**INTRODUCTION**

**Abnormal uterine bleeding (AUB)** is an umbrella term encompassing various forms of uterine bleeding that deviate from the normal menstrual pattern in terms of regularity, volume, duration, or frequency. It is defined as bleeding originating from the uterine corpus in a non-pregnant woman. AUB can manifest as heavy menstrual bleeding, irregular menstrual bleeding, or postmenopausal bleeding, which all differ in severity and cause. This condition has emerged as a leading cause for gynecologic consultation, significantly affecting a substantial portion of the female population. The impact of AUB is widespread, with studies suggesting that up to 14-25% of women in the reproductive age group, and up to 50% of women in the perimenopausal phase, experience some form of abnormal uterine bleeding [3, 4, 5].

Abnormal uterine bleeding is considered a common complaint, often causing considerable physical and emotional distress to affected individuals. In reproductive-aged women, it frequently leads to impaired quality of life, with symptoms such as heavy menstrual bleeding (HMB) causing anemia, fatigue, and restriction in daily activities. Furthermore, AUB often leads women to seek medical advice as the condition may be associated with underlying pathologies, including uterine fibroids, polyps, endometrial hyperplasia, and, in more serious cases, malignancy [6]. As women approach perimenopause, the frequency and severity of AUB tend to increase, mainly due to hormonal changes, aging, and the onset of structural uterine abnormalities [7].

**The Significance of AUB and its Prevalence**

**Abnormal uterine bleeding** is a condition that varies widely in terms of its prevalence, depending on age, geography, and health conditions. Studies suggest that the **prevalence of AUB in reproductive-age women** ranges from 3% to 30%, with some reports noting that it can affect up to one-third of women at some point in their lives [1]. The condition also disproportionately affects perimenopausal and postmenopausal women, as they are at increased risk of underlying structural uterine changes such as fibroids and endometrial hyperplasia. In postmenopausal women, AUB is particularly concerning because it raises the possibility of malignancy, necessitating a thorough evaluation[1].

Perimenopause is a phase of transition before menopause, generally beginning between 45 and 47 years of age, marked by irregular cycles and hormonal fluctuations, which can contribute to AUB [6]. The World Health Organization (WHO) defines perimenopause as the period extending from two to eight years before menopause, characterized by a decline in ovarian function and a reduction in estrogen production. This phase is often marked by unpredictable menstrual cycles, with some women experiencing an increase in menstrual flow, while others experience irregular bleeding or skipped periods [6, 7].

In terms of structural abnormalities, common causes of AUB during the reproductive years include uterine fibroids (leiomyomas), endometrial polyps, and adenomyosis. As women approach perimenopause, however, conditions like endometrial hyperplasia and carcinoma become more prevalent. This shift in pathology underscores the importance of tailoring diagnostic and therapeutic strategies based on a woman’s age and reproductive status [8].

**Nomenclature and Classification of AUB**

Historically, AUB was described using a variety of inconsistent terms such as menorrhagia, metrorrhagia, and dysfunctional uterine bleeding (DUB). These terms often overlapped and failed to provide clear diagnostic distinctions. In response to this, the **International Federation of Gynecology and Obstetrics (FIGO)** introduced a consensus on the terminology for AUB in 2007. This consensus aimed to standardize terminology and provide a more comprehensive and clinically relevant classification system. In 2011, FIGO published an updated classification that included the **PALM-COEIN** system, which classifies AUB into structural and non-structural categories based on the underlying pathology. The **PALM-COEIN** system includes the following categories:

* **P** – Polyp (AUB-P)
* **A** – Adenomyosis (AUB-A)
* **L** – Leiomyoma (AUB-L)
* **M** – Malignancy and Hyperplasia (AUB-M)
* **C** – Coagulopathy (AUB-C)
* **O** – Ovulatory Dysfunction (AUB-O)
* **E** – Endometrial (AUB-E)
* **N** – Iatrogenic and Not Otherwise Classified (AUB-N) [8, 9].

This classification system has revolutionized the understanding of AUB by categorizing its causes into structural (e.g., polyps, fibroids, endometrial carcinoma) and non-structural factors (e.g., coagulopathies, ovulatory dysfunction). The PALM-COEIN system is instrumental in guiding clinical management, ensuring that both clinicians and patients can communicate effectively about the underlying causes of AUB. It also facilitates research by providing a unified framework for investigating the etiology of abnormal uterine bleeding [8].

**Pathophysiology and Mechanisms of AUB**

The pathophysiology of AUB is multifactorial and varies depending on the underlying cause. In cases involving structural abnormalities such as uterine fibroids, polyps, or adenomyosis, the uterus becomes unable to function normally during the menstrual cycle. Fibroids, for instance, can disrupt the endometrial lining, leading to heavy bleeding and irregular cycles. Similarly, polyps or endometrial hyperplasia can result in abnormal bleeding patterns due to abnormal growth of endometrial tissue [8].

In addition to structural causes, **non-structural factors**, such as ovulatory dysfunction, also play a crucial role in AUB. Ovulatory dysfunction, commonly associated with anovulatory cycles, can result in irregular shedding of the endometrium, leading to heavy bleeding. This is often seen in adolescent girls and women in the perimenopausal period due to hormonal fluctuations or insufficient progesterone production during the luteal phase of the menstrual cycle [1, 9].

Moreover, coagulopathies (disorders of blood clotting) can significantly contribute to abnormal uterine bleeding. Women with underlying bleeding disorders, such as von Willebrand disease or platelet dysfunction, are at increased risk for heavy or prolonged bleeding episodes. The pathophysiology of coagulopathies in AUB involves a disruption in the normal coagulation cascade, preventing proper clot formation and leading to excessive menstrual flow [9].

One of the critical contributors to primary endometrial dysfunction is a disturbance in the mechanisms responsible for endometrial hemostasis. This can result from a failure to produce adequate vasoconstrictors such as endothelin-1 and prostaglandin F2α, or from excessive production of vasodilators like prostaglandin E2 and prostacyclin, which promote vasodilation and increase blood flow to the uterus. These imbalances can lead to abnormal bleeding, particularly during menstruation, when the endometrial tissue is naturally undergoing shedding [11, 12, 13].

Chronic endometrial inflammation or infection may also play a role in AUB. Although chronic endometritis has been recognized as a potential cause of AUB, its exact relationship with abnormal bleeding remains unclear. Chronic endometritis may occur due to infections or long-term inflammation within the uterus, leading to changes in the endometrial lining that could contribute to abnormal bleeding patterns. However, there is insufficient evidence to classify it definitively as a major cause of AUB, and it is often regarded as a diagnosis of exclusion [15, 16].

**Diagnostic Approaches to AUB**

The diagnosis of AUB requires a systematic approach, starting with a detailed patient history and physical examination. A thorough history helps to identify potential causes, such as medications (e.g., anticoagulants, hormonal therapies), underlying health conditions (e.g., thyroid dysfunction, coagulopathies), or a history of uterine pathology (e.g., fibroids or polyps). Exclusion of pregnancy-related causes is paramount, especially in reproductive-aged women, as pregnancy complications (e.g., miscarriage, ectopic pregnancy) can lead to abnormal bleeding [2].

The next step in the diagnostic workup is endometrial sampling (biopsy), which is considered the gold standard for diagnosing AUB. Endometrial biopsy involves the collection of tissue from the uterine lining for histopathological evaluation. This procedure is critical in diagnosing conditions such as endometrial hyperplasia, carcinoma, and inflammatory disorders. Additionally, hysteroscopy has gained popularity as a diagnostic tool, as it provides direct visualization of the uterine cavity, allowing for the detection of focal lesions such as polyps, fibroids, and other structural abnormalities [2, 5].

Dilation and curettage (D&C) remains a common procedure for obtaining endometrial tissue, especially in settings where hysteroscopy is not readily available. However, D&C has limitations, particularly in its inability to detect focal lesions or malignancy in some cases, especially in postmenopausal women. Therefore, combining D&C with complementary imaging techniques, such as saline infusion sonohysterography or hysteroscopy, can enhance diagnostic accuracy and improve management [5, 6].

Ultrasound imaging is also commonly used in the evaluation of AUB, especially to assess for structural lesions such as fibroids and polyps. While it is a non-invasive and widely accessible tool, ultrasound may not always provide sufficient detail for accurate diagnosis, particularly when there are focal lesions in the uterine cavity. In such cases, advanced imaging or direct visualization via hysteroscopy may be necessary [2, 9].