinoma | 0 | 0.00% | 0 | 0.00% | 1 | 3.40% | 1 | 0.70% | |
| No Specific Pathology | 1 | 3.40% | 0 | 0.00% | 0 | 0.00% | 1 | 0.70% | |
| Non-Secretory Endometrium | 6 | 20.70% | 31 | 33.70% | 10 | 34.50% | 47 | 31.30% | |
| Proliferative Endometrium | 2 | 6.90% | 10 | 10.90% | 3 | 10.30% | 15 | 10.00% | |
| Secretory Endometrium | 3 | 10.30% | 15 | 16.30% | 4 | 13.80% | 22 | 14.70% | |
| Senile Cystic Atrophy | 2 | 6.90% | 3 | 3.30% | 2 | 6.90% | 7 | 4.70% | |

**Discussion**

The results of the study show that uterine fibroids were the most common cause of AUB, with histology confirming leiomyomas in 45.3% of patients and ultrasonography identifying 61.3% of cases. Although fibroids were successfully identified by ultrasonography, histology offered conclusive proof, highlighting their higher diagnostic accuracy. This finding is in line with that of Talukdar et al. [3], who determined that fibroids were the main

structural anomaly causing AUB in the perimenopausal age range. As also mentioned by Gupta et al. [8], fibroids are known to damage the uterine surface, increasing menstrual blood flow and prolonging bleeding.

Histopathological analysis revealed that 19.3% of patients had adenomyosis, another important cause of AUB. However, as noted by Mahajan et al. [7], ultrasonography demonstrated low sensitivity in diagnosing adenomyosis, mainly because of its widespread infiltration into the myometrium. Additionally, Elkholi and Nagy highlighted that imaging methods cannot accurately detect diffuse adenomyotic alterations [9]. These results highlight how important histology is as the gold standard for identifying adenomyosis and associated disorders.

According to histopathological investigation, the most common results were non-secretory and disorganized proliferative endometrium, which were found in 31.3% and 27.3% of patients, respectively. According to Pillai et al. [4], these endometrial alterations point to hormonal abnormalities, especially in women who have anovulatory periods. These perimenopausal alterations, which are frequently invisible on ultrasonography, emphasize the need of histopathology in obtaining a precise diagnosis [10].

Larger lesions such fibroids and a big uterus were successfully detected by ultrasonography, but more subtle endometrial and myometrial abnormalities were not adequately described. According to Bindroo et al., histological analysis is still crucial in cases when ultrasonographic results are not conclusive, confirming its function in improving the diagnostic strategy [11]. The accuracy and management of AUB are greatly enhanced by the combination of imaging and histology.

Significant endometrial disease, including polyps and hyperplasia, was more common in patients with irregular menstrual periods. According to Jetley et al., irregular bleeding patterns are important clinical markers of structural problems that need careful histological analysis to inform the best course of treatment [12]. This demonstrates how ultrasonography is limited in its ability to identify structural abnormalities in these situations.

In the study population, comorbidities such as anemia and hypertension were common; 17.3% of patients had anemia. Anemia is frequently made worse by chronic blood loss brought on by AUB, making clinical management more difficult. In addition to managing the underlying causes of AUB, Dias et al. emphasized the significance of addressing these comorbidities [13]. When histopathology is successfully included into the diagnostic framework, it aids in both determining the underlying cause of AUB and customizing treatment to enhance patient outcomes [6,13].

In 96% of cervical specimens, histopathological analysis also showed chronic cervicitis. This conclusion is in line with Verma and Verma's identification of chronic inflammation as a possible cause of AUB [10]. Additionally, 18.7% of cases had benign ovarian cysts, especially follicular cysts, highlighting the necessity of a thorough adnexal examination, which is frequently more effectively accomplished by histology than by imaging alone [10].

Ultrasonography's limits in identifying specific uterine and adnexal diseases make a multimodal diagnostic approach that includes histopathology

essential. Combining imaging with histological examination improves diagnosis accuracy, especially when there are non-specific imaging abnormalities or suspected malignancies, according to Emanuel et al. [14]. By ensuring a more conclusive diagnosis, this integrated approach improves patient care and makes focused treatment solutions possible [15].

## Conclusion

The results of this investigation highlight how important histological evaluation is for making a conclusive diagnosis of AUB, especially when imaging is not enough. The most frequent cause of AUB was found to be uterine fibroids, although adenomyosis and other endometrial abnormalities also played important roles. Although ultrasonography proved successful in detecting leiomyomas, tissue testing is essential for a precise diagnosis because of its low sensitivity in detecting disorders like adenomyosis. In order to increase diagnostic precision and support individualized, patient-centered treatment plans, this study promotes an integrated diagnostic strategy that blends imaging methods with histopathological investigation. A thorough strategy like this can greatly improve patient outcomes, particularly for women with unclear or persistent instances of AUB.

## Statements and Declarations

### Conflicts of interest

The authors declare that they do not have conflict of interest.

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