THE EFFICACY OF TRANSVAGINAL ULTRASONOGRAPHY AND OFFICE HYSTEROSCOPY IN EVALUATION OF ABNORMAL UTERINE BLEEDING (AUB')

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"THE EFFICACY OF TRANSVAGINAL ULTRASONOGRAPHY AND OFFICE HYSTEROSCOPY IN EVALUATION OF ABNORMAL UTERINE BLEEDING (AUB)"

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LIST OF ABBREVATIONS

A/V	Anteverted
AP	Antero posterior
AUB	Abnormal uterine bleeding
B/L	Break through bleeding
CBC	Complete blood count
CO2	Carbon dioxide
D&C	Dilatation and Curettage
DM	Diabetes mellitus
ECG	Electrocardiogram
FF	Fornix free
GnRH	Gonadotropin releasing hormone
HbSAg	Hepatitis B surface antigen
HIV	Human immunodeficiency virus
HPE	Histopathological examination
HPMB	Heavy and prolonged menstrual bleeding
HRT	Hormone replacement therapy
LH	Luteal hormone
MRI	Magnetic resonance imaging
N	Number
NSAID	Nonsteroidal anti-inflammatory disease
NT	Non tender
OH	Office hysteroscopy

OR	Operation room
OPD	Outpatient department
PCOS	Polycystic ovarian syndrome
PMB	Postmenopausal bleeding
PT	Prothrombin time
SIS	Saline infusion sonography
SLE	Systemic lupus erythematosus
TCRE	Trans cervical resection of endometrium
TSH	Thyroid stimulating hormone
TVS	Transvaginal ultrasonography
USG	Ultrasonography
Ut	Uterus
VDRL	Venereal disease research laboratory
VWF	Von Willebrand Factor
2D	2 Dimensional

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ABSTRACT

BACKGROUND:

Abnormal uterine bleeding (AUB) is a prevalent issue in women of child bearing age group. AUB can be uncomfortable, embarrassing in social situations, and have a considerable impact on health-related quality of life. AUB causes productivity loss and may require major surgical procedures, such as a hysterectomy. AUB is reported to occur in 9 to 14% women between menarche and menopause. The reported prevalence of AUB in India is around 17.9%

OBJECTIVES:

1) To evaluate the causes of abnormal uterine bleeding using Transvaginal sonography (TVS), Office hysteroscopy (OH) and endometrial biopsy (HPE) to achieve the greatest diagnostic accuracy.

2) To determine the sensitivity and specificity of TVS , OH and correlate with histopathological findings in the detection of various uterine pathologies.

3)To compare the cost effectiveness of each procedure

MATERIALS AND METHODS:

It is a prospective observational study done in 75 patients with abnormal uterine bleeding attending the gynaecology OPD at BLDE(DU) SHRI B M PATIL MEDICAL COLLEGE, VIJAYAPURA,KARNATAKA. Detailed history of the patient was taken and thoroughly examined including checking of vitals and bimanual examination and the TVS was done after obtaining consent. This was followed by Office Hysteroscopy and Endometrial biopsy was taken for histopathological examination. Data were gathered and examined and cost analysis of each procedure was done.

RESULTS :

In this study, 75 AUB patients were included, and the majority of them were in perimenopausal age group. The most frequent presenting symptom was heavy menstrual bleeding (49.3%), followed by irregular menstrual bleeding (41.4%). Office hysteroscopy & TVS were performed and then followed by endometrial biopsy in these patients. For the normal variations, such as proliferative and secretory, the sensitivity of TVS was 81.48% and for the detection of polyps, endometrial hyperplasia, and submucous fibroid it was 45.45%, 42.86%, 100% respectively. For the normal variations, such as proliferative and secretory phases of endometrium, the sensitivity of OH was 74.07% and for the detection of polyps, endometrial hyperplasia, and submucous fibroid which was 46.15%, 100%, 100% respectively. The p value was <0.05 which shows the statistical significance of both tests. For normal variations of endometrium, TVS demonstrated good association with Office hysteroscope results, but low correlation for intracavitary diseases. OH was costlier when compared to TVS.

CONCLUSION:

In patients with AUB , TVS was the initial method of evaluation which was safe, easily accecible and cost effective. TVS has more sensitivity and accuracy in detecting intramural pathologies like uterine fibroids. Office hysteroscopy is a quick, safe, and well-tolerated method of determining the reason of AUB. Though Office Hysteroscopy is not cost effective, it had showed greater diagnostic accuracy in identifying intra cavitory pathologies of uterus and doing intervention in the same setting. Hence both are complimentary to each other and together helps in ruling out the causes of AUB more accurately.

KEY WORDS:

Abnormal uterine bleeding, Heavy menstrual bleeding, Hysteroscopy, Office Hysteroscopy, Transvaginal ultrasonography

INTRODUCTION

Women of reproductive age frequently experience abnormal uterine bleeding (AUB). AUB can be uncomfortable, embarrassing in social situations, and have a considerable impact on health-related quality of life. AUB results in decreased productivity[1] and may require surgical procedures including hysterectomy[2]. AUB is reported to occur in 9 to 14% women between menarche and menopause[3] . In India, the reported frequency of AUB is approximately 17.9%3. Descriptive terms that have been used to characterize AUB patterns include menorrhagia, metrorrhagia, polymenorrhoea, dysfunctional uterine bleeding and heavy menstrual bleeding.[3]

A proper etiological diagnosis is essential to achieving the objectives of clinical management. Traditional studies used to determine the causes of abnormal uterine bleeding included dilatation and curettage and ultrasonography[4]. The endometrium must be given for evaluation during the blind dilatation and curettage technique. Ultrasonography clearly shows the uterine contour and the ovarian condition, but it is insufficient for revealing the endometrium's condition. Though TVS is an excellent method for evaluating intramural pathologies it lacks accuracy in diagnosing intrauterine conditions. With the advent of office hysteroscopy, a new era in the diagnosis of abnormal uterine bleeding has begun. In the majority of cases, the aetiology can be identified by direct view of the uterine cavity. It helps in early identification of endometrial cancer and uterine polyps and can detect endometrial hyperplasia.

One of the most typical problems that a patient brings to a gynaecologist is abnormal uterine bleeding. The diagnostic gold standard for assessing abnormal uterine bleeding has long been a D&C. Curettage alone frequently misses the presence of polyps and submucous fibroids[4].

The purpose of this study was to evaluate the usefulness of TVS and office hysteroscopy in evaluating AUB. Use of hysteroscopy in abnormal uterine bleeding is almost replacing blind curettage, as it ‘‘sees’’ and ‘‘decides’’ the cause. With the availability of Office hysteroscopy of 1.9mm/2.9mm there is no need for anaesthesia and inpatient admission. Considering all these factors, office hysteroscopy with transvaginal ultrasonography appears to be effective complementary method in evaluation of abnormal uterine bleeding with histopathology as the basis for correlation.

AIMS AND OBJECTIVES

1) To evaluate the causes of abnormal uterine bleeding using transvaginal sonography, hysteroscopy and endometrial biopsy to achieve the greatest diagnostic accuracy.

2) To determine the sensitivity and specificity of TVS , hysteroscopy and correlate with histopathological findings in the detection of various uterine pathologies.

3)To compare the cost effectiveness of each procedure

REVIEW OF LITERATURE

Lubna Pal et al (1997)[5] in their study 54 women underwent endometrial biopsy, transvaginal ultrasound scan followed by office hysteroscopy. When compared to hysteroscopy results, transvaginal ultrasound had a sensitivity and specificity of 0.60 and 0.88, respectively. The negative predictive value of an unremarkable endometrial biopsy was 51%. The endometrial biopsy's sensitivity and specificity were 0.04 and 0.83, respectively. They concluded that the most accurate and cost-effective approach appears to be proceeding with hysteroscopy early in the assessment.

Moawad et al (2014)[6] studied 130 patients who underwent office diagnostic hysteroscopy with trans vaginal ultrasonography, the results were compared with tissue sampling. Among the 55 women who underwent OR(operation room) hysteroscopy, there was 71% agreement between findings on hysteroscopy in the office hysteroscopy and the OR. They concluded that office hysteroscopy has the ability to decrease the need for OR hysteroscopies under anesthesia and to increase OR availability for other procedures and services.

Gazal Garg et al (2017)[7] studied 60 patients who underwent OH and TVS and correlated with histopathologic examination. Endometrial polyps were the most common cause of AUB, comprising 26.67% (n = 16) of total cases, followed by submucous myomas attributing to 23.33% (n = 14) of the cases. Their study proved that OH with TVS was more specific and sensitive in diagnosing the pathology.

SinhaP et al (2018)[8] studied 56 women in which all with symptoms of abnormal uterine bleeding were examined, and histopathological and TVS findings were compared. The

hysteroscopy's sensitivity, specificity, PPV, NPV, and accuracy were calculated. Hysteroscopy identified 53.6% of pathology, diagnosing adhesion and forgetting IUCD in 5.4% of cases each, polyps in 16.1%, calcification in 12.5%, submucosal fibromas in 10.7%, necrotic masses in 7.1%, and adhesion in 12.5% of cases. Submucous myoma was discovered in a considerably larger percentage of individuals with hysteroscopy ($p = 0.012$). It was concluded that hysteroscopic findings were more accurate compared with histopathological findings.

Hui-Yu Huang et al (2019)[9] in their study, 836 patients with various indications who had diagnostic hysteroscopy without anaesthesia in an outpatient environment were evaluated. A total of 530 (63.3%) patients reported histologic results that supported the agreement between hysteroscopic and histologic findings. The maximum concordance was found in submucosal myoma (96.3%), whereas the lowest concordance was seen in endometrial hyperplasia (50%). Endometrial hyperplasia involved 48 individuals (5.7%) and endometrial cancer involved 35 patients (4.2%). Endometrial pathology was present in two patients who were first diagnosed with nonspecific endometrial thickness.

Nancy A. Towbin, MD et al (1996) [10] showed that Hysteroscopy was 79% sensitive and 93% specific in diagnosing intracavitary pathologic disorders, whereas transvaginal ultrasonography was only 54% sensitive and 90% specific. In this study they concluded that Office hysteroscopy is a rapid, safe, well-tolerated, and highly accurate means of diagnosing the cause of excessive uterine bleeding. It permits patient and physician to discuss more treatment options before surgery, including outpatient operative hysteroscopic procedures.

Col B.K. Goyal et al (2015)[11] found that, among the 58 participants in the study, menorrhagia was the most frequent presenting symptom, Metrorrhagia, menometrorrhagia, and continuous bleeding followed next lasting longer than 21 days. The uterine size of all 74 patients was

average. On TVS, the uterine cavity was normal in 57 instances. Six patients had submucous fibroids, 16 had endometrial polyps, and 19 patients had thickened endometrium. In 41 female patients, hysteroscopy revealed polypoidal endometrium, polyps, or submucous fibroids, while in 59 female patients, the cavity was normal. TVS was found to have great sensitivity, specificity, and positive and negative predictive values (95.23 and 94.82, respectively). There has been shown to be excellent agreement between TVS and hysteroscopy.

Veena . B.T et al (2014)[12] showed that TVS has an accuracy of 83.3% for proliferative phase detection and 66.67% for secretory phase detection. For an intra-cavitary local lesion of the endometrial cavity, TVS shows a sensitivity of 0%. In the case of postmenopausal patients with endometrial thickness less than 4mm, TVS was also preferred. Thus patients with AUB should to be subjected to TVS as first procedure, followed by hysteroscopy; and hysteroscopically directed biopsy, wherever necessary and required.

Danavitner et al (2013)[13] demonstrated that hysteroscopy had a noticeably higher sensitivity in identifying intrauterine fibroids. The difference was not statistically significant, despite the fact that hysteroscopy had stronger predictive values for uterine polyps.

Waleed El-khayat et al (2011)[14] showed that Menorrhagia (40%) and menometrorrhagia (34%) were the two most prevalent bleeding patterns, and endometrial hyperplasia (about 50% of these lesions) and endometrial polyps (approximately 50% of the numerous lesions) were both confirmed to be present, Endometrial polyps (26%) and endometrial hyperplasia (32%) were the two most common findings by TVS. The most frequent lesion identified by hysteroscopy was an endometrial polyp, which was discovered in 28% of cases. While 2D ultrasound has good sensitivity for detecting endometrial polyps, adenomyosis has the highest specificity and accuracy. Hysteroscopy has a low sensitivity but a good specificity for

adenomyosis and endometrial hyperplasia. For the detection of uterine lesions, ultrasound was more accurate and sensitive than hysteroscopy, while hysteroscopy showed higher specificity.

Sefa Kelekci et al (2006)[15] showed that The sensitivity and specificity of TVS, SIS, and OHS in detecting intracavitary abnormalities were 56.3% and 72%, 81.3% and 100%, and 87.5% and 100%, respectively. The prevalence of endometrial polyps was not different in women with and without AUB. Saline infusion sonography was less painful than OHS (pain scores of 4.3 and 7.2 respectively).

Jaiswar Shyam Pyari et al (2006)[16] found that menorrhagia (40%) poly menorrhoea (14%), metrorrhagia (18%) and menometrorrhagia (14%) were the most common signs of irregular uterine bleeding. TVS has a sensitivity of 78.15% and a specificity of 44.4% when compared to hysteroscopy, while D&C has a sensitivity of 89% and a specificity of 45%. TVS or D & C are less sensitive than hysteroscopy and guided biopsy in identifying the reasons of abnormal uterine bleeding.

deWit et al (2003)[17] retrospectively assessed 1045 hysteroscopies carried out during a 6-year period. 54.2% of people had normal cavities. Endometrial polyps (14.4%) and fibroids (21%) were the most prevalent aberrant findings. Only little more than half of cases with endometrial hyperplasia detected by hysteroscopy had it verified. In 2 of the 7 verified instances, endometrial cancer was suspected on the hysteroscopic view. A useful method for identifying structural intra-cavitary pathology is diagnostic hysteroscopy, which is ideal for outpatient clinics. A useful method for identifying structural intra-cavitary pathology is diagnostic hysteroscopy, which is ideal for outpatient clinics.

Gianninot et al (2003)[18] analysed diagnostic hysteroscopy in AUB retrospectively and found that it was a quick, safe, and quite well. for AUB. Diagnosis in all age groups and Widespread

usage of it can significantly lessen the need for traditional curettage, improving patient satisfaction and reducing expenses.

Bain et al (2002)[19] In a study involving 370 pre-menopausal women, the effectiveness of hysteroscopy over standard vaginal examination and endometrial biopsies was evaluated and compared. The researchers came to the conclusion that diagnostic hysteroscopy performed outside of a hospital setting is a reasonable practise and may offer better guarantees. In some situations, outpatient hysteroscopy may be beneficial, but when done without care, it has minimal impact on clinical management and raises expenditures.

Clark et al (2002)[20] analysed the effectiveness of hysteroscopy in the detection of endometrial hyperplasia and cancer. They came to the conclusion that while hysteroscopy has only moderate diagnostic accuracy for endometrial diseases, it is good for detecting endometrial cancer.

Madan et al (2001) [21] In their retrospective examination of 556 cases of AUB that underwent hysteroscopy and D&C, only 13 patients had their polyps histologically confirmed, although endometrial polyps were found in 53 cases. For the diagnosis of endometrial hyperplasia (85%) and endometrial cancer (99.5%), hysteroscopy was very reliable; Hysteroscopy has a 40% sensitivity for detecting endometrial cancer and a 30% sensitivity for detecting endometrial hyperplasia.

ABNORMAL UTERINE BLEEDING

PHYSIOLOGY OF NORMAL MENSTRUATION[23]:

Menstruation is the regular uterine bleeding that takes place during the fertile years between menarche and menopause. Menarche typically occurs between the ages of 10 and 16, with 13 being the average age in the Indian context.

Menstruation ends completely with menopause. In India, 48 years old is the typical menopause age. If the ovum is not fertilised, the corpus luteum will degenerate, causing normal menstruation, which is essentially a progesterone withdrawal haemorrhage. Normal menstruation symbolises the cyclic shedding of secretory endometrium.

The endometrium goes through the following phases as a result of the ovaries monthly cyclic synthesis of oestrogen and progesterone.

- Proliferative phase
- Secretory phase
- Menstrual phase

Proliferative phase:

It relates to the ovarian cycle's follicular phase. It continues through the menstrual phase and ends with ovulation. The proliferative phase is when the endometrium regenerates from the basalis layer due to the oestrogen produced by the developing follicle. Due to the impact of oestrogen, short, narrow, and straight glands grow longer and convoluted, and the stroma thickens and compacts. The endometrium is 3-5 mm thick during ovulation. The duration of time period varies depending on when ovulation occurs.

Secretory phase[23]:

This is the progestational phase of the endometrial cycle, which begins following ovulation. From the time of ovulation until the beginning of the following cycle, it lasts. The estrogen-primed endometrium undergoes secretory alterations during the progesterone-dominant secretory phase, which primarily serves to create the ideal environment for implantation and supply the fertilised ovum with nutrients. The progesterone increases the glands' tortuosity and gives the glandular epithelium a pseudostratified appearance. The stroma becomes more vascular and edematous. This modification is known as "pseudo-decidualization".

The endometrial thickness is approximately 5-6mm one week following ovulation, at the height of the secretory period. The corpus luteum degenerates and menstruation begins around the 14th day after ovulation if the ovum is not fertilised. This stage is almost constant.

Menstruation phase[23]:

The menstrual endometrium has dense tissue which is fragile. This tissue later exhibits a variety of functional states during menstruation, including gland breakdown and disarray, red cell interstitial diapedesis, white cell infiltration, and vascular and stromal fragmentation. Epithelial and stromal stem cells are the sources of endometrial regeneration.

In the basalis layer, endometrial mesenchymal stem/progenitor cells can be seen next to blood vessels. It is believed that these progenitor cells help the endometrial functionalis stroma regenerate and expand. The proliferative and exfoliative phases of the cycle, which are more dramatic, are bridged by the menstrual endometrium. Incomplete or delayed shedding is linked to heavier flow and more blood loss. The dense mass of the stromal fibroblast layer allows the resurfacing epithelium to "migrate" over it. The reaction might not

be a hormone-mediated one, but rather one that is initiated by injury because hormone levels are at their lowest throughout this repair period. This "healing" proceeds quickly; by day 4 of the cycle, new epithelium has covered more than two-thirds of the hollow. By 5-6 days, the cavity has been completely reepithelialised, and stromal development has started.

MECHANISM OF NORMAL MENSTRUATION[23]:

The presence of spiral arterioles, which branch out of basal arteries at a right angle and point into the uterine cavity, is a distinctive characteristic of endometrium. End arteries known as spiral arterioles supply the small portion of endometrium that isn't anastomosed. The strong vasoconstriction of spiral arterioles occurs about 24 hours before menstruation, which causes ischemia necrosis of the endometrial region supplied by them, is a critical event in the menstrual cycle. This blood-filled pool separates from the necrotic endometrium and is removed from the body. The vasoconstrictive activity of prostaglandins is likely what causes severe vasospasm.

THE OVARIAN CYCLE[23,27]:

At around five to six weeks of intrauterine life, the primordial germ cells emerge in the yolk sac, allantois, and hindgut and move to the genital ridge to lay in the future ovaries. By 16–20 weeks of intrauterine gestation, they have multiplied quickly and number about 6-7 million. By birth, rapid degeneration leaves roughly 2 million primordial follicles behind. Up until puberty, only 3,000 follicles are left due to atresia[23]. Finally, only approximately 500 follicles mature and ovulate over a woman's entire reproductive life.

The ovulation event separates the two phases of the ovarian cycle.

- Follicular phase
- Luteal phase

The Follicular phase:

Basically, the follicular phase involves the follicle's growth and maturity, which leads to the hormones (oestrogen, progesterone, and androgens) being synthesised and a mature ovum that can be fertilised. Ovulation marks the end of it.

Ovulation[23]:

Declining FSH as a result of increasing Inhibin appears to rescue itself from this suppression at mid-cycle, causing enhanced FSH output again. A subsequent sharp spike in LH production known as the LH urge results from this rising FSH secretion as well as the peak oestrogen secretion from growing follicles.

Release of Ovum[23]:

Just prior to ovulation, the LH surge causes quick, fast alterations in the pre-ovulatory follicle that initiate progesterone synthesis. Follicle distends and collects liquid folliculi. It is then moved closer to the ovarian surface, where the wall is cracked by the activity of a proteolytic enzyme at the weakest spot (stigma), allowing the ovum to escape.

Luteal phase[23]:

The follicle collapses and develops into corpus luteum after the release of the ovum. The corpus luteum develops fully in just five days, at which point it begins to operate and reaches its peak function in the next three to four days. If fertilisation does not occur, the function begins to decline 4-5 days before the next anticipated menstrual period. When examined with the naked eye, it appears yellow because lipoids are present. Hyaline degradation eventually causes it to produce corpus albicans. Progesterone is the main hormone secreted by the corpus luteum, along with oestrogens and a little quantity of androgens.

DEFINITION OF ABNORMAL UTERINE BLEEDING[22]:

Abnormal uterine bleeding (AUB) is a nonspecific term that is best defined as irregularities in the menstrual cycle involving

frequency, regularity, duration, and volume of flow outside of pregnancy. It can have a variety of menstrual patterns, which, by clinical experience, have yielded empirical definitions. It reflects disruption of physiological control of hypothalamic-pituitary-gonadal axis, impaired haemostasis mechanism of endometrium and vasculature fragility as the result of aberrant angiogenesis. It can be broadly categorized as anovulatory and ovulatory AUB.

In 2011, International Federation of Gynaecology and Obstetrics (FIGO) introduced a new nomenclature to standardize the terminologies describing menstrual disturbances in reproductive age group women by an acronym PALM-COEIN[22] (Polyp, Adenomyosis, Leiomyoma, Malignancy and hyperplasia, Coagulopathy, Ovulatory dysfunction, Endometrial, Iatrogenic, and Not yet classified). The American College of Obstetricians and Gynaecologists also recommends this new nomenclature system developed by FIGO to standardize the terminology used to describe AUB. Dysfunctional uterine bleeding often used synonymously with AUB is not part of the PALM- COEIN system, hence its use is not recommended[22].

According to PALM-COEIN classification[22] , uterine bleeding abnormalities are defined as -

- Heavy menstrual bleeding (instead of menorrhagia), is defined as menstrual blood loss greater than 80 ml.
- Inter menstrual Bleeding (instead of metrorrhagia) is defined as bleeding between cyclic and predictable menstrual periods.
- Frequent menstrual bleeding (instead of polymenorrhea) is defined as bleeding that occurs more often than every 24 days.

- Infrequent menstrual bleeding (instead of oligomenorrhea) is defined as bleeding that occurs less frequently than every 38 days.

Recommended Normal Limits of Menstrual Dimensions

The present report updates the FIGO recommendations for both FIGO-AUB Systems 1 and 2, including clarifications on terminologies and definitions, as well as modifications in the PALM-COEIN system that include reassignment of some entities, and guidance for subclassification of leiomyomas, much of which has been preliminarily published.

TABLE : 1 - FIGO-AUB SYSTEM 1 [(22)]

Parameter	**Features**
Frequency	Absent (no bleeding) = Amenorrhoea Infrequent (>38 days) Normal (>/=24 to </=38 days) Frequent (<24 days)
Duration of flow	Prolonged >8 d Normal 4 – 8 d Shortened <4 d
Regularity	Normal or Regular (Shortest to longest cycle variation : </= 7-9 d) Irregular (Shortest to longest cycle variation : </= 8-10 d)
Flow Volume	Light Normal Heavy
Intermenstrual bleeding	Spontaneous bleeding occurring between menstrual periods

TABLE : 1 - FIGO AUB SYSTEM 2 [22]

AUB - A	Refined sonographic diagnostic criteria
AUB - L	Inclusion of type 3 as submucous leimyoma Type definitions and distinctions Distinction between Types 0 and 1; 6 and 7 Distinction between Types 2 and 3; 4 and 5
AUB - C	excludes AUB associated with pharmacological blood coagulation-impairing drugs, which are currently included in AUB-I
AUB - I	Now covers AUB linked to all iatrogenic processes, including the use of pharmaceuticals thought to interfere with ovulation and those used as anticoagulants.
AUB - O	Based on the above-mentioned system 1 adjustments, the diagnosis threshold alters. No longer includes any ovulatory diseases linked to medications that are known to interfere with ovulation or are suspected of doing so.
AUB - N	The name "Not yet classified" has been replaced with Not otherwise classified as the name of the category.

The following are recommended definitions, classifications, and terminology for AUB symptoms:[22]

Disturbances of Regularity:

- Irregular Menstrual Bleeding (IrregMB): Bleeding of >20 days in individual cycle lengths over a period of one year.
- Absent Menstrual Bleeding (amenorrhea): Menstrual bleeding is absent during a 90-day period

Disturbances in Frequency:

- Infrequent Menstrual Bleeding: a maximum of one or two episodes every 90 days.
- Frequent Menstrual Bleeding: is defined as having more than four episodes in a 90-day period.

Disturbances of Heaviness of Flow:

- Heavy Menstrual Bleeding (HMB): Excessive menstrual blood loss can happen alone or in conjunction with other symptoms, interfering with a woman's physical, emotional, social, and material quality of life.
- Heavy and Prolonged Menstrual Bleeding (HPMB): It is less frequent than HMB. Given that they may have diverse aetiologies and respond to various treatments, it is crucial to distinguish between them and HMB.
- Light Menstrual Bleeding: Rarely related to pathology; based on patient complaint.

Disturbance of the Duration of Flow:

- Prolonged Menstrual Bleeding: Regular menstrual cycles that last more than eight days.
- Shortened Menstrual Bleeding: Bleeding for no more than two days is unusual.

- Irregular Non-menstrual Bleeding : Irregular bleeding episodes that take place between typical menstrual cycles and are frequently light and brief. The majority of the time connected to benign or malignant structural abnormalities. May happen during or after sexual activity.

Bleeding Outside Reproductive Age:

- Postmenopausal Bleeding (PMB): Bleeding that starts more than a year after the recognised menopause.
- Precocious Menstruation: Usually occurring before the age of nine years, premature puberty is characterised by additional symptoms.

Acute AUB

- A significant amount of heavy bleeding in a woman of reproductive age who is not pregnant necessitates prompt action to stop future blood loss.

Chronic AUB

- bleeding from the uterine corpus that has been ongoing for the majority of the last six months and is abnormal in duration, volume, or frequency

Patterns of Bleeding

- The volume and shape of the bleeding pattern during the course of a single menstrual cycle. Most people are aware that the first three days of the cycle, with days 1 or 2, are when 90% of the total menstrual flow is lost. This pattern is not always present in women with AUB.

PALM-COEIN Classification System[23]:

Polyps (AUB-P) [23,27]

- These epithelial proliferations include varying amounts of fibro-muscular, connective tissue, glandular, and vascular components
- The most common presenting symptom is unusual vaginal bleeding.
    - The presence or absence of polyps is observed.
    - It is the reason for abnormal vaginal bleeding, which affects 21-28% of post-menopausal women and 39% of pre-menopausal women. They can be identified with hysteroscopy, TVS, and saline infusion sonography.

Adenomyosis (AUB-A)

AUB symptoms account for 70% of cases, dysmenorrhea for 30%, and both for 19%.

- It can be identified by USG or MRI.

Leiomyomas (AUB-LSM or AUB-LO)

- It is a benign myometrial fibromuscular tumour. The majority of benign genital tract tumours are this type.
- Women over 45 years of age have a lifetime risk of greater than 60%.
- Compared to intramural and subserosal leiomyomas, submucosal lesions are strongly related with AUB.

Malignancy and Hyperplasia (AUB-M)

- The main symptom of endometrial neoplasia is AUB.
- 15% of PMB with AUB have hyperplasia, 15% have endometrial cancer, and findings in 70% of PMB with AUB are benign. Concurrent carcinoma is found in about 50% of women with endometrial hyperplasia. Both premalignant and malignant lesions are included in AUB-M.

Coagulopathies (AUB-C)

- Von Willebrand disease, which is most frequently present in 13% of women with HMB, may be missed during the differential diagnosis since it is a systemic illness of haemostasis.

TABLE : 3 - Types of Von - Willebrand disease:

Type	Inheritance	Characteristics
1	Autosomal dominant	Most common variant (85%) Results from quantitative deficiency of von Willebrand factor
2	Autosomal dominant	Has four subtypes – all of which involve qualitative abnormalities of von Willebrand factor
3	Autosomal recessive	Rare Total deficiency of von Willebrand factor – this results in the most severe form of coagulopathy

Ovulatory Dysfunction (AUB-O)[23,27]

- It could manifest as any of a wide range of menstrual disorders, from amenorrhea to episodes of severe HMB requiring medical attention to prevent further blood loss.
- These individuals frequently have endocrinopathies like anorexia nervosa, polycystic ovary syndrome, hypothyroidism, hyperprolactinemia, stress, and obesity.
- All of these patients should be assessed for ovulatory dysfunction because ovulatory problems are more common in the extremes of reproductive age.

Endometrial Causes (AUB-E) [23,27]

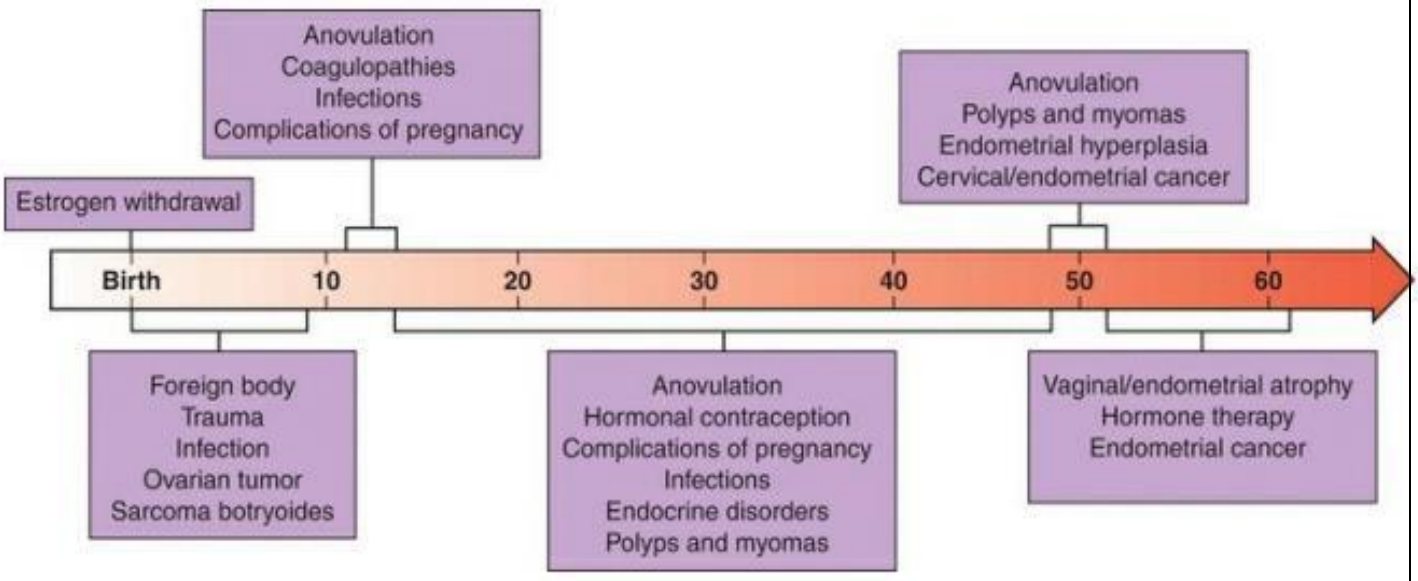
- These individuals won't have any clearly defined causes of AUB, but they will experience predictable cyclical menstruation that suggests normal ovulation.
- The majority of them have HMB, which could be a sign of a main condition that affects endometrial haemostasis.
- Others may exhibit IMB, which could be a complication of endometrial inflammation, an infection, or an abnormal reaction to localised inflammatory reactions.

Iatrogenic (AUB-I)[22, 23]

- Medicated or inert IUDs, gonadal steroidal therapy, and other systemic pharmacological medications that influence blood clotting or ovulation are some of the causes.
- Breakthrough "bleeding" , which is nothing more than unauthorised endometrial bleeding while receiving exogenous gonadal steroid therapy, makes up the majority of the AUB-I categorization.

Not Yet Classified (AUB-N) [22,23]

- Allocated for a number of different uterine phenomena, such as arteriovenous malformation, chronic endometritis, and myometrial hypertrophy, that are little understood, inadequately investigated, or both.
- Other illnesses may only be identified through molecular biology or biochemical tests.
- These entities will probably be classified into a new or current category in this system with further information.



- Although FIGO's efforts to standardise and streamline the language used to characterise menstrual irregularities are praiseworthy and well-founded, because of the traditional terminology entrenched status and ambiguity, acceptance of this new nomenclature has been slow.

Notation [22]

- Following thorough assessment of the patient by the necessary tests, as described below, AUB symptoms could have one or more probable causes, according to a diagnosis.
- As a result, this system's categorization and notation have been created in a way that will make them simpler for experts and researchers to understand.
- Like WHO /TNM staging of malignant tumors, each component will be addressed for all patients.
    - For instance, if it was discovered that a person had a type 2 leiomyoma, an ovulation abnormality, and no other abnormalities, they would be classified as: AUB PO AO LI (SM) MO - CO 01 EO IO NO.

However, it would be laborious to write the entire notation in a therapeutic setting. Consequently, a possible abbreviation has been created. The same patient would fall under the AUB-LSM; O category.

Anovulatory Bleeding[23,27]**:**

In women of reproductive age, anovulatory disorders are most frequently caused, and they are particularly prevalent in teens. In the first year after menarche, up to 80% of periods are anovulatory. After menarche, cycles typically take 20 months to become ovulatory. No treatment is required if anovulatory bleeding is neither severe or protracted. If a youngster is upset about the irregularity of menses, oral contraceptives are advised as a course of treatment[23]. After the hypothalamic-pituitary axis reaches maturity, some women continue to

have anovulatory cycles. To rule out serious pathology, serum concentrations of prolactin and thyroid-stimulating hormone should be checked. The hypothalamus can anovulate due to weight loss, eating disorders, stress, chronic sickness, or overexertion.

In polycystic ovarian disease excess androgens are converted to oestrogen in peripheral tissues. The risk of endometrial hyperplasia and cancer rises in an unopposed oestrogen condition. Some women with chronic anovulation are thought to have idiopathic chronic anovulation since they do not fit into any of the categories listed above.

A progesterone deficiency is evident in all anovulation-causing factors. Treatment options include oral contraceptives, ovulation stimulation with clomiphene if pregnancy is desired, and every three months, exogenous progesterone to prevent endometrial cancer.

Ovulatory Dysfunctional Bleeding [23]***:***

Ovulatory DUB is possible but is less frequent than anovulatory haemorrhage. DUB manifests as regular, cyclic bleeding in women with ovulatory cycles. Menorrhagia can also be brought on by chronic renal failure and liver illness with the resulting coagulation problems. Usually, incomplete luteal phase or brief follicular phase result in polymenorrhea. Typically, an extended follicular phase in an ovulating woman causes oligomenorrhea. A delayed follicular phase is typically what causes oligomenorrhea in ovulating women. The quick fall in oestrogen levels before ovulation may cause midcycle spotting[23].

Excess oestrogen induces the endometrium to proliferate in an undifferentiated manner, resulting in oestrogen breakthrough bleeding. A section of the endometrial lining sloughs off at irregular intervals because there is not enough progesterone to support its

structural integrity. Lack of the typical platelet plugging and progesterone-guided vasoconstriction frequently results in heavy bleeding.

Abrupt drop in oestrogen levels causes bleeding associated with oestrogen withdrawal, like when exogenous oestrogen medication is stopped, after bilateral oophorectomy, right before ovulation during a regular menstrual cycle, etc. Estrogen withdrawal bleeding typically resolves on its own and doesn't happen again if oestrogen levels stay low.Lack of oestrogen causes the endometrium to atrophize, become ulcerated, and be more prone to frequent and irregular bleeding.

TABLE : 4 – CHARACTERISTICS OF OVULATORY AND ANOVULATORY BLEEDING

Category	Characteristics	Differential diagnosis
Anovulatory[10]	▪ Irregular, often infrequent periods ▪ Progesterone – deficient/ oestrogen – dominant state ▪ Flow ranges from absent or minimal to excessive 14 ▪ percent of women with recurrent anovulatory cycles develop cancer or hyperplasia	▪ Adolescence ▪ Uncontrolled diabetes mellitus ▪ Eating disorder ▪ Hyper – or hypothyroidism ▪ Hyperprolactinemia ▪ Perimenopause ▪ Polycystic ovary syndrome ▪ Pregnancy **Medication effects:** ▪ Antiepileptics ▪ Antipsychotics
Ovulatory[10]	▪ Regular intervals (24-38 days) with excessive bleeding or duration greater than 8 days. Less than 1 percent of women ▪ develop cancer or hyperplasia if they have no more than one risk factor for endometrial cancer.	**Bleeding disorder** ▪ Factor deficiency ▪ Leukaemia ▪ Platelet disorder ▪ Von Willebrand disease **Hypothyroidism** **Advanced liver disease** **Structural lesions** ▪ Fibroids ▪ Polyps

CAUSES OF ABNORMAL UTERINE BLEEDING:

- Endocrinopathies
- Neoplastic ○ Ovarian ○ Cervical ○ Uterine ○ Vaginal
- Benign uterine disease ○ Adenomyosis ○ Endometriosis ○ Simple or complex hyperplasia of endometrium ○ Cervical and Endometrial polyps
  - ○ Leiomyoma

- Prevalence of fibroid is age dependent - 11.0% for women aged 20–39 years; 45.4% for those aged 40–59 years; and 19.5% for women 60 years or older.[14]
- Metrorrhagia or menorrhagia - the most distressing presenting symptom.
- When menorrhagia is the presenting symptom, the probability of having an ultrasound diagnosis of fibroid will be 73.3%.[24]

- Pelvic inflammation / Infections
- Coagulopathy
- Von Willebrand's disease
- Thrombocytopenia
- Iatrogenic

o Irregular hormonal treatment (Depo-Provera, HRT)

o IUCD - induced menorrhagia (LNG IUCD)

o Drug – induced (Anticoagulation therapy)

- Systemic illnesses:

  - o Diabetes mellitus
  - o Systemic Lupus Erythematosus
  - o Malignancy
  - o Myelodysplasia
  - o Chronic renal disease
  - o Liver disease

- Hypothyroidism
- Hyperprolactinemia
- Cushing disease
- PCOS
- Leukaemia
- Adrenal dysfunction

- In adolescents:
  - Genital trauma
  - Sexual abuse
  - Cervicitis relating to sexually - transmitted infections (Chlamydia)
  - Foreign bodies (e.g. Retained tampons)

AUB DIAGNOSTIC EVALUATION [22]:

History:

- Age of menarche, parity, and menopause
- The course of menstrual bleeding and severity
- Pain , Blood loss
- Medical conditions, prior surgical experience, and medication use
  - Potential haemostatic condition symptoms and warning indicators

Physical Examination

- General physical and systemic
- Pelvic Examination
  - Per speculum and per vaginal
  - Bimanual

Laboratory Tests

- UPT or serum pregnancy test
- CBC
- LFT and RFT
- TSH
- Chlamydia trachomatis
- Prothrombin time, Partial thromboplastin time and specific tests for von Willebrand disease, von Willebrand-ristocetin cofactor activity, VWF antigen, and factor VIII are all recommended for targeted screening for bleeding problems (where warranted, based on history)

Diagnostic or Imaging Tests (when indicated)

- SIS
- TVS
- MRI
- Hysteroscopy

Various Tissue Sampling Techniques (when indicated)

Endometrial sampling under hysteroscopic guidance (office or operating room)

Clinical Screening of the Patient with Excessive Menstrual Bleeding for an Underlying Haemostasis Disorder:

Any of the following constitutes a positive screen:

Heavy menstrual bleeding since menarche

From the list below:

o Postpartum haemorrhage

o Bleeding associated with surgery

o Bleeding during dental procedures - Two or more of the symptoms listed below::

- Bruising one to two times per month
- o Epistaxis one to two times per month
- o Frequent gum bleeding
- o Family history of bleeding symptoms

Indications to Sample Endometrium:

- Age above 45 years
- HNPCC syndrome in the family
- Unaccounted-for persistent AUB or unsuccessful treatment (HNPCC)

MANAGEMENT OF ABNORMAL UTERINE BLEEDING[23]:

MEDICAL MANAGEMENT:

NSAIDs:

- Mechanism of action: Inhibition of prostaglandin synthesis by inhibiting the enzyme cyclooxygenase.
- Decreases menstrual blood loss by approximately 20-40%
- Doses of commonly used NSAIDs are as follows:
    - o Mefenamic acid -500mg thrice a day
    - o Meclofenamate sodium - 1000mg thrice a day o Flurbiprofen -100mg twice a day
    - o Naproxen -500mg twice a day
    - o Indomethacin - 25mg four times a day
- Side effects:
    - o Gastrointestinal: Nausea, vomiting, dyspepsia, abdominal pain, heart burn, constipation, diarrhoea, gross bleeding/ perforation
    - o Prolonged bleeding time
    - o Rashes and pruritus
    - o Dizziness, headache, tinnitus
    - o Abnormal liver and renal function tests

ANTIFIBRINOLYTIC AGENTS[27]:

- Aprotinin
- Epsilon-amino caproate
- Ethamsylate
- Desmopressin
- Vitamin K

Tranexamic acid

- Tranexamic acid:
    - Mechanism of action: Inhibits tissue plasminogen activator that leads to prevention of fibrinolysis of clots thereby controlling menstrual blood loss.
    - Dosage: 1-1.5 gm 3-4 times daily administered for 4-7 days during menses reduces menstrual blood loss by

      35-60%

ESTROGEN –PROGESTIN CONTRACEPTIVES

- Reduces menstrual bleeding by up to 40%

PROGESTATIONAL TREATMENT[15]:

- In acute AUB:

  o Intramuscular route:

    - Progesterone in oil –100-200mg
    - Depot medroxyprogesterone acetate –150mg
    - o Oral route:

- Medroxyprogesterone acetate –20-40mg/day
- Norethindrone –1-5mg/day
- Oral contraceptives –1-4tabs/day

- In chronic AUB:
  - o Intramuscular route:
    - Depot medroxyprogesterone acetate –150mg every 3 months o Oral route:
    - Medroxyprogesterone acetate –10mg/day x 12days
    - Norethindrone –10mg/day x 12days
    - Oral contraceptives –1tab/day x 210days

Depending on Endometrial histology in the second half of cycle[16]:

- Absent / Deficient endometrium:
  - o Emergency: Premarin 25mg
  - o Acute : Unopposed oestrogen 21 days then oral contraceptives o Chronic : Oestrogen dominant oral contraceptives
- Proliferative / Hyperplastic endometrium:
  - o Acute: Higher dose progestogen
  - o Chronic : Progestogens (days 15-25) or days (5-20)
- Normal (secretory):
  - o Acute: antifibrinolytics o Chronic: low dose oral contraceptives and/or NSAIDs

TABLE : 5 - Ethinyl Estradiol Dose in Combined Oral Contraceptive [23]

30-35 mcg	1 pill 3 times daily x 48-72 h 2 pills daily x 1 wk 1 pill daily x 1 wk Stop Consider restarting at 1 pill daily	Reduction anticipated within 48h If nausea , consider adding an antiemetic Withdrawl bleeding Cycle control
20-25 mcg	1 pill 4 times daily 3 pills daily x 1 wk 2 pills daily x 1 wk 1 pill daily x 1 wk Stop Consider restarting at 1 pill daily	Reduction anticipated within 48 h If nausea, consider adding an antiemetic Withdrawal bleeding Cycle control
30-35 mcg	1 pill 4 times daily x 4d 3 times daily x 3d 2 times daily x 2d 1 tablet daily x 3 wk	Reduction anticipated within 48 h If nausea consider adding an antiemetic
Wk – weeks, d - days		

LEVONORGESTEROL –RELEASING INTRAUTERINE SYSTEM:

- Reduces menstrual blood loss by 75–95% through the endometrial decidualization caused by progesterone.
- A desirable choice for ovulating women who experience severe menstrual bleeding and for those who have chronic kidney disorders

DANAZOL AND GnRH ANALOGUES:

- Danazol is a highly efficacious drug with intolerable side-effects
- GnRH agonists is a safe, effective valuable therapy for heavy menstrual bleeding but long term therapy has more side-effects
- Currently, both are useful in preparing endometrium before ablative procedures.

MINIMALLY INVASIVE PROCEDURE:

ENDOMETRIAL ABLATION PROCEDURE[25]:

If medical management, such as NSAIDs or progesterone-releasing IUCDs have not been successful, the next step in the intervention ladder should be to consider endometrial ablative techniques.

Reduce menstrual bleeding by 80-90%, reduces pain in 70-80% of patients, 25-50% develop amenorrhea, 75–90% of patients are happy with the way the surgery went, and 80% do not require any further surgery for up to 5 years after the ablation.

Types:

- Laser Ablation
- Transcervical Resection of the Endometrium (TCRE)
- Balloon devices
- Fluid-filled balloons
- Radiofrequency balloons
- Bipolar Ablation
- Microwave endometrial ablation
- Free fluid ablation
- Automated Laser ablative techniques
- Cryotherapy

TABLE :6- MINIMALLY INVASIVE PROCEDURES – ADVANTAGES AND DISADVANTAGES

Method	Advantages	Disadvantages
Cryoablation	Not completely blind Less pain than methods using heat energy Requires minimal or no anaesthesia	No outcomes data for women with intracavitary lesions
Thermal balloon Ablation	First global technique approved for use East to learn	Not recommended for women with abnormal uterine cavity
Hydrothermal ablation	Circulating hot water contacts all endometrial surfaces, regardless of shape, Direct visualization of uterine cavity	Not recommended for women with a uterus>10cm Requires 8mm hysteroscope Hot water stimulates pain Risk for burns to vagina and perineum
Bipolar radiofrequency ablation	Short procedure time Easy to perform Requires no endometrial pre treatment	Not recommended for women with abnormal or enlarged uterine cavity
Microwave ablation	Applicable in women with large uterine cavity or small myomas	Requires pre-treatment USG to document minimum 1 cm myometrial thickness in all areas

CONVENTIONAL SURGERY: HYSTERECTOMY[23]:

Indications:

- Failure of medical treatment
- Failure following repeated dilatation and curettage
- Failure following minimally invasive surgeries
- Associated pathologies requiring surgical intervention
- Family history of carcinoma endometrium
- Premalignant endometrial lesions

ROUTES OF HYSTERECTOMY[23]:

- Abdominal o Subtotal o Total o Pan hysterectomy
- Vaginal o With /without salpingo-oophorectomy o Associated prolapsed repair
- Laparoscopic assisted vaginal hysterectomy and Total laparoscopic hysterectomy.

TREATMENT SUMMARY [23]

- Cyclical progestin medication is an effective treatment for oligomenorrheic anovulatory women with episodic abnormal bleeding who do not need contraception.
- Clinical examples include those of women whose optimally executed endometrial biopsies yield little tissue and those who are undergoing long-term progestin therapy, and women who experience prolonged, heavy bleeding.
- In these circumstances, progestin or oestrogen-progestin medication is unlikely to be effective and may even make the issue worse.
- When medical treatment for suspected anovulatory bleeding fails, it is highly likely that another pathology is to blame or playing a role in the bleeding, necessitating further diagnostic testing.
- In women who are bleeding heavily and unexpectedly, transvaginal ultrasonography can be utilised to determine the endometrial thickness and spot structural problems that might not have been picked up otherwise.
- If the endometrium is healthy or thickened, high-dose oestrogen-progestin therapy or high-dose progestin alone (where oestrogen is contraindicated) can be used to treat acute extended episodes of heavy anovulatory bleeding[23].
- In cases where oestrogen is contraindicated, acute protracted episodes of significant anovulatory bleeding may be treated with high-dose oestrogen-progestin therapy or high-dose progestin alone.

- Endometrial curettage should be considered when bleeding is severe and requires rapid action or when it continues despite getting intensive medical therapy.
- A hysteroscopy performed at the time of curettage aids in proper diagnosis.
- With very few exceptions, LNG-IUS implantation or cyclic or continuous progestin therapy are effective treatments for the lesion.
- Unless a woman wants to keep her reproductive potential, endometrial hyperplasia with cytologic atypia is best treated surgically.
- Medical care of atypical endometrial hyperplasia necessitates high doses and prolonged progestin therapy or LNG-IUS implantation, repeated endometrial biopsies to track response, and prolonged vigilant monitoring.
- Because uterine myomas are so frequent, they should not be assumed to be the cause of irregular bleeding before other causes have been ruled out, especially if they do not protrude into or move the uterine cavity.
- Myomas' proximity to the uterine cavity is precisely defined by sonohysterography, which also aids in distinguishing between myomas that are clinically significant and those that are not.
- Desmopressin works wonders to control heavy menstrual bleeding in patients with von Willebrand disease. Treatment should start as soon as menstruation begins.
- For women with coagulation issues, tranexamic acid, oestrogen-progestin contraceptives, or LNG-IUS implantation may also help shorten the frequency and duration of menstruation.

- Tranexamic acid, LNGIUS, oestrogen-progestin contraceptives, and nonsteroidal anti-inflammatory medications are all reliable medicinal remedies for controlling heavy menstrual bleeding.
- The newest family of medications for treating irregular bleeding in people with uterine fibroids is called SPRMs.
- GnRH analogues and LNG IUS are useful treatments for adenomyosis-related abnormal bleeding.
- When medical are unsatisfactory endometrial ablation utilising hysteroscopic or non-hysteroscopic procedures is an effective substitute for hysterectomy for the management of excessively heavy monthly flow.

OFFICE HYSTEROSCOPY AND HYSTEROSCOPY

HISTORICAL REVIEW:

In reference to the future of hysteroscopy, Lindmann12 stated, "An attentive eye in the uterine cavity is preferable to repeated blind curettages".

The first decades of the 19th century mark the beginning of endoscopic history. In 1869, Pantaleoni19 described the first hysteroscopy, also known as a metroscopy or uteroscopy.

He noticed endometrial growths that were polypoid. Pantaleoni lighted the uterine cavity with a candle that was reflected off of a concave mirror.

Baggish first described the panoramic hysteroscope with all-channel operating sheath in 1987. Recently Baggish also first described the panoramic hysteroscope with all-channel operating sheath in 1987.

Office A telescope-like device is inserted via the vagina into the cervical canal and uterine cavity during a hysteroscopy procedure to view the endocervical canal and uterine cavity.

Modern hysteroscopes are so slender that they require little to no dilatation to pass through the cervix. Office hysteroscopy is relatively simple to do and doesn't necessitate any sedation or anaesthesia.

require little to no dilatation to pass through the cervix. Office hysteroscopy is relatively simple to do and doesn't necessitate any sedation or anaesthesia. A day care treatment called office hysteroscopy, which is conducted in an outpatient setting, has emerged

as a result of technological developments, healthcare trends, customer demand, and perceptions of benefits for women and the health service.

The last two centuries have seen a significant advancement in hysteroscopy. Endoscopes with a reduced diameter that make use of cold light fibreoptic technology have taken the place of the previous, huge, crude optical light conducting tubes. These micro Hysteroscopes can be rigid or flexible and provide high-resolution, high-quality video images. A continuous supply of distension media is made possible by the use of exterior sheaths with extra instillation ports, which enables the use of delicately crafted surgical tools and power sources that may be accessed via tiny operating channels.

HYSTEROSCOPIC INSTRUMENTS [27]

1. Telescope
2. C- Mount Camera Head
3. Light generator and Light Cable Inlet
4. Diagnostic and operative sheath
5. Distension media
6. Surgical instruments:
    a. Speculum and anterior vaginal wall retractor
    b. Vulsellum

c. Hegar Cervical dilators

d. Uterine sound

e. Curette

DIFFERENT TYPES OF HYSTEROSCOPES:

1. Conventional panoramic hysteroscope
2. Contact hysteroscope
3. Micro hysteroscope
4. Portable outpatient hysteroscope
5. Specialised hysteroscopes

    a. Flexible hysteroscope

    b. Hysteroser

ENDOSCOPES[30]:

Rigid Hysteroscope [29,30] ***:***

Hysteroscopes come in a variety of sizes, ranging from the flexible 1.2 mm model with a diagnostic sheath of 2.5 mm to the traditional 4 mm model with a diagnostic sheath of 5 mm. The flexible 1.2 mm scope is easily inserted into the uterine cavity without dilation. It produces a small image and is quite fragile. Additionally, it prohibits all forms of operational work. A typical 4 mm Hopkins scope, on the other hand, is rigid and provides an excellent

image. A typical 4 mm Hopkins scope, on the other hand, is rigid and provides an excellent image. Typically, a 30° scope is utilised for diagnostic purposes and a 12° scope for resection. However, resection can also be done with a 30° scope. When performing operational techniques, a 4 mm scope and an operative sheath with a diameter of 7.0 to 8.5 mm must be used together, entailing anaesthesia and cervical dilatation. Two systems that can be used voluntarily for diagnostic and office hysteroscopy have been developed in order to address the aforementioned problems. With the help of these devices, surgical operations including polypectomy (4 cm diameter), adhesiolysis, tubal cannulation, and myomectomies (2 cm) can be completed in an office setting.

BETTOCCHI HYSTEROSCOPE (KARL STORZ & COMPANY)[26]

1. The popular Hamou 2 hysteroscope is a scaled-down version of the conventional Bettocchi hysteroscope with Hopkins-based rods and lens system. This scope has an outside diameter of 2.9 mm. It can be used as a micro contact hysteroscope and even as a panoramic hysteroscope (1x) (80x). It can be utilised for diagnostic purposes with either a 3.6 mm single flow outer sheath or a 4.4 mm continuous flow outer sheath. It can be paired with a continuous flow operative sheath of 3.9 mm to 5.9 mm in the case of operative office hysteroscopy (average diameter 5 mm). Five French instruments can fit via the sheath's operational canal, which is designed for that purpose.
2. The modified Bettocchi: This is a new model with a 1.9 mm diameter optic and correspondingly smaller diagnostic and surgical sheath sizes.

VERSASCOPE SYSTEM (JOHNSON & JOHNSON GYNECARE DIVISION)[26] –

The Versascope is a flexible telescope with a 0° field of view and a 75° outer panoramic angle that is constructed from 50,000 fused optical fibres. The scope measures 28 cm in length and has an exterior diameter of 1.8 mm. The image system's density and optical quality create a picture that resembles the traditional rod lens panoramic hysteroscope. The continuous flow diagnostic-cum-operative sheath is used with the scope. It has an outer diameter of 3.5 mm and a distal curvature of 10°. There are proximal collars that can rotate. This enables full peripheral viewing by manipulating the scope without shifting the instrument's location. The extensible instrument channel in the operating channel may readily accept instruments with a diameter of up to 7 French. During the procedures, this operative channel also serves as a separate outflow port for continuous flow. Versascope features a disposable sheath, unlike Storz. However, in actual use, the sheath can be reused at least 10 to 20 times after being re-sterilized with cidex, making the device far more cost-effective. Fiberoptic cables are included with both scopes.

FLEXIBLE HYSTERO FIBROSCOPES [25,26]:

These are extremely precise devices, with less than 2 mm in diameter. They are both incredibly expensive and fragile. They can be utilised for both fine surgical procedures like embryo transfer and diagnostics. Due to their expense, fragility, and inability to be autoclaved, they are not frequently utilised in practise.

CONTACT HYSTEROSCOPY [25,26]:

The contact hysteroscope is different in these ways:

1) No distending medium is necessary.

2) It does not need a sheath and is just useful for diagnostic reasons.

3) Since the instrument captures and collects both directed and ambient light, no fibreoptic illumination system is required.

It is divided into three main sections. a robust interior and outer steel shell that mirrors the interior core of optical mineral glass. The most common form has an outer diameter of 6 mm and a core length of 350 mm (with magnifier). The second element is a cylindrical light trap that receives light from an outside source, such the light in the exam room. The image can be magnified three times using a magnifying eyepiece with a focusing mechanism. This endoscope offers 20 mm of discrimination. The small device is perfect for office and outpatient hysteroscopy and has a straightforward but innovative optical system.

In comparison to its prehistoric origins, the current contact hysteroscope is a highly refined, accurate equipment that offers the endoscopist the simplest and most portable system available. The contact optical technology produces excellent-quality images that can distinguish between two locations that are only 20 mm apart. Since the endoscope is positioned inside the tissue itself during contact hysteroscopy as opposed to panoramic hysteroscopy, which views the tissue from a distance, the two methods are fundamentally different. Additionally, a healthy vascular supply is necessary for adequate colour distinction during accurate interpretation. Due to the absence of an inflated uterine cavity, the endometrium is visible in its normal form, which is when the anterior and posterior endometrial walls are in apposition. The hysteroscope's patterns are then deciphered in a way similar to colposcopy.

PANORAMIC TELESCOPES [31]:

The endoscopic system's telescope is its most crucial part. Among the telescope's optical components are lenses, prisms, glass windows, and fibreoptics [29]. Bead-lenses are composed of glass that is no thicker than their diameter, but Hopkins'[30] rod-lens system has lenses whose thickness is greater than their actual diameter and has incredibly small gaps between them. An array of long, superior optical quality glass cylinders transmits the light, resulting in a wider viewing angle and a brighter image The graded index (GRIN) system is the third optical system, in which the entire system consists of a thin glass rod with a refractory index that rises steadily from the centre to the edges. With very thin optical systems, this latter system is employed. The size of telescopes can be reduced without sacrificing resolution . The field of view gets reduced as the refractory index rises. [31] Fibreoptic technology allows for the transmission of strong light to the endoscope from a suitable light source without creating excessive heat or breaking distal bulbs. The tens of thousands of tiny glass fibres (10 m) with a core that has a high refractory index and a cladding that has a low index produce brighter light more effectively and with less loss. All of this has led to the development of high-quality, small-diameter telescopes with vast fields of vision.

SHEATHS :

The telescope must be affixed to a sheath before being allowed to enter a hollow organ like the uterus so that a distending medium can be infused to create the appropriate distention for panoramic viewing[40] . To fit the 4 mm telescope, the standard sheath has a diameter of 5 mm. The diameter of the sheath depends on the kind of scope being used, as was already explained. The majority of instrument manufacturers, including Storz, Olympus, ACMI, Wolf, and others, have introduced and begun manufacturing the new tiny diameter continuous flow hysteroscopes with a 5 French operating channel. Periodic quality and construction reviews are necessary to guarantee the procedure's safety. Regular inspections should be made of the sheath's locking mechanism, input and output stopcocks, etc. The majority of contemporary continuous flow systems feature separate inflow and outflow channels and offer effective uterine cavity cleansing[40]. A continually flushing mechanism is the ideal for a surgical hysteroscopic sheath in the twenty-first century. This method uses an outside perforated drain sheath to remove murky or discoloured fluid from the uterine cavity and an inner sheath to feed fresh fluid into the cavity.

A. VERSASCOPE SHEATH[29]:

This disposable sheath has an inflow and outflow channel that are both continuously flowing. This 3.5 mm sheath is suitable for both surgical and diagnostic operations. As a result, it can see well and distend well. Additionally, it features an operating cannel through which 2 mm diameter devices can be passed, such as forceps or versa point electrodes (twizzle, spring, or ball).

B. SHEATH FOR 2.9 MM BETTOCCHI SCOPE [29,31]*:*

1. A 3.6 mm single flow diagnostic sheath

2. Continuous stream 3.6 mm inner and 4.4 mm outer sheaths are used for diagnostic hysteroscopy.

3. solitary flow operating sheath measuring 4.3 mm with a slot for attaching tools measuring 2 mm.

4. constant flow For all operational and diagnostic procedures, a 4.3 mm inner and 5 mm outer sheath are used. The ideal combination is this one.

5. There is a new smaller diameter resectoscope that can be used with the Bettocchi that has inner and exterior channels as well as smaller diameter electrodes (Loop, ball, cylinder, and knife).

C. SHEATHS FOR THE 4 MM STANDARD HYSTEROSCOPE [26,30]*:*

1. Single flow sheath for diagnosis

2. For diagnostics, a continuous flow with an inner and outer sheath is used.

3. In addition to an operational channel, the inner and outer sheath have continuous flow.

4. Standard 26 mm resectoscope with working element, electrodes for employing unipolar current, inner and outer sheaths.

5. Standard Gynecare Johnson 26 mm resectoscope with inner and outer sheaths, the working element, and bipolar electrodes for use with Versapoint bipolar current. It is significant to note that this sheath must be used with a normal Hopkins rigid hysteroscope that is 2.9 mm or 4 mm in diameter. Versascope cannot be coupled with it.

LIGHT CABLES[29]

1. Versascope requires a special fused fibre light wire. With the use of unique adaptors, this cable can be connected to any kind of light source. It's vital to remember that Versascope and this cable must only be used together. Versascope damage is possible if one unintentionally uses a regular fiberoptic wire.

2. Hopkins endoscopes and either a xenon light source or a cold light source should be used with standard fiberoptic cable. Typically, the cable has a 5 mm diameter and is 180 cm long.

LIGHT SOURCE[29]:

The quality of the image is greatly influenced by the type of light source. The best results are obtained using a high-quality light source, like xenon source. There are many different light sources available for illumination. The supplied light has a bluish tint due to the metal-halide light sources. A 175 W light source is enough for the majority of hysteroscopic procedures, although a small telescope could need a stronger (300 W) source. In addition to photography, this 300 W source is advised for video-controlled hysteroscopy. A fiberoptic or fluid light cable with a diameter of 2.5 to 4.8 mm and a length of 180 to 300 cm is used to transfer the light. Standard hysteroscopy light wires have a 180 cm length and a diameter of 2.5 to 3.5 mm.

a. Halogen: This cold light source of 150–250 W is enough for vision. However, it often gives the image a reddish tint.

b. Xenon: A 175 W xenon light source enables a good depth of field and offers exceptional lighting. The majority of the heat is dissipated over the length of the fiberoptic cable, despite the fact that the light is extremely hot at its source. Nevertheless, a sizable quantity of heat can still be produced near the distal tip. With extended contact, this could burn paper drapes or

clothing or inflict thermal harm on the sufferer. Therefore, it is best to maintain the light intensity as low as possible.

ENDOSCOPIC CAMERA AND MONITOR [29,32] :

The operators must learn how to operate while viewing the video-hysteroscopic image on the monitor in a cosy and ergonomically sound position. The picture size in office hysteroscopy is fairly tiny. Therefore, it is advisable to utilise cameras with zoom systems to choose the right picture size. For simple diagnostic and surgical tasks, a single-chip endoscopic camera is adequate. A three-chip camera won't be any more useful unless it also contains extra filters to prevent the image from becoming pixelated and digitalized. Modern high-definition cameras produce incredibly realistic and crisp images that make video endoscopy easier and decrease operator fatigue.

The technical criteria of a good camera are:

1. Good resolution: Based on the number of lines or pixels.

2. Minimum sensitivity (lux).

3. High quality of video output/images.

4. High signal to noise ratio: This indicates that there is little loss of light intensity when the video feed changes in a severe circumstance (such as bleeding).

5. Method of sterilization.

RECORDING DEVICES [29,32] :

Commercially available image data recording, transmission, and storage peripherals include video recorders, video printers, and digital documentation devices with CD/DVD burning capabilities. A video monitoring system called Tele Pack was created specifically for hysteroscopy in an OPD scenario. This creates a small, practical system that integrates visual display capabilities with a camera unit, illumination, and documentation.

MONITORS :

Sony high resolution monitors or digitalized flat screen computer monitors both offer outstanding clarity. Modern flat-screen television models can also be used to save money.

DISTENTION SYSTEMS :

Almost all hysteroscopic procedures require a sufficiently dilated uterine cavity. When using an intrauterine electrosurgical tool, like a hyster resectoscope, Additional safety precautions are necessary. Although liquid media are more frequently employed, diagnostic hysteroscopy can also be performed using gaseous media.

LIQUID MEDIA:

HIGH VISCOSITY FLUIDS:

Hyskon:

• Dextrose with 32% dextran 70

• Excellent medium for both diagnostic and operative hysteroscopy.

Advantages:

• Can be used with all electrosurgical equipment, lasers, and standard equipment.

• Colourless, viscid solution.

• Immiscibility with blood - allows the surgeon to identify the bleeding site and provides excellent vision, even during active bleeding.

• Support the Nd-YAG laser's thermal activity.

• It won't likely result in volume overload.

Disadvantages:

• Clogging of the hysteroscopic sheath by dried and hardened debris;

• Difficult to infuse with 5mm sheath. By immediately flushing with hot water, it can be avoided.

• Pulmonary oedema (0.11%)

• Unusual anaphylactic reaction (0.05%)

• Interferes with von Willebrand factor (factor VIIIR), which interferes with platelet adhesiveness and causes bleeding disorders.

LOW VISCOSITY FLUIDS:

The safest distending medium should be iso osmolar, or 300 mOsm, and the sodium level of the fluid should be roughly 140 mEq/L. To maintain uterine distension, the fluid must be continuously pumped out of the cavity. So 0.9% sodium chloride is the perfect low-viscosity fluid medium.

Disadvantages:

• It is challenging to flush with a conventional diagnostic sheath, and this results in a less-than-ideal picture since the inevitable blood ooze can mingle with the distending fluid, obstructing the operative field.

• Fluid overload might result in hyponatremia.

• Pulmonary oedema.

Normal Saline (0.9%Sodium Chloride) And Ringer Lactate:

Advantages:

• The most widely used, least expensive, and safest hysteroscopic media.

• A physiological, isotonic, and isoosmolar medium.

• Easily infused using an infusion pump or an intravenous pole

• Useful in hysteroscopes that employ bipolar electrodes, the Nd-YAG laser or KTP/532 laser, and mechanical tools like scissors.

Disadvantages:

- Fluid overload.
- Pulmonary oedema.
- Can easily leak out of the uterus which needs constant infusion and high flow rates.

  Not suitable for monopolar electro-surgery
- Need for larger volumes of fluid - less ideal for office use.

Glycine 1.5% and Sorbitol 3%:

- • Easily accessible, affordable, and offers a respectable level of visibility
- Non viscous, clear fluid
- Hypo osmolar fluid (glycine, 200 mOsm/L; sorbitol, 178 mOsm/L).
- Effective in monopolar electrosurgical devices.

Disadvantages:

• Miscible with blood and need irrigation with continuous flow.

• Acute Hyponatremia and Hypoosmolality

- Intravasation into the vessels can lead to hypervolemia, pulmonary oedema, heart failure and death.
- Glycine can cause disturbances in oxygenation and coagulation
- Can cause cerebral oedema and demyelination of the brain cells
- Needs high-pressure infusion pump.

5% Mannitol and 2.2% Glycine:

Advantages:

- Infinitely Safer medium
- Can be used with electros surgical devices
- Approximately isoosmolar (Mannitol- 285 mOsm, osmotic diuretic)
- Optical characteristics are equivalent to glycine and sorbitol.

METHODS OF INFUSION:

- **Pressure cuff:** Similar to a sphygmomanometer, they are inflated all around the bag, applying pressure to it, but not maintaining a steady pressure.
- **Gravity:** By suspending the typical 2- to 3-L bag or bottle of fluid 6 to 8 feet above the operating table, it is possible to keep the uterine distension at 60 to 70 mm Hg.
- **Rotary pump:** not only delivers the fluid but also weighs it in real-time, providing the surgeon with a continuous display of the fluid's flow rate and total volume infused.
- **Electronic suction and irrigation pump:** An automated pump called the Hamou Endomat can maintain a clean field of vision and consistent uterine distension.

INDICATIONS:

FOR DIAGNOSTIC HYSTEROSCOPY[27,28,]:

- Abnormal uterine bleeding in premenopausal and postmenopausal women
- Mullerian anomalies like arcuate, subseptate, bicornuate uterus or uterine didelphys.
- Uterine synechiae, Uterine polyps and submucous uterine myoma.
- For the evaluation of primary and secondary infertility
- For the identification of missed intrauterine device.
- Haemangiomas and Arteriovenous Malformations.
- For the diagnosis of chronic pelvic pain due to obstructive uterine anomalies, fibroids and bicornuate uterus.
- For the visualization of transformation zone with colpo microhysteroscopy.

FOR OPERATIVE HYSTEROSCOPY[27,28]:

- For the correction of septate uterus (metroplasty)
- To take biopsy from suspected intrauterine lesions
- For trans-cervical resection of uterine polyps and submucous uterine myoma.
- For the surgical correction of uterine synechiae (Synaecolysis)

- For the cannulation of fallopian tube to treat interstitial blockage by cellular debris and tubal spasm.
- For endometrial ablation or resection to treat abnormal uterine bleeding
- For sterilization
- For removal of misplaced IUD or foreign body.

CONTRAINDICATIONS FOR HYSTEROSCOPY:

ABSOLUTE:

- Recent or active Pelvic inflammatory disease:
    - Hysteroscopy can spread the infection through the fallopian tubes into the peritoneal cavity.
- Acute Cervico-Vaginal Infection:
- Pregnancy: o Hysteroscopy can interrupt the continuation of pregnancy.
- Cervical cancer: Manipulation of hysteroscope through friable cervix can cause torrential bleeding.
- Cardiopulmonary disorders:
    - Apart from anaesthesia risks, fluid overload, air embolism and pulmonary oedema can occur with hysteroscopy.
- Profuse uterine Bleeding:
    - Can obscure the operative field.

RELATIVE:

- Adenocarcinoma of endometrium
- Cervical stenosis: Can cause cervical trauma
- The operator's lack of knowledge with the equipment and procedure.

COMPLICATIONS, PREVENTION AND MANAGEMENT[27,28]:

According to Lindmann (1989), Incidence of complications with Diagnostic Hysteroscopy is 0.012%. Complications are more common and more serious with operative hysteroscopy.

ANAESTHETIC COMPLICATIONS: (NOT CONSIDERED FOR OH)

❖ **Due to faulty positioning of the patient:**

o Nerve injuries:

- Brachial plexus injury from incorrect placement of shoulder restraints
- Peroneal nerve injury due to lithotomy stirrups
- o Damage to soft tissue:
  - Due to burns from electrosurgical unit
- o Deep venous thrombosis:
  - From prolonged compression of the calves by leg supports.

Intraoperative and postoperative bleeding: Most common complication **Management:**

- Aspirate the blood
- Increase the pressure of the distending media to exceed the arterial pressure
- Coagulate the bleeding vessel
- If bleeding continues, inflate intrauterine balloon gradually from 2- 5mL to 10 mL until the bleeding stops. Keep it in place for 6-8 hours then deflate partially after 6 hours and completely before removal.
- If still bleeding continues, hysterectomy to be considered.

❖ **Uterine perforation:**

- Most common during resection of septum, myomectomy and adhesiolysis.
- Simple or complex perforation

❖ **Simple perforation:** Can occur during forcible insertion of cervical dilators, hysteroscope or non-electrical instruments

- Treatment:
  - Observation and broad spectrum antibiotics
  - Laparoscopy may be considered to exclude bleeding.

❖ **Complex perforation:**

- These are most dangerous perforations, usually associated with laser or electrosurgical devices.
- Associated to heat damage to nearby structures, such as the bowel or major arteries.

- Perforation should be immediately suspected when the endometrial cavity depressurizes and collapses around the hysteroscope, creating a compromised view of the cavity.
- Prevention:
    - Use laparoscopy simultaneously.
- Management:
    - Laparoscopic Examination or laparotomy to exclude any injury to intestine, blood vessels or ureter is mandatory.

❖ **Poor visibility in the operative field:**

- Most common cause is deep insertion of the hysteroscope that directly in contact with the endometrium.
- Blood within the uterine cavity secondary to dilatation mixes with distending medium. Over-dilatation of the cervix- results in excessive leakage of distending medium.
- Prevention:
    - Rapid flushing with the hysteroscopic medium combined with aspiration using a cannula placed into the cavity via the operational route.
    - Avoid over-dilatation of the cervix
- Management:

- Better to discontinue the procedure rather than press on and risk a catastrophic error.

❖ **Distension media related:**

❖ Liquids:

- Normal saline: Fluid overload

❖ Prevention:

o It is required to keep track of fluid inflow and output.

Treatment:

Insertion of central venous line, administration of oxygen, diuretic and if necessary cardiac stimulants.

❖ Glycine:

- Nausea and vertigo, Hyponatremia
- Pulmonary edema, cerebral edema
- Neurological symptoms due to demyelination
- Ammonium toxicity leads to encephalopathy and rarely death.
- Treatment:
- Treat hyponatremia with diuretics and hypertonic saline solution
- o Monitor electrolyte levels
- o Hemodialysis in case of encephalopathy due to ammonium toxicity.

❖ CO_2 gas:

- Cardiac arrhythmias
- Air embolism
- Prevention: Avoid Trendelenburg position, purge air from all tubing and sheaths, and careful dilatation of the cervix to avoid opening venous channels.

❖ **Infections:**

- Very rare when there is proper selection, evaluation and screening of patients been done before surgery.
- Prevention:
  - Avoid hysteroscopy in the presence of gross cervical, uterine infections or salpingitis
  - Use sterile techniques
  - Give prophylactic antibiotics in patients with cardiac diseases or suspected chronic endometritis.

Complications related to intrauterine operations:

- Risk of leiomyosarcoma after endometrial ablation for abnormal uterine bleeding is less than 1%.
- Adherent placenta, Loss of pregnancy after hysteroscopic ablation have been reported.
- Endometrial ablation in patients with abnormal uterine bleeding produce amenorrhoea in about 30% of cases and 10% require further surgery.

- Adhesiolysis for Ashermann‟s syndrome is only curative in about 30-40% of cases.

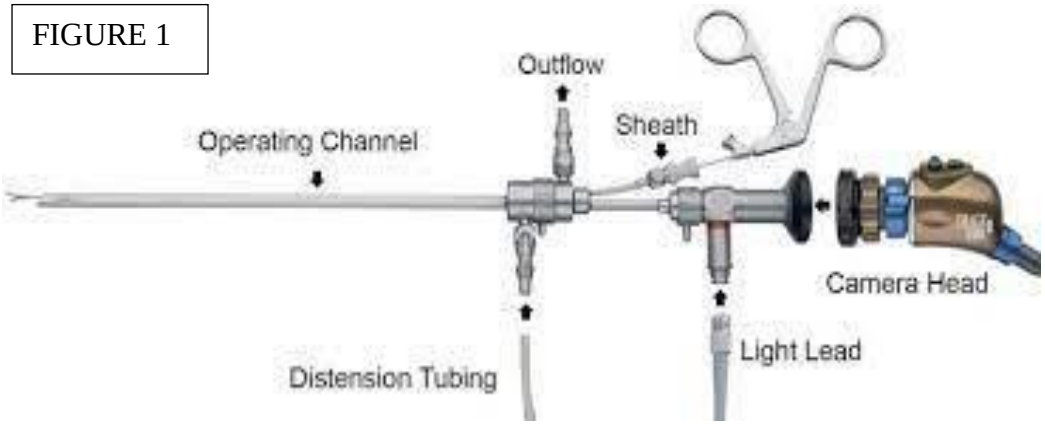
THE HYSTEROSCOPY TECHNIQUE

After gathering a thorough history, performing a physical examination and informed written consent, patient can be scheduled for diagnostic hysteroscopy in the post menstrual period.

Position: Under suitable anaesthesia, patient is placed in dorsal lithotomy position.

Procedure: The perineum and vagina are gently painted with povidone-iodine or another suitable antiseptic solution. Each vaginal and per speculum examination is performed. Sims speculum introduced into the posterior wall of the vagina and retracted downwards. A 2.9 mm office Hysteroscopic telescope is selected and checked for clarity of the eyepiece and objective lens. The light generator is switched on, and the fiber-optic cable is attached to the telescope. The telescope is inserted into the diagnostic sheath, and 0.9% Normal Saline is flushed through the sheath to expel any air within the sheath. The hysteroscope is then inserted into the cervical canal and moved forward while being seen until it reaches the uterine cavity. The cervical canal, anterior and posterior uterine walls, fundus, and tubal ostia are all carefully examined during a systematic evaluation of the cavity.

FIGURE 1



OFFICE HYSTEROSCOPE

FIGURE 2

PRESSURE BAG

FIGURE 3

EQUIPMENT AND TV STAND WITH HYSTEROMAT

FIGURE 4

Endoscope 30 degree 2.9 x 302mm

Inner sheath

Outer sheath 16.5 Fr x 200 mm

HYSTEROSPOPIC VISUALIZATION OF ENDOMETRIUM:

Five clearly stated characteristics are taken into account while describing various morphologies:

1. Surface - smooth (or) rough.
2. Height - As it approaches the ostia and the isthmus, it becomes less constant in typical circumstances.
3. The opening of the endometrial gland and its macroscopic features.
4. Endometrial vessels.
5. Tubal ostia - The mucosa will typically have some parallel folds and be smooth and straight.

Proliferative Endometrium:

- The surface will be smooth and the colour- white or yellow.
- Endometrial height - 2-5 mm.
- Endometrial glandular opening seen and regularly situated.
- Superficial vascularisation forms - relatively poor and are seen as interrupted and punctate lines.
- Tubal ostia are normal.

Secretory Endometrium:

• Surface: smooth or just a little bit rough. It ranges in colour from yellow to orange.

• 5-7mm is the endometrial height.

• Superficial vascularization, a common geometric pattern that resembles a net.

• Normal tubal ostia are present.

Atrophy - Natural:

• Surface: smooth, white or yellow in appearance.

• Endometrial height: 1mm or less.

• There are no evident endometrial glandular apertures.

• Absence of superficial vascularization, but presence of deep stromal

vessels

• Tubal ostia—either absent altogether or visible as fibrous folds.

Atrophy - Induced:

• Surface is uneven and ochre in colour.

• 1-2mm Endometrial Height

• There are no discernible endometrial glandular apertures.

• Deeper stromal vessels can be observed, although superficial vascularization is absent.

• Tubal ostia exhibit typical atrophy.

Simple hyperplasia, adenomatous hyperplasia, and in-situ carcinoma

• Through micro hysteroscopy, it is challenging to distinguish between them.

• Surface and colour may change (white, yellow or pink)

• Very thick and irregular endometrial height that is associated with a pseudo polypoid look.

• There is a lot of superficial vascularization but no discernible pattern. Haemorrhage is easily caused by hysteroscopy.

• Poorly defined glandular orifices that lose their normal placement.

Normal tubal ostia.

Cystic hyperplasia:

• Hyperplasia shares characteristics with surface, endometrial height, and tubal ostia.

• Although superficial vascularization is widespread and has a distinctive network appearance, the extent of the pattern is uneven.

• Haemorrhages within the cysts are observed. They are clear cysts of various sizes that have become entangled in the "net meshes "'s and are surrounded by a fluid that has a brown hue.

Pseudo Decasualization:

• Variable endometrial height and rough surface

• The emergence of pseudopolypoids.

• In the secretory phase, there is abundant and crowded superficial vascularization.

• There are no visible endometrial glandular apertures.

• Normal tubal ostia.

Myomas , Polyp's and Carcinoma:

• Smooth, distinct, glossy, and vascular appearance are the characteristics of benign endometrial polyps.

• Compared to the rest of the endometrium, sub mucous myomas are smooth and light in appearance.

• Endometrial cancer presents as an atypical lesion with bleeding and surface ulcers.

Cervix:

• The cervical canal will have a limited diameter anteriorly and a round or oval shape.

• Mucous membrane will be smooth and have whitish appearance.

• With high magnification, endocervical arborvitae will be seen.

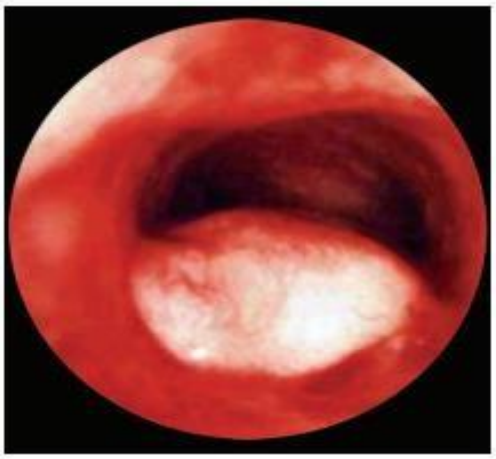


Figure 5 : Polyp on hysteroscope

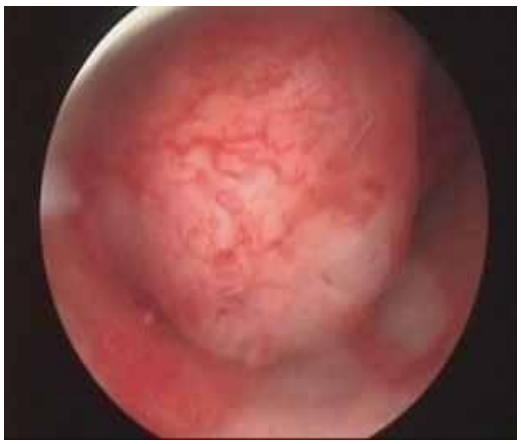


Figure 6: Submucosal fibroid on hysteroscope

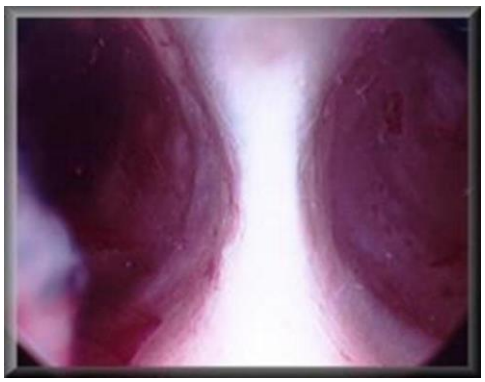


Fig. 7: Septum on hysteroscope.

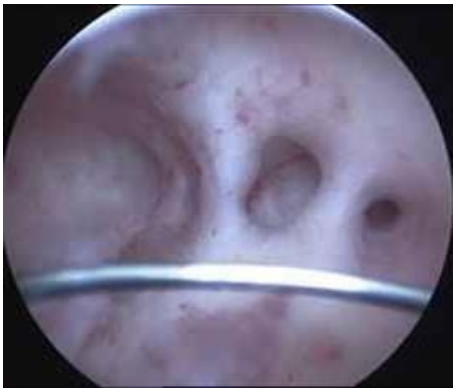


Figure 8 : Synechiae on OH

OFFICE HYSTEROSCOPIC IMAGES OF OUR STUDY :

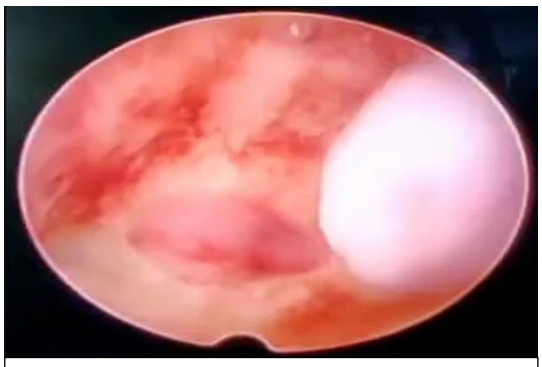


Figure : 9 – Endometrial polyp on OH

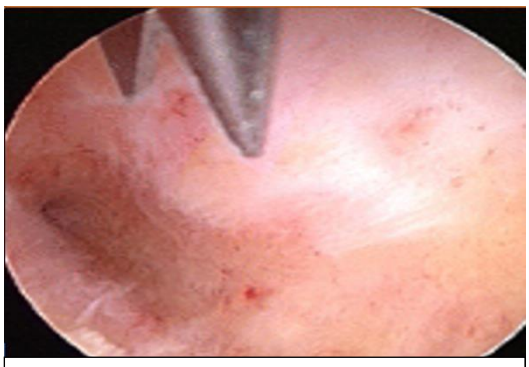


Figure : 10 – Synechiae on OH

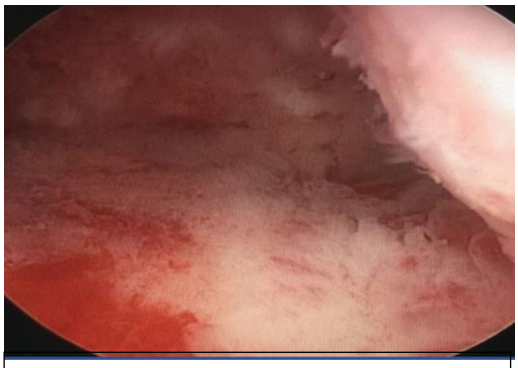


Figure : 11 – Endometrial hyperplasia on OH

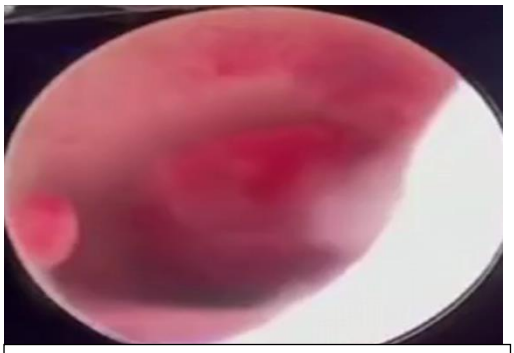


Figure : 12 – Endometrial polyp with hyperplasia on OH

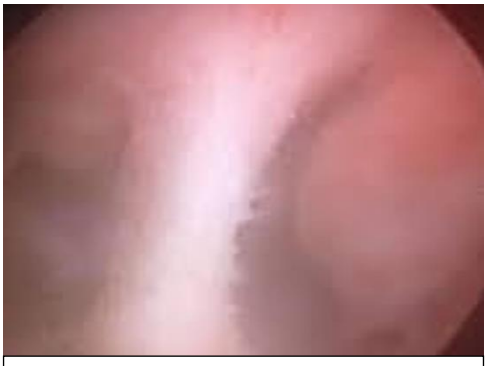


Figure : 13 – Additional finding – intra uterine septum on OH

TRANSVAGINAL ULTRASONOGRAPHY

The word sonar stands for sound navigation and ranging. Ultrasound is a sound wave beyond the range of human audibility limit and therefore has a frequency more than 20,000hz human ear is capable of hearing frequencies between 20-20,000Hz.[34]

Sonar utilizes a frequency of 3.5MHz-10MHz in obstetrical and gynecological examination. The distance calculation is based on the assumption that ultrasound travels at a speed of 1560m/sec in human tissue.

HISTORY:

- Russian scientist SergelSokolven in 1929 emphasised the potential importance of sonar and is regarded as *"Father of ultrasound"*.[35]
- First medical use of USG was by Dr.Karl Dusik in Aiain 1930.
- It was Ian Donald in 1955 who designed a contrast scanner which is now used, clinically for studying the female pelvis and abdomen and he is regarded as *"Father of modern ultrasound"*.[34]
- The technique of TVS was first introduced in the ultrasound literature in 1984 by Schwimer S.R and Lebonce J, who used 5MHz,13mm transducer, that was not specifically designed for vaginal work. Although the comparison of their vaginal and abdominal images was impressive, this form of scanning did not become popular until several years later, when specifically designed vaginal probes were introduced.[37]

Vital ingredients of sonic imaging are[34] -

- Transducer
- Ana ultrasonic beam
- A display method

Transducer acts both as a transmitter and a receiver. Sound is transmitted in approximately 1000burs each second. During the time interval between the pulses, the transducer functions as a director sensing the returning echoes from previous pulse. The coupling agent or jelly is applied to the transducer and is positioned on the patient and moved about to produce approximate echoes and simultaneously, manipulated to optimally display the image.

PHYSICS:

The reverse PIEZO electric effect is utilised in medical ultrasound.[37] Piezoelectric crystals that resemble quartz crystals or synthetic ceramic materials are used to generalise ultrasound. The Piezo electric effect occurs when a crystal is compressed or stretched, generating an electric voltage. The compression or expansion of a crystal brought on by the application of voltage is known as the reverse Piezo electric effect. A succession of longitudinal waves that are transmitted on an organ help compensate an ultrasound beam. Multiple particles move in tandem to propagate the longitudinal wave (molecules oscillating back and forth to produce bands of compression and rarefaction in the conducting medium). These wavelengths reflect back to the Peizo electric crystal as echoes, charging the thickness of the crystal to create an electric signal. The signal is the basis for:

A mode (amplitude modulation) shows echoes as spikes that extend from the base line in a one-dimensional static image.

The TM mode is used to analyse moving parts, and the M mode (Motion display) records echoes as dots.

By moving a transducer longitudinally or cross-wise, A mode brightness modulation produces a two-dimensional image display.

If an echo is weak or powerful, it will be shown in a different shade of grey in grey scale imaging. Strong echoes appear as dark grey or black, while weak echoes are represented by varied shades of grey. Gray scale makes it possible to see the soft tissue's minute interval consistency and identify the abnormal patterns that are indicative of diffuse pathology. [26]

VAGINAL TRANSDUCER PREPARATION[38]:

The term transducer in general refers to any device which converts one form of energy to another. An ultrasonic transducer is both source and detector of ultrasonic signals.

Depending upon the individual manufacturer vaginal transducers may be mechanically and electronically focused. They are usually between 7.5 MHz in frequency. Size of sector image between 90-115. Image is produced from either end firing transducer in which sound beam is symmetrically emitted or from a transducer that angled upto 30 of axis in which sound beam is asymmetrical.

MOVEMENTS POSSIBLE WITH THE PROBE[39]:

1. Moving the transducer forward or backward along the vaginal axis.
2. Angulating the transducer by angling the tip from front to back or from side to side.

3. The transducer's axis should be rotated.

4. Testing for pain. The probe can reach and touch any pelvic organ seen on monitor and test for pain by watching the organ on screen an localizing it.
5. Combing the bimanual pelvic palpatory examination with the transvaginal ultrasound examination.

Following systemic approach is used[39]:

1. Uterus- size, shape, contour, position and texture.

2. Endometrium - thickness , texture, types.

3. Ovaries, adnexae and lateral areas of pelvis are evaluated.

4. Evaluate cul-de-sac.

EVALUATION OF ENDOMETRIUM

With transvaginal sonography (TVS) scanning the uterus is first imaged. According to callen , length of uterus measures 6 - 8.5cms in nulli, 8 - 10.5cms in multi width of corpus 3 - 5cms in nulli, 4 - 6cms in multi and AP diameter (thickness) 2 - 4cm in nulli , 3-5cm in multiparous women. Uterine position may be anteverted, mid position or retroverted.[40]

One of the following axes can be used to scan the endometrium. [41] -

1. Long axis or sagittal image (A-P view).

2. Transverse or semi-coronal.

3. Oblique or semi-axial.

It is always best to view the endometrium in long axis. This is because, starting with the contact in the endocervical canal, one can see many interfaces emerging from the endometrium itself in the long axis.

This stands out in marked contrast to cervical mucus, which is thicker and more echogenic during the secretory phase of the cycle. Cervical mucus is predominantly anechoic and has a high fluid content throughout the periovulatory period[40]. In the central uterus, the endometrium manifests as echogenic interference.

Table:7 - The average thickness of endometrium in various phase of menstrualcycle are[43] –

According to callen[40]:	
□ Proliferative endometrium	4 - 8 mm
□ Periovulatory	6-10 mm
□ Secretory	10-14 mm
□ Postmenopausal	< 4mm

Sonographic measurements should include both opposing layers of endometrium, but should not include hypo echoic halo frequently e more echogenic seen surrounding the more echogenic endometrium. Intrauterine fluid if present, should also be excluded and in such cases endometrium is measured separately in each wall.

It is important to fully comprehend the endometrium's long axis from the fundus to the internal os. This viewpoint is how endometrial thickness is measured. From one basalis to the opposite basalis, the endometrium is measured. (from a single endometrial–myometrial

interface to the opposite endometrial–myometrial interface). It's crucial to see the interior os when taking endometrial measurements. A marker that ensures a proper midline slice is shown is when the endometrial cavity narrows to its thinnest thickness. [43]

Table:8- Correlation of normal menstrual cycle anatomy and physiology with ultra sound endometrial patterns.[42]

ANATOMY/ PHYSIOLOGY	**ULTRASOUND PATTERNS**
MENSES Early	Hyperechoic: has anechoic regions that signify endometrial breakdown and mimics an endometrium in the luteal phase.
Mid menses	Blood and tissue are indicated by a mixed pattern with hyperechoic and anechoic regions. Two slender hyperechoic lines that outline the endometrial cavity are the only physical signs of endometrium.
Late	The endometrial cavity is shown by a thin single line.
FOLLICULAR PHASE Early	Three lines: the endometrial cavity is represented by the middle line, and the two outer hyperechoic lines are the endometrial-myometrial junction.
Late	Between the three hyperechoic lines, anechoic endometrial layer thickens.

LUTEAL PHASE Early transitional Late	An uneven hyperechoic filling of the previously anechoic endometrial layers and thickening of the hyperechoic three lines. Hyperechoic: Endometrium that is uniformly hyperechoic and whitish.
PREMENSTRUAL **POSTMENOPASUAL**	Small anechoic collections in a hyperechoic environment. Similar to late mentural endometrium in a single line Usually little more than 4mm thick.

PHASE OF MENSTURAL CYCLE[43]:

MENSES:

Early in the menstrual cycle, endometrial shedding is inadequate, and the endometrium frequently seems to be more echogenic due to endometrial blood.

The endometrium has totally shed off to the basalis layer during the conclusion of the menstrual cycle. The basalis appears as a thin line with a thickness of less than 4 mm on ultrasound.

FOLLICULAR PHASE [41,43]:

The endometrium often seems to be more echogenic due to endometrial blood in the early stages of the menstrual cycle when endometrial shedding is incomplete.

In the latter stages of menstruation, the endometrium has entirely shed and reached the basalis layer. An ultrasonographic image of the basalis shows it as a thin line with a thickness of less than 4 mm. The endometrium functionalis is hypoechoic in follicular phase

because of homogenecity of the edematous stroma and the lack of arteriole invasion. The basalis is always echogenic because of increased edema and vascularity at the basalis.

In the normal cycle, endometrial thickness ranges from 6 - 12 mm in late follicular phase .endometrium grows in late proliferative phase at the rate of approximately 0.5mm per day. Three layer endometrium and posterior acoustic enhancement are characteristic of the follicular phase and present in 90% of cases.

The transition from proliferative to secretory endometrium characterises the periovulatory endometrium. During this phase, fluid can be detected in the endomertrial cavity. Given that glandular secretions do not start until the mid-leuteal phase, this fluid is not a byproduct of endometrial glandular secretions. Contractions cause cervical mucus to be pushed into the endometrial cavity, where it fills the space. The production of fluid from the fallopian tubes may also contribute to endometrium.

LUTEAL PHASE:

Through the early luteal phases, the echogenicity of the hypoechoic endometrium increases. The endometrium is totally echogenic in the mid-luteal phase, when maximum echogenicity is observed. Early in the luteal phase, the basalis shows an increase in echogenicity. Ultrasonography frequently reveals cul-de-sac fluid, which supports the notion that ovulation has taken place.

Although the cause of the rise in echogenicity is unclear, luteal phase secretions and vascularity are most likely to be responsible.

TABLE : 9 - Abnormal endometrial patterns on TVS[42]:

Pattern	Characteristics	Clinical association
Hyperechoic thickened	Usually thicker then 17mm	Hyperplasia, Carcinoma, Polyps, Leiomyomas
Hyperechoic, poorly developed	Uniformly hyperechoic(white),but less than a normal sonographic luteal phase endometrium with persistence of the central line representing the endometrial cavity	PCOD, Chronic anovulation
Mixed pattern	Presence of both hyperechoic and hypoechoic areas.	Polyps, submucosal leiomyomas protruding into the endometrial cavity in complete abortion, Mixed blood and tissue
Hypo echoic	Distended endometrial cavity with anechoic material, usually blood or fluid surrounded by thin hyperechoic endometrium	Hematometra, pyometra (usually filled with a fine grained echotexture) Associated with cervical stenosis or cervical cancer.
Absent	No endometrium imaged	Atrophic and /or very thin endometrium: Low serum IgE

1) Various causes of endometrial thickening are[44]:

- Secretory phase
- Decidual reactions in early pregnancy
- Infection(Endometritis)
- Endometrial hyperplasia and polyp
- Endometrial carcinoma
- Increased endogenous oestrogen ○ Ovarian tumour
  ○ Adrenal tumour
- Oestrogen type medication
- HRT, Tamoxifen

ENDOMETRIAL HYPERPLASIA[45]:

The trophic influence of unopposed E2 is assumed to be the secondary cause of endometrial hyperplasia. The endometrium thickens and becomes a pseudo polypoidal shape.

Premenopausal >12mm thickness needs further evaluation. Postmenopausal >5mm-abnormal. Sonographic finding should be interrelated with patients clinical and lab findings.

TABLE : 10 - ENDOMETRIAL HYPERPLASIA ON TVS[44]:

ENDOMERTIUM	• Thickened >12mm • Highly reflective and unchanging throughout menstrual cycle • Multiple small cysts
Uterus	• Moderate enlargement may occur if the endometrium is very thick
Ovaries	• Functional cyst common-often multiple

Polyps[45]:

Polyps are tiny in mild cases, but can grow up to 5 cm in size in more severe ones. On TVS, thicker endometrial in these patients than in women of comparable age is typically found.

Mailgnancy[46]:

As mentioned before thickened endometrium in a post menopausal women> 5 mm is of concern.

Myometrial invation –the extent of invasion can be detected and classified into superficial deep or intermediate depending on the extent of tumour invasion to the myometrium. By proving an accurate measurement of uterine wall thickness, TVS can also

help the radiotherapist in calculating an accurate tumour dose to the myometrium and serosa of the uterus.

Preservation of endometrial hallow generally indicates superficial invasion, whereas nascence of a hallow is frequently associated with deep invasion.

Other sonographic findings with endometrial carcinoma include tubular endometrium, loss of sub endometrial hallow with early invasion , an enlarged uterus with a mixed echo pattern or endometrial fluid.[46]

IMAGES ON TRANSVAGINAL SONOGRAPHY IN OUR STUDY

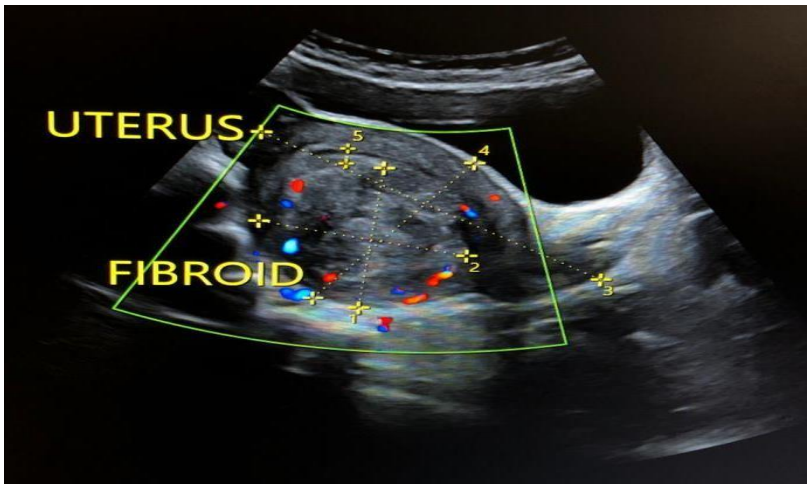


Figure :14 - INTRAMURAL FIBROID ON TVS

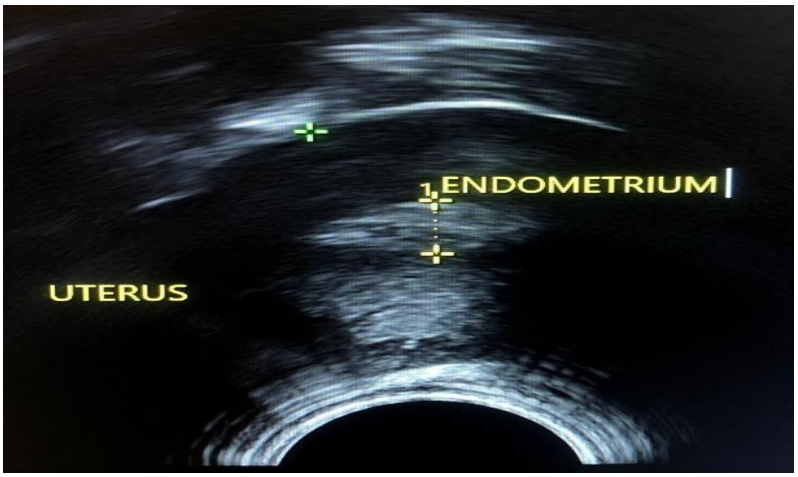


Figure :15 – ET- 7mm PROLIFERATIVE ENDOMETRIUM ON TVS

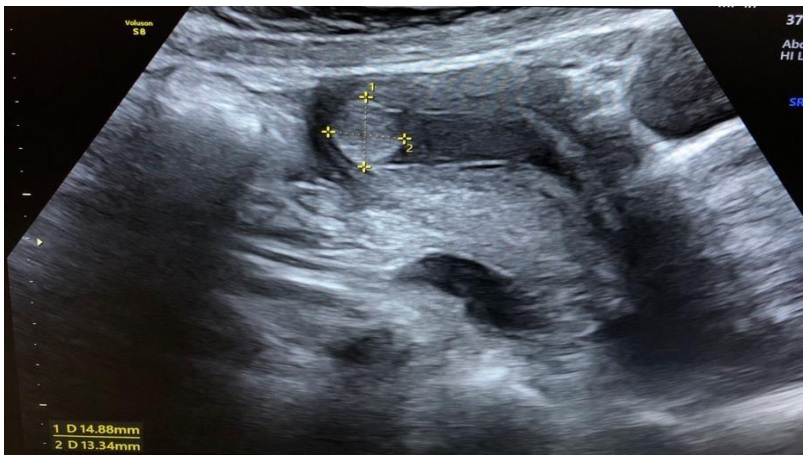


Figure :16 – ET- 7mm ENDOMETRIAL POLYP ON TVS

ENDOMETRIAL SAMPLING [23] :

A biopsy of the endometrium can rule out malignancy or endometrial hyperplasia. When a woman experiences abnormal bleeding, age beyond 35 or 40 is frequently indicated as a risk factor for endometrial illness and as a reason for a biopsy. Although older women are more likely than younger women to have endometrial hyperplasia and cancer, the length of exposure to unopposed oestrogen stimulation is the most important risk factor. Women over the age of 30 and even teenagers can get endometrial cancer, but older women are more likely than younger ones to do so from long-term exposure. When menstruation is irregular in premenopausal women, the likelihood of aberrant endometrial histology is moderately high (14%) but extremely low (1%) when periods are regular.

Endometrial sampling is therefore warranted due to the extended, unopposed oestrogen exposure seen in obesity or anovulatory diseases like PCOS. A woman of any age who has chronic AUB despite acceptable attempts at medical care should also undergo such sampling. In comparison to older conventional biopsy instruments, the small flexible suction cannulas presently extensively used for endometrial biopsy (such as the Pipelle suction curette) are less painful and produce results that are equivalent. Even though it is no longer the gold standard, hospital-based curettage without hysteroscopy is nevertheless often carried out. Dilation and curettage (D&C) is currently indicated when an office biopsy cannot be completed due to cervical stenosis or patient discomfort, or when there is insufficient tissue for a diagnosis or chronic AUB despite normal histology. However, it is advised that hysteroscopy be performed prior to collect focused biopsies, if necessary. This is justified because a diagnostic D&C has

a high likelihood of missing specific pathology. In addition to identifying any intrinsic endometrial diseases like hyperplasia, adenocarcinoma, or chronic endometritis, a biopsy can help women with a murky history of irregular bleeding choose the best course of treatment or direct additional examination. Women who are unlikely to respond to progestational therapy are those with an inactive or atrophic endometrium. A secretory endometrium in women who have not recently used exogenous progestins offers reliable proof of recent ovulation and indicates the need to look for an anatomical reason.

METHODOLOGY

SOURCE OF DATA :

Women attending the gynaecological OPDs in BLDE (DU) SHRI B M PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH INSTITUTE , Vijayapura with abnormal uterine bleeding.

Study period : January 2021 to April 2022

Sample size : 75 cases

Design : Prospective observational study

All women who fulfilled the inclusion criteria were included in the study and explained about the procedure and results were subjected to statistical analysis.

Inclusion criteria :

- All patients with age >18 years with complaint of abnormal uterine bleeding willing to participate in the study.

Exclusion criteria :

- 1)suspected pregnancy
- 2)suspected pelvic inflammatory disease
- 3)ongoing vaginal infections

MATERIALS AND METHOD :

After receiving written consent from the patient and receiving counselling, a thorough clinical history was collected, followed by general, systemic, and bimanual examinations. Complete hemograms, bleeding and clotting times, platelet counts, thyroid and liver function tests, and routine urine examinations are among the investigations that are performed.

Transvaginal Ultrasonography (TVS):

By using a 7.5 mHz transducer, transvaginal sonography was performed, and the uterine size and contour, intramural and submucosal lesions, and endometrial thickness were all examined.

After informed consent Office hysteroscopy was performed in the OPD using hysteroscopic endoscope of 2.9mm 30 degree and findings were evaluated. Endometrial biopsy was taken in the same setting and sent for HPE. Cost analysis was done for the baseline investigations , Office hysteroscopy , TVS and Endometrial Biopsy.

Office Hysteroscopy (OH):

PROCEDURE: The perineum and vagina were gently painted with povidone-iodine solution. Sims speculum introduced into the posterior wall of the vagina and retracted downwards. The 2.9mm hysteroscopic telescope was selected and checked for clarity of the eyepiece and objective lens. The light generator was switched on, and the fiber-optic cable is attached to the telescope. The telescope is inserted into the diagnostic sheath, and 0.9% NS was flushed through the sheath to expel any air within the sheath. Then Hysteroscope was introduced in the cervical canal and advanced under vision till it enters the uterine cavity. The uterine cavity, anterior and posterior uterine walls, fundus and the cervical canal were all thoroughly examined, and a biopsy was collected from suspected abnormal endometrium. Cervical canal was revaluated while retracting back the office hysteroscope. Followed by,

dilatation and curettage done with sharp curette and sample collected for histopathological examination.

Patients were labelled as " NEGATIVE HYSTEROSCOPIC VIEW" when the following 3 criteria were met:

- Good visualization of entire uterine cavity
- No structural abnormalities in the cavity.
- A uniformly thin, homogenous appearing endometrium without variation in thickness.

RESULTS

In this study , 75 patients presenting with AUB who met the inclusion criteria in women attending the gynaecological OPD in BLDE (DU), SHRI B M PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH INSTITUTE, Vijayapura with Abnormal uterine bleeding from November 2020 to April 2022 were undertaken. They were studied by TVS and Office hysteroscopy followed by endometrial biopsy . These cases were further evaluated. The information was organised in an Excel spreadsheet and statistically analysed.

Table-11: Age distribution of study participants

AGE	FREQUENCY	PERCENT
18 - 30	19	25.3
30 - 39	26	34.7
40 - 49	23	30.7
50 - 59	7	9.3
Total	75	100.0

It is observed in the table and bar diagram that maximum no. of patients belonged to age group of 30-39 yrs i.e 34.7% (n=26) followed by 40-49 years of age i.e 30.7% (n=23) with the youngest being 20 years and the eldest of 59 years. Age group 50-59 years comprised of 9.3%(n=7) of the patients and that of 18-30 years is 25.3%(n=19).Mean (SD) age group of study participants was 36.1 years.

Graph 1

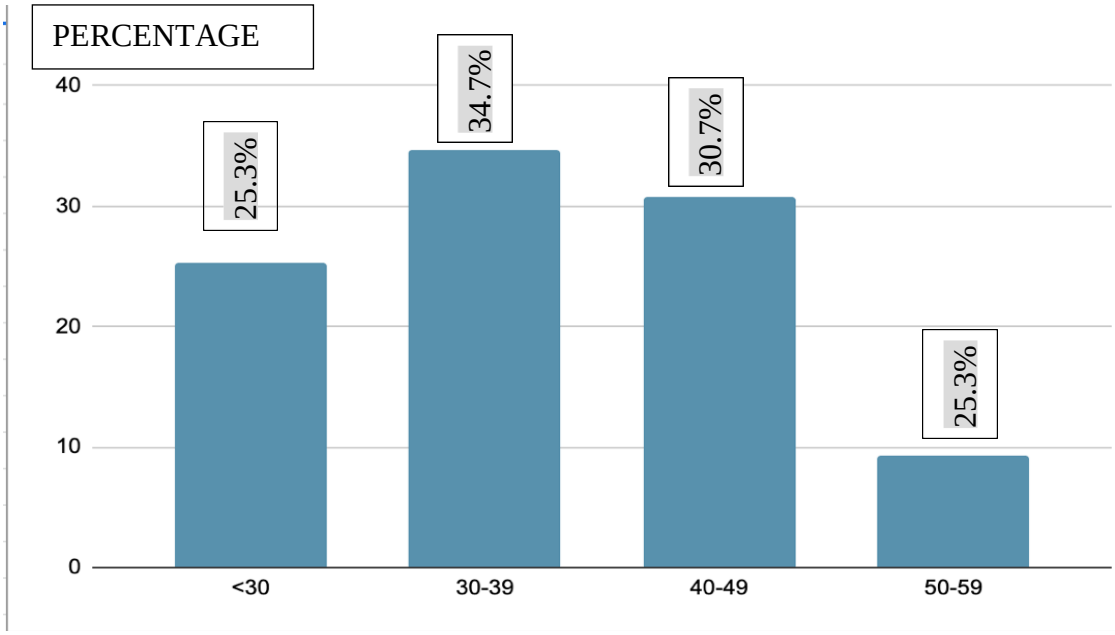


Table-12: Showing the patient's symptoms

Symptoms	Frequency	Percent
Heavy bleeding	37	49.3
Irregular cycles	31	41.5
Light bleeding	2	2.6
Infrequent menses	5	6.6
Total	75	100.0

In table 2 it is shown that most common symptom with which patient presented was heavy menstrual bleeding i.e in 37 cases (49.3%) followed by Irregular menstrual cycles in 31 cases (41.4%). Infrequent menses & light bleeding was seen in 5 and 2 cases respectively i.e in 6.6% and 2.6% cases repectively.

Graph 2

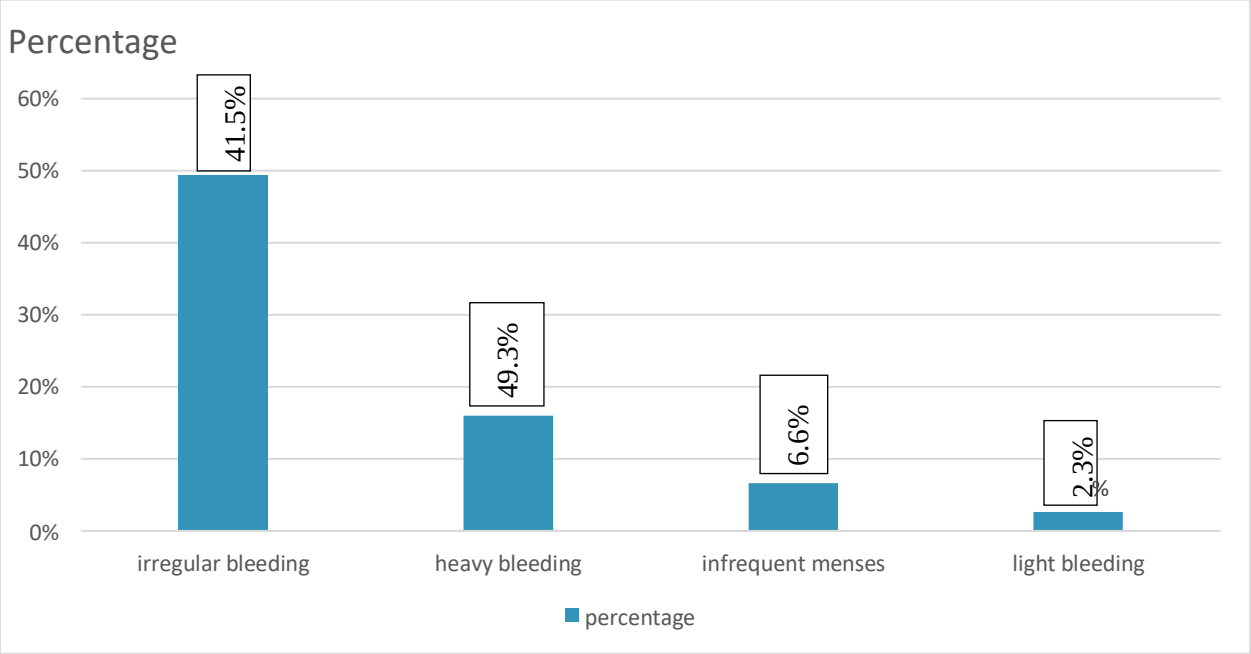


Table-13 : Distribution of study participants by Parity

Parity	Frequency	Percent
Nulli	11	14.7
Primi	6	8.0
Multi	58	77.3
Total	75	100.0

Most of the patients were multiparous i.e 58 cases (77.3%) ,followed by Nulliparous women i.e. in 11 cases (14.7%). Primipara group comprised of about 6 of the patients (8%)

Graph 3

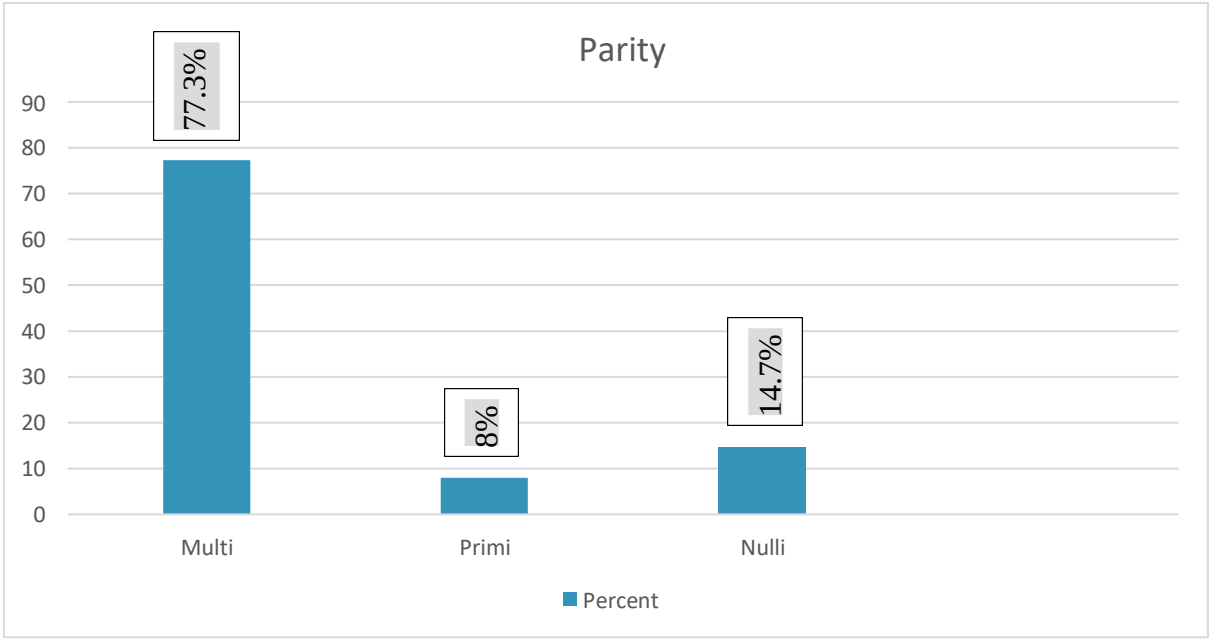
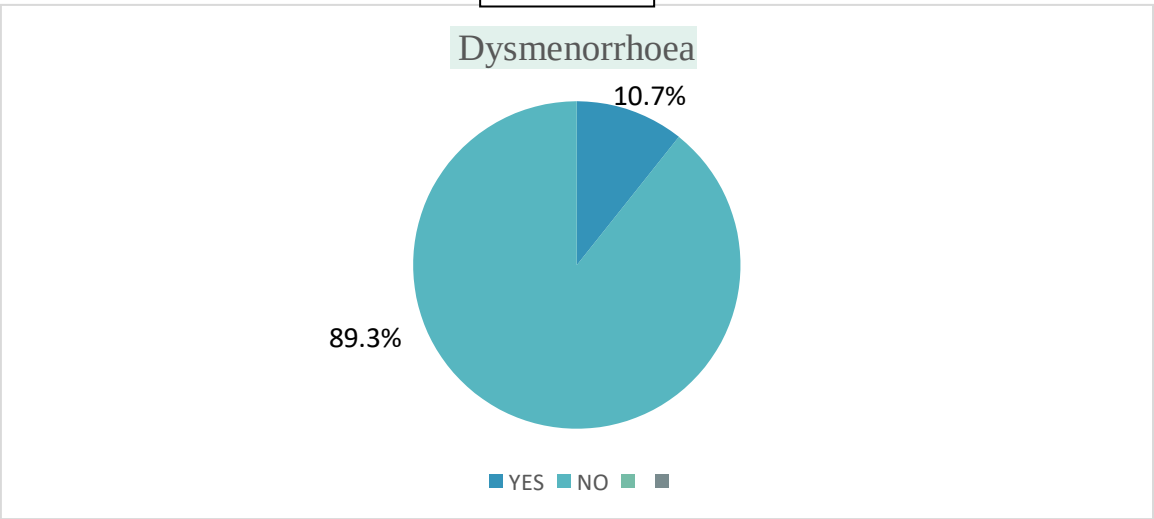


Table- 14 : Distribution of study participants by incidence of dysmenorrhea

Dysmenorrhoea	Frequency	Percent
No	67	89.3
yes	8	10.7
Total	75	100.0

Graph 4



Of total 67 patients didn't have dysmenorrhoea (89.3%) and 8 (10.7%) of them presented with dysmenorrhoea along with AUB.

Table- 15 : Distribution of study participants by bimanual examination findings

Bimanual findings	Frequency	Percent
Ut 10-12 wks AV, ff , nt	1	1.3
Ut 8-10 wks AV , ff ,nt	1	1.3
Ut 6 weeks AV, ff , nt	3	4.0
Ut normal size AV, ff, nt	68	90.7
Ut small AV, ff, nt	2	2.7
Total	75	100.0

Per vaginal examination showed normal uterus findings in 68 patients (90.7%) , Uterus was small in 2 cases (2.7%), uterus was 10-12 weeks size & 8-10 weeks size in 1 patient each i.e. 1.3% .Uterus was 6 weeks size in 3 patients (4%).

Graph 5

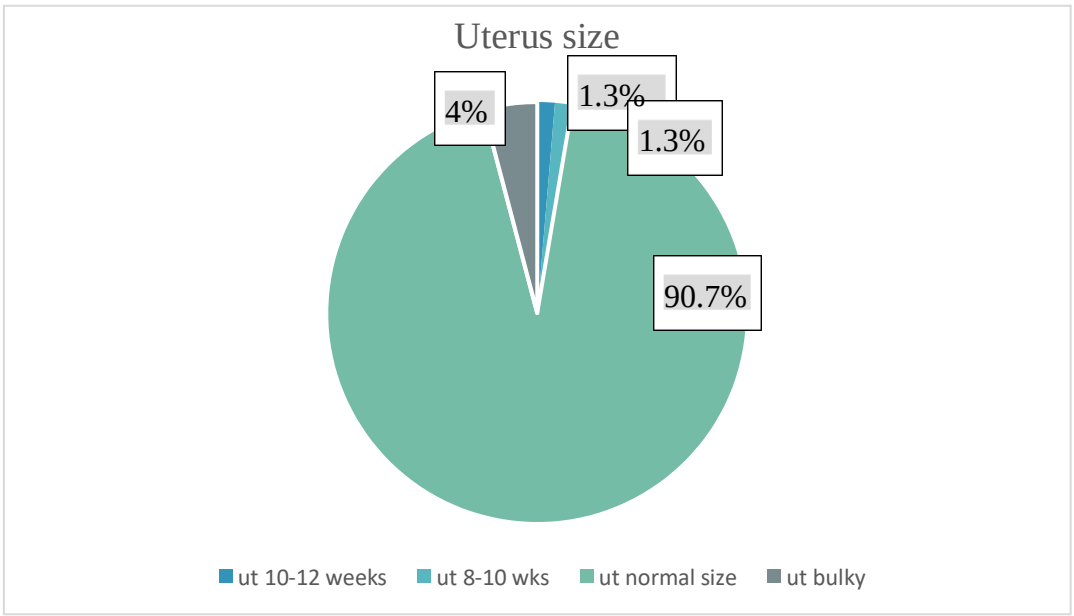


Table 16: Participants' distribution according to TVS findings

TVS findings	Frequency	Percentage(%)
Atrophic endometrium	3	4.0
Endometrial polyp	6	8
Hyperplasia	7	9.3
IM Fibroid	1	1.3
Proliferative	45	60
Secretory	9	12.1
Submucous fibroid	4	5.3
Total	75	100.0

It is mentioned in table 6 that TVS was normal in 54 patients (72.1%) (Both proliferative and secretory endometrium) of patients. The most prevalent among the abnormal findings was Endometrial hyperplasia in 7 cases (9.3%) and endometrial polyp 6 cases (8%)

Graph 6

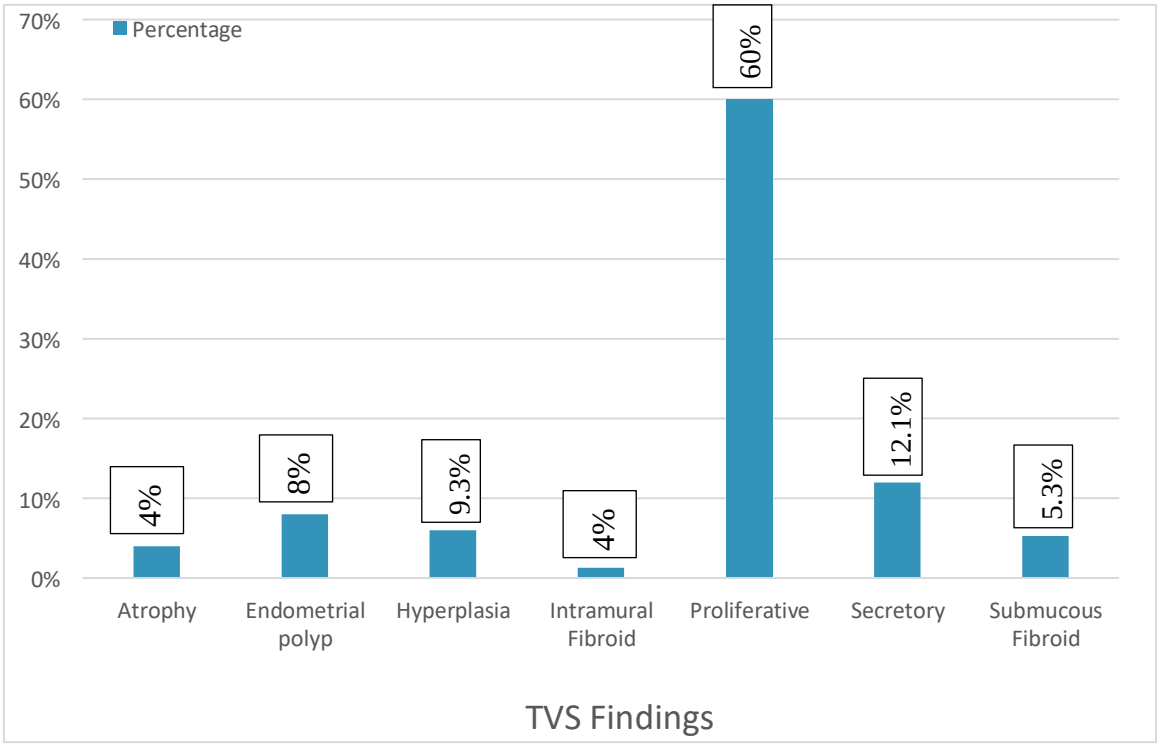
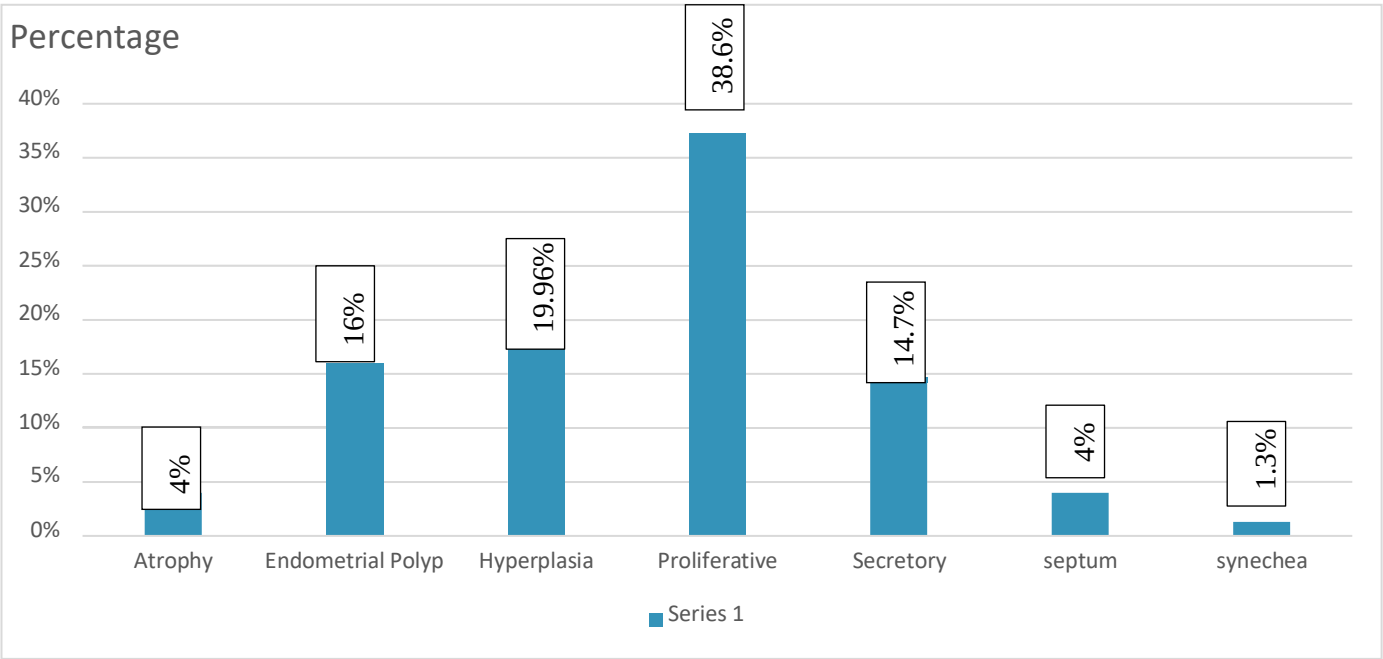


Table-17 : Participants' distribution according to Office Hysteroscopy results

OH findings	Frequency	Percent
Atrophic endometrium	3	4.0
Endometrial polyp	12	16
Hyperplasia	15	19.96
proliferative	29	38.66
secretory	11	14.7
Submucous fibroid	4	5.3
Uterine synechea	1	1.3
Total	75	100.0

Graph 7



Hysteroscopy was normal in 58.62% (n =40) (Both proliferative and secretory endometrium and uterine septum being the additional finding of cases.

Among the abnormal ones most common finding was endometrial hyperplasia in 19.96% (n=15) cases followed by Endometrial polyp in 16% (n=12) cases.

Submucous fibroid was seen in 5.3% (n=4) of the cases & uterine synechia was seen in 1.3%(n=1) of the cases. Uterine septum was additionally detected in 3 cases.

Table-18: Distribution of study participants by findings of histopathological examination

HPE Examination	Frequency	Percent
Atrophic endometrium	3	4.0
Endometrial polyp	11	14.6
Hyperplasia without Atypia	7	9.33
proliferative	41	54.7
secretory	13	17.3
Total	75	100.0

Histopathology showed normal endometrium in 72 % (n=54) cases.

Endometrial polyp was seen in 14.6 % (n=11) of cases followed by

Hyperplasia without Atypia in 10.6% (n=8) of the cases

Graph 8

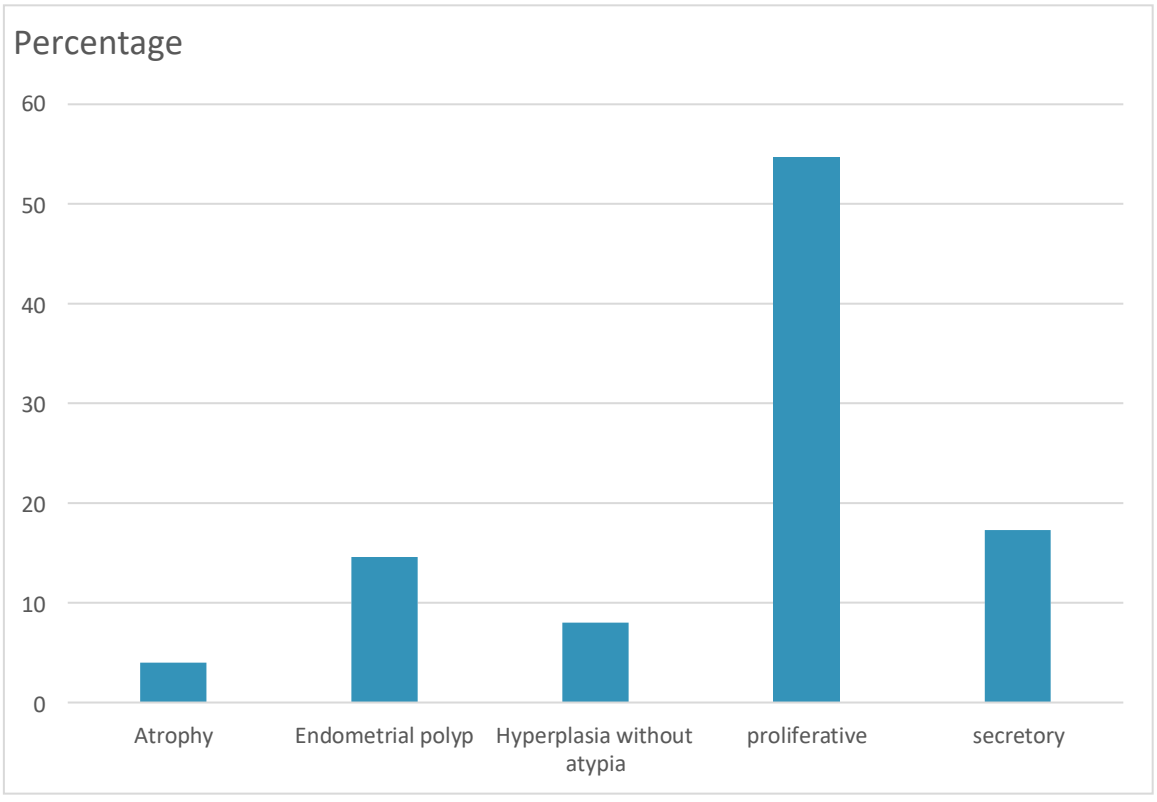
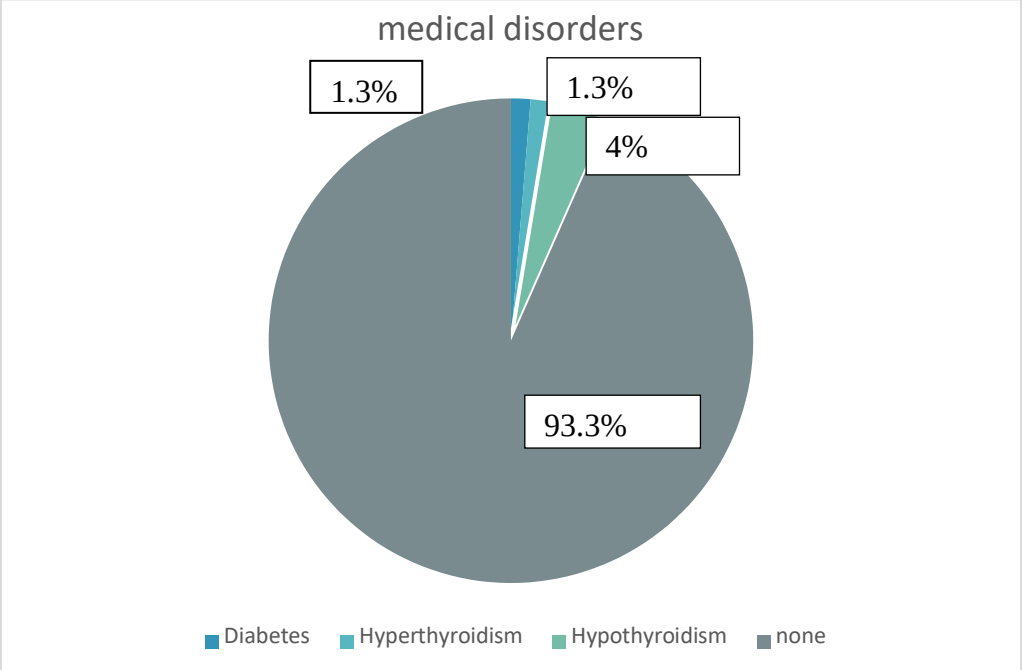


Table-19: Distribution of study participants by presence of medical disorders

Medical disorder	Frequency	Percent
Diabetes mellitus	1	1.3
Hyperthyroidism	1	1.3
Hypothyroidism	3	4.0
None	70	93.3
Total	75	100.0

Graph 9



70 patients who came with AUB (93.3%) were without any medical disorders.

Of total 1 patient (1.3%) had hypothyroidism, 3 patients had hyperthyroidism and one presented with diabetes mellitus.

Table -20: Distribution of study participants by haemoglobin levels & TSH levels

Parameter	Age(yrs)	Hb (gm%)	TSH (mIU/ml)
Mean	36.81	11.256000	2.136133
Median	36.00	11.300000	2.100000
Std. Deviation	9.436	1.1985622	1.1308845

The mean Hb value in the present study is 11.25 and TSH is 2.13 with standard deviation of 1.19 and 1.13 respectively in the mean age group of 36.81 years.

TABLE 21: SHOWING COST OF EACH PROCEDURE:

TEST	COST
ROUTINE INVESTIGATIONS = A	**Rs.500/-**
OFFICE HYSTEROSCOPE = B	**Rs.3750/-**
ENDOMETRIAL BIOPSY AND HPE = C	**Rs.500/-**
TVS = D	**Rs.578/-**
A + B + C	**Rs.4750/-**
A + C + D	**Rs.1578/-**

The cost of baseline investigations were Rs.500/- and that of OH with routine investigations & HPE was Rs.4750/-. In contrast to this the cost of routine investigations with HPE and TVS were Rs.1578/-.

Table-22: COMPARISON OF OFFICE HYSTEROSCOPY WITH HPE

Finding	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV	Accuracy	P value
Atrophic	3	0	0	72	100	100	100	-	-	<0.001
Proliferative	29	0	12	34	70.73	100	100	73.91	84	<0.001
Secretory	11	0	2	62	84.62	100	100	96.88	97.33	<0.001
Hyperplasia	7	8	0	60	100	88.24	46.67	100	89.33	<0.0171
Polyp	11	1	0	63	46.15	100	98.44	100	98.67	<0.001

The following formulas were used respectively to calculate the statistic results :

Sensitivity =a/a+c x 100= TP/TP+FN x 100

Specificity = d/d+b x 100= TN/TN+FP x 100

Positive predictive value = TP/TP+FP x 100

Negative predictive value = TN/TN+FN x 100

No. of Atrophic endometrium diagnosed by Office hysteroscope = 3

All the 3 cases were confirmed to be atrophic by histopathologic examination.

Hence No. of true positives(TP) =3 , No. of false positives (FP)=0 which showed 100% sensitivity and specificity with a PPV of 100%

Number of proliferative and secretory endometrium diagnosed by office hysteroscope= 29 and12 respectively (Normal endometrium = 40)

Out of these , all 29 and 12 were proved to have proliferative and secretory endometrium respectively by histopathology examination

Hence for proliferative endometrium : No. of true negatives(TN)=34, No. of false negatives(FN)=12

Hence for secretory endometrium : No. of true negatives(TN)=62, No. of false negatives(FN)=2 i.e. For normal endometrium TP=40 , FP=0 , TN=25 , FN=14

Therefore, for normal endometrial findings (proliferative and secretory endometrium), sensitivity was 40/40+14 x 100 = 74.07 , specificity was 25/25+0 x 100 = 100% , PPV was 100%, NPV was 64.1% & accuracy was 82.28%.

Number of hyperplastic endometrium diagnosed by Office hysteroscope = 15

Out of these 15 cases, 7 were confirmed to be hyperplastic by HPE examination

Hence No. of true positives(TP) =7 , No. of false positives (FP)=8

Therefore hyperplastic endometrium had sensitivity of 100% and specificity of 88.24% , PPV of 46.67%, NPV of 100% and accuracy of 89.33%.

Number of endometrial polyps diagnosed by Office hysteroscope = 12

Out of these 12 cases, 11 were confirmed to be hyperplastic by histopathologic examination

Hence No. of true positives(TP) =11 , No. of false positives (FP)=1

Therefore endometrial polyps had sensitivity of 46.15% and specificity of 100% , PPV of 98.44%, NPV of 100% & accuracy of 98.67%. OH had diagnosed 4 cases (5.3%) of submucous fibroid cases with PPV, NPV & accuracy being 100%. In addition OH had detected 3 cases (4%) with uterine septum which was an additional advantage to see intra uterine pathologies. Office Hysteroscopy diagnosed intra uterine synechiae in 1 case with PPV of 100% and accuracy of 98.67%. P value was <0.05 for all the parametres compared and hence it was statistically significant.

Table-23: COMPARISON OF TVS WITH HPE

Finding	TP	FP	FN	TN	Sensitivity	Specificity	PPV	NPV	Accuracy	P value
Atrophic	3	0	0	72	100	100	100	-	-	<0.001
Proliferative	34	11	7	23	82.93	67.65	75.56	76.67	76	<0.001
Secretory	8	1	5	61	61.54	98.39	88.89	92.42	92	<0.001
Hyperplasia	3	4	4	64	42.86	94.12	42.86	94.12	89.33	<0.0171
Polyp	5	1	6	63	45.45	98.44	83.33	91.3	90.67	<0.001

Number of Atrophic endometrium diagnosed by TVS = 3

All the 3 cases were confirmed to be atrophic by histopathologic examination. Hence No. of true positives(TP) = 3 , No. of false positives (FP) = 0 which showed 100% sensitivity and specificity with a PPV of 100%. Number of proliferative and secretory endometrium diagnosed by TVS = 45 and 9 respectively.

Out of these all 34 & 8 were proved to have proliferative and secretory endometrium respectively by histopathology examination.

Hence for proliferative endometrium : No. of TP = 34, No. of FP=11,

No. of FN = 7, No. of TN = 23Hence for secretory endometrium : No. of TP = 8 , No. of FP = 1, No. of FN = 5, No. of TN = 61

i.e. For normal endometrium TP=44 , FP=9 , TN=12 , FN=10

Therefore, for normal endometrial findings (proliferative & secretory endometrium), sensitivity was 44/44+10 x 100 = 81.48 , specificity was 12/12+9 x 100 = 57.14% , PPV was 83.02%, NPV was 54.55% & accuracy was 74.67%.

Number of hyperplastic endometrium diagnosed by TVS = 7

Out of these 7 cases, 3 were confirmed to be hyperplastic by HPE examination.

Hence No. TP = 3 , No. of FP = 4 , No. TN = 64 , No. of FN = 4

Therefore hyperplastic endometrium had sensitivity of 42.86 % and specificity of 94.12 % , PPV of 42.86 %, NPV of 94.12 % & accuracy of 89.33%.

Number of endometrial polyps diagnosed by TVS = 6

Out of these 6 cases, 5 were confirmed to have endometrial polyp by histopathologic examination

Hence No. TP = 5 , No. of FP = 4 , No. TN = 63 , No. of FN = 6

Therefore endometrial polyps had sensitivity of 46.15% and specificity of 100% , PPV of 83.33%, NPV of 91.3% & accuracy of 90.67%. TVS had diagnosed 4 cases (5.3%) of submucous fibroid cases with PPV, NPV & accuracy being 100%. P value was <0.05 for all the parametres compared and hence it was statistically significant.

Table-22: COMPARISON BETWEEN OH AND TVS

FINDINGS			OH %	TVS %
sensitivity	Normal Endometrium		74.07	81.48
	Abnormal endometrium	Hyperplasia	100	42.86
		Polyp	46.15	45.45
		SM fibroid	100	100
		IM fibroid	-	-
		Uterine Synaechea	-	-
		Atrophic	100	100
specificity	Normal Endometrium		100	57.14
	Abnormal endometrium	Hyperplasia	88.24	94.12
		Polyp	100	98.44
		SM fibroid	100	100
		IM fibroid	-	98.67
		Uterine Synaechea	100	-
		Atrophy	100	100
PPV	Normal Endometrium		100	83.02
	Abnormal endometrium	Hyperplasia	46.67	42.86
		Polyp	98.44	83.33
		SM fibroid	100	100
		IM fibroid	-	-
		Uterine synaechea	-	-
		Atrophy	100	100
NPV	Normal Endometrium		64.10	54.55
	Abnormal endometrium	Hyperplasia	100	94.12
		Polyp	100	91.3
		SM fibroid	100	100
		IM fibroid	-	100
		Uterine synaechea	100	-
		Atrophy	-	-
Accuracy	Normal Endometrium		82.28	74.67
	Abnormal Endometrium	Hyperplasia	89.33	89.3
		Polyp	98.67	90.67
		SM fibroid	100	100
		IM fibroid	-	-
			-	-

		Uterine synaechea Atrophy	-	-

Table 25: Showing P value for various pathologies (OH with TVS)	
Findings	P Value
Hyperplasia	<0.001
Polyp	<0.001
SM fibroid	< 0.001
Atrophy	< 0.001

Both TVS & OH have showed atrophic endometrium in 3 cases with 100% sensitivity and specificity with a PPV of 100%. TVS and OH both have diagnosed 4 cases (5.3%) of submucous fibroid cases with PPV, NPV & accuracy being 100%.

Normal endometrial findings like proliferative & secretory endometrium had sensitivity of 74.07% with OH and 81.48% with TVS and specificity of 100% with OH and 57.14% with TVS. PPV was 100% and 83.02% with OH and TVS respectively and NPV of 64.10% and 54.55% respectively. Accuracy was better with OH which was 82.28% when compared to that of TVS which was 74.67%. TVS had diagnosed 6 cases (8%) of polyp while OH diagnosed 12(16%) such cases with sensitivity of 46.15% with OH and 45.45% with TVS and specificity of 100% with OH and 57.14% with TVS.

PPV was 98.44% and 83.33% with OH and TVS respectively and NPV was100% and 91.3% respectively. Accuracy was better with OH which was 98.67% when compared to that of TVS which was 90.67%. In addition OH had detected 3 cases (4%) with uterine septum Which was an extra benefit to see intra uterine pathologies. Office Hysteroscopy diagnosed intra uterine synechiae in 1 case with specificity of 100% , NPV of 100% whereas TVS had missed them. For all the parameters compared by Office Hysteroscopy with TVS such as proliferative endometrium , secretory endometrium , endometrial polyp , endometrial hyperplasia , submucous myoma , intramural myoma the P value is <0.0001 which was statistically significant. But TVS had detected intramural fibroid in one case with specificity of 98.67% and NPV of 100% which was missed on OH. But TVS had detected intramural fibroid in one case with specificity of 98.67% and NPV of 100% which was missed on OH. P value calculated for all the parameters was less than 0.05 and hence it was statistically significant. Thus intra cavitary abnormalities like polyp, submucous fibroid, uterine synechaie were better diagnosed with Office hysteroscopy though TVS was considered as initial line of investigation.

DISCUSSION

Most common pathologies causing AUB in perimenopausal patients are endometrial hyperplasia, endometrial polyps, submucous fibroids and adenomyosis. If the etiologic reason is correctly identified, it may be possible to treat the pathology specifically and prevent the need for large surgical operations. The most frequently used diagnostic tests for evaluation of AUB are transvaginal ultrasonography (TVS), Office hysteroscopy and sono-hysterography either alone or together. It has been proven that professionals who order and execute the diagnostic procedure frequently have a poor understanding of how the various diagnostic tests available operate. The Present study was a prospective observational study of Office hysteroscopy and Transvaginal Ultrasonography in diagnosis of endometrial pathology in patients with abnormal uterine bleeding, TVS was done in 75 patients of AUB followed by Office hysteroscopy and their correlation has been done with endometrial biopsy. The techniques used to assess the uterine cavity have advanced significantly during the past few years. Transvaginal ultrasonography is considered a simple examination with good acceptability. The uterus and its intramural pathological lesions can be visualised clearly but it lacks accuracy in diagnosing intra cavitory pathologies. Office hysteroscopy on the other hand has the advantage of providing a direct visualisation of the uterine cavity and endometrium and allows biopsy to be taken from suspected abnormalities.

AGE GROUP:

The age group in the study population was above18 years and the most of the patients were between 30-39 years of age i.e 26 of them (34.7%) followed by 40-49 years i.e 23 of the

patients (30.7%) with the youngest being 20 years and the eldest was of 59 years & with mean age being 36.1 years. This correlates with studies of Sinha p et al [8] where mean age was 36.4+/-7.6 years and Kathuri R et al[47] where mean age group was 30 - 45 years. Krishnamoorthy N et al[48] conducted a study on 100 women with AUB and the mean age of the patients was 42.9 years (40 – 50) years . The table below shows maximum incidence of age group in various studies.

Table 26: Range of age group in various studies

Study	Age group in years (maximum incidence) (%)
Present study	30-39
Pal L et al.,[5]	41-50
Kathuria R and Bhatnagar B et al[47]	30-45
Barati M et al[49]	>40
Kumari M et al[50]	31-50
Sinha P et al[8]	Mean age – 36.4 +/-7.6 years

PRESENTING SYMPTOMS:

The most common presentation was Heavy menstrual bleeding found in 37 cases i.e. 49.3% followed by irregular cycles in 31 cases i.e. 41.4% cases, which correlates with the studies done by El-khayat W et al[14] (40%) , Khaturia R et al[47](46%) , Kumari M et al[50](40%) where as it is contrary to the study done by Krishnamurthy N et al[48] where the heavy menstrual bleeding was seen in 71% of the patients.

Here is the table correlating the percentage of heavy menstrual bleeding in the patients with my study.

Table 27: Common presenting symptoms in various studies

Study	Heavy menstrual bleeding (HMB)(%)
Present study	49.3
Krishnamoorthy N et al[48]	71
Goyal BK et al[51]	58
El-khayat W et al[14]	40
Khaturia R et al[47]	46
Kumari M et al[50]	40

PARITY:

Here, most of the patients were multi parous i.e. n= 58 (77.3%), 6 were primipara i.e. 8 % , 11 were nulliparous i.e. 14.7% which correlates with study of Rustagi M[52] et al where nulliparous women comprised of 10% and multiparous women of 77.1% and also correlates with studies done by Bhosle A et al[53] Wanderley MS et al[54] but in Krishnamurthy et al[48], Nandan et al[55] where maximum of the patient group comprised of multiparous women of 97% and 90.9% respectively.

Table 28: Parity in various studies		
Study	Multipara %	Nullipara %
Present study	77.3	14.7
Krishnamoorthy N et al[48]	97	3
El-khayat W et al[14]	88	
Kumari M et al[50]	61.4	22.9
Wanderley MS et al[54]	70	
Bhosle A et al[53]	71	
Nandan N et al[55]	90.9	
Rustagi M et al[52]	77.1%	10%

OTHER FINDINGS:

In this study 93.3% (n=70) of the patients are normal without any medical disorders, 4% (n=3) of the patients presented with hypothyroidism and 1.3% (n=1) of the patients had Diabetes mellitus.

TVS FINDINGS:

In this study TVS showed normal endometrium in 54 cases (72.1%) and abnormal in 46 cases(27.9%) which correlates with Nancy A Towbin et al[10] where TVS showed 59% normal uterus. In a research by Fedele L et al[56] TVS was reported to be 100% sensitive and 94% specific for identifying submucous myomas.

Table 29: Endometrial polpys on TVS in various studies				
Study	Sensitivity(%)	Specificity(%)	PPV(%)	NPV(%)
Present study	45.45	98.44	83.33	91.3
Krishnamoorthy N et al[48]	56.25	91.67	50	50
Balic D et al[59]	100	56.4	62.5	62.5
Feitosa IMSD et al[57]	27.3	94.7	78.5	78.5
Wanderley MS et al[54]	71.4	60.3	16.67	16.67
Makled AK et al[58]	91.6	92.1	50	50

Among the abnormal lesions polyp constituted 6 cases (18 %) and submucous fibroid in 4 cases (9%) which Neumann T et al[60] had similar observations. Sensitivity and specificity to detect polyps were 45.45% & 98.44% respectively. In a research by Krishnamoorthy N et al[48] the sensitivity and specificity of TVS in detecting polyps were 56.25% and 91.67%, respectively but had discrepancy with studies done by Balic D et al[59] , Makled AK et al[58] and Wanderley MS et al[54] where sensitivity was 100%, 91.6% and 71.4% respectively.

Table 30: Endometrial hyperplasia on TVS in various studies				
Study	Sensitivity(%)	Specificity(%)	PPV(%)	NPV%
Present study	42.86	94.12	42.86	94.12
Krishnamoorthy N et al[48]	45.71	76.56		
Balic D et al[59]	22.7	100	100	66.7
Wanderley MS et al[54]	58.3	68.1		

On TVS endometrial hyperplasia in the present study has sensitivity of 42.86% and specificity of 94.12%. This was correlating with the studies done by Krishnamoorthy N et al[48] and Wanderley MS et al[54] but showed discrepancy with the study done by Balic D et al[59]

Hence based on these findings it was observed that TVS showed good accuracy in diagnosing normal variants and intramural pathologies but Less accurate in diagnosing intracavitory pathologies.

OH FINDINGS:

Office Hysteroscopy in the present study showed normal uterus in 40 cases (58.62%) and abnormal in 35 cases i.e. in 41.38% of cases. Similar pattern were observed in studies done by Lubna p et al[5], Acharya Veena[61], Veena BT. et al[12]. Among the abnormal lesions polyp constituted 12 cases (16 %) and submucous fibroids were seen in 4 cases (5.3%) which Neumann T et al[60] had similar observations and it was 100% sensitive and specific and were correlating with the sensitivity and specificity of the present study. Atrophic endometrium was seen in 3 cases (4%) and were correlating with the study done by Rustagi M et al[52] in which 4.3% of atrophic endometrium cases were present. In addition Ofiice hysteroscopy had the advantage of accurately diagnosing the intra uterine pathologies like Intra uterine synechiae and Septum. In this study we had observed one case of uterine synechiae and 3 cases of intra uterine septum which was not visualized with TVS. Sensitivity and specificity of the intra uterine pathologies by OH were correlating with other studies.

Table 31: Endometrial polyp on hysteroscopy in various studies		
Study	Sensitivity(%)	Specificity(%)
Present study	46.15	100
Krishnamoorthy N et al[48]	93.75	78.57
Sheetal GP et al[62]	100	95.78
Kumari M et al[50]	100	
Mukhopadhayay S et al[63]	71.4	100
Bettocchi S et al[64]	89	93
Balic´ D et al[59]	100	100
Tajossadat A et al[65]	93	100

Office hysteroscopy's sensitivity for polyp diagnosis using HPE as the gold standard was 46.15%, and its specificity was 100%. This study, which was comparable to earlier studies, indicated that office hysteroscopy had the highest sensitivity and specificity for detecting endometrial polyps. For endometrial polyps, Sheetal GP et al[62] reported a sensitivity and specificity of 100% and 95.78%, respectively. Similarly Mukhopadhayay S et al[63] in their study showed 100% specificity in detecting polyps.

Table 32: Endometrial hyperplaisa on hysteroscopy in various studies		
Study	Sensitivity(%)	Specificity(%)
Present study	100	88.24
Krishnamoorthy N et al[48]	60	78.12
Sheetal GP et al[62]	75	92.5
Vercellini P et al[66]	45	99
Bettocchi S et al[64]	74	93
Balic´ D et al[59]	86.4	100
Fakhar S et al[67]	63	92

Endometrial hyperplasia was seen in 15 cases (19.96%) which were correlating with Rustagi M et al[52] where it was 22.9% and with Nancy et al study in which it was 16%. This was comparable with a study conducted by El-khayat W et al[14] where hysteroscopy detected endometrial hyperplasia in 20% cases. Similar to our study, Sheetal GP et al.[62] showed that hysteroscopy had a sensitivity and specificity of 75% and 92.5% for detecting endometrial hyperplasia. Other studies done by Balic D et al[59] was also nearly correlating with our study where specificity was 100%.

There are limited studies available comparing the cost effectiveness of OH with TVS. Though OH is costlier than TVS , it has the own advantage of decreasing the need for the more costly alternative in the Operation Room(OR). When clinically appropriate, office hysteroscopy has the ability to decrease the need for OR hysteroscopies under anaesthesia and to increase OR availability for other procedures and services.

Our study's findings support their reasoning. Office hysteroscopy, as compared to TVS, provides a direct sight of the endometrial cavity and identifies any localised lesions. TVS can identify fibroids with good sensitivity. The TVS has a 100% negative predictive value for fibroids. However, TVS has a limited sensitivity (42.86%) for diagnosing endometrial hyperplasia, despite having a negative predictive value (94.12%). Office hysteroscopy exhibited a good negative predictive value of 100% and was 100% sensitive in detecting endometrial hyperplasia.

In a study done by Epstein E et al[68] the sensitivity and specificity of hysteroscopy were reported to be 100% and 84%, respectively which agrees with our findings. 400 patients with AUB were looked into in a different study conducted in the UK by Tahir MM et al.[69] Transvaginal sonography, endometrial biopsy, and office hysteroscopy were advised as the first and second steps, respectively. These recommendations are consistent with the results of the present investigation. 419 patients with AUB were taken into account in a different study conducted in Italy by Garuti G et al[70]. It once again showed that office hysteroscopy was more accurate than transvaginal sonography and that it was an appropriate diagnostic technique for the initial phase. Similarly, Mathlouthi N et al[71] and Yela DA et al[72] showed that hysteroscopy had better diagnostic values for identifying intrauterine diseases. Trans-vaginal sonography and hysteroscopy were used in another study conducted in Turkey by Kelekci S et al[73] to diagnose intra uterine lesions in individuals with AUB Transvaginal sonography had a sensitivity and

specificity of 56.3% and 100%, respectively. Hysteroscopy also had a 100% specificity rate and an 81.3% sensitivity rate. Therefore, one of the best ways to find polyps in this area is through office hysteroscopy. As a result of the high degree of agreement between pathology and office hysteroscopy, the former's diagnostic efficacy outperformed that of transvaginal sonography in detecting intra uterine pathologies. In light of this, it is advised that patients with AUB to be carried out with both transvaginal sonography & office hysteroscopy as the next step. A extensively used, reasonably priced, and practical approach to diagnose uterine pathologies is trans-vaginal ultrasonography. The patient has minimal discomfort because it is non-invasive. As a result, it is frequently employed as the first modality in patients with AUB. It is an excellent diagnosing tool and initial method of evaluation.

As in the study by Grimbizis GF et al[74], where TVS was also unable to distinguish hyperplasia or endometrial cancer from other intracavitary lesions, no ultrasonography data was suggestive of malignancy. Therefore together both TVS and OH is the nest method and can accurately rule out the causes of AUB

CONCLUSION

The majority of individuals who present with AUB belong to the peri menopausal age group. In this age group, intrauterine diseases are more common. TVS is the initial line of investigation and it is safe , easier helps in detecting intra mural pathologies with more precision and also cost effective for the patients. Office hysteroscopy provides a direct view of the uterine cavity and, if necessary it targeted biopsy can be taken in the same setting. A quick, safe, well-tolerated, and very accurate method of determining the cause of abnormal uterine bleeding is office hysteroscopy. It enables the patient and doctor to consider other treatment alternatives prior to surgery which means saving time, money, and resources for professionals, procedure and hospitals. Thus, both TVS and office hysteroscopy have different accuracies in diagnosing intra uterine pathologies and both are complementary to each other in precisely finding out the conditions causing AUB. Though Office Hysteroscopy wasn't cost effective it had it's own advantage of accurately diagnosing intra uterine pathologies and hence further decreasing the need and costs of major surgical procedures.

Limitations:

It was challenging to provide patient counselling in patients coming from rural areas and second-tier cities.

In our study we couldn't evaluate more patients with fibroid and carcinoma.

Study was done in a single centre and hence couldn't evaluate a wide variety number of patients

SUMMARY

The study was carried out in the Obstetrics and Gynaecology division at BLDEDU Shri B.M. Patil Medical College, Hospital and Research Centre, Vijayapura after ethical committee clearance. It is a prospective observational study conducted on 75 patients of abnormal uterine bleeding and correlating the findings with those of transvaginal ultrasonography and HPE over one and half years and the following observations were made. The patients were between the age group of 18 and 59. Most common age group was 30-39 years (34.7%) with the mean age group being 36.1%. Most common presenting pattern was Heavy menstrual bleeding in 37 cases (49.3%) followed by irregular cycles in 31 cases (30.7%). Most of the patients were Multiparous women i.e. 77.3% followed by nulliparous women (14.7 %). On clinical examination uterus size was normal in 90.7% of the cases and abnormalities of uterine size was seen in 9.3% of them. 10.7% of them presented with complaints of dysmenorrhoea and 89.3% of them were devoid of pain. Of the total patients 54 (72.1%) of them had normal findings and 21 (27.9%) showed abnormality on TVS endometrial hyperplasia was the most prevalent among the abnormal findings. (9.3%), followed by endometrial polyp(8%) . Submucous Fibroid was seen in 4 of them and Intramural fibroid was detected in one patient.

Same group of patients then underwent Office Hysteroscopy procedure which was normal in 41 cases (54.71%) and showed abnormality in 34 patients (45.29%). The most frequent abnormality among those was endometrial hyperplasia, which was found in 18.63% of cases and endometrial polyps in 16% of them. Submucous Fibroid was seen in 4 cases as in TVS and additionally OH detected 3 cases of Uterine septum and one case of uterine synechiae.

The endometrial biopsy sample that was subjected to histopathology showed normal endometrium in 54 (72%) of the cases. Endometrial polyp was the common feature with detection rate of 14.6% followed by hyperplasia without atypia which was seen in 8% of them. TVS & OH have showed atrophic endometrium in 3 cases which was same on HPE. TVS diagnosed 6 cases of endometrial polyp while OH diagnoses 12 such cases. OH has diagnosed intra uterine synechiae in 1 case whereas TVS couldn't evaluate it.

To sum up, our work contributes to the corpus of research demonstrating the value of office hysteroscopy and TVS in determining the cause of AUB. TVS should be utilised as the initial investigation in cases of AUB in women of reproductive age. Further evaluation with office hysteroscopy should be taken into consideration if the patient doesn't respond or if there is a recurrence. If the initial TVS reveals any abnormalities, it can guide the next intervention in the proper direction. And hence both TVS and OH are complementary to each other and in addition OH offers the benefit of allowing direct visualisation of the uterine cavity. and also intervention can be done in the same setting if needed. Although more expensive than transvaginal ultrasonography, OH offers specific advantages in diagnosing intra uterine pathologies with more accuracy. Patient and physician may view the abnormality simultaneously through a video monitor and proceed rapidly with specific medical or surgical therapy. It provides alternatives to hysterectomy in patients who prefer or are best suited for conservative treatment. Office hysteroscopy should be used as an adjunctive diagnostic modality in all patients complaining of abnormal uterine bleeding as it is accurate , rapid , safe , well tolerated , had both diagnostic and intervention properties at the same setting and has best patient compliance. Though Office Hysteroscopy wasn't cost effective it has it's own advantage of accurately diagnosing intra uterine pathologies and hence further decreasing the need and costs of major surgical procedures.

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ANNEXURE – I

ETHICAL CLEARANCE

B.L.D.E. (DEEMED TO BE UNIVERSITY) IEC/No-09/2021 Date-22/01/2021

(Declared vide notification No. F.9-37/2007-U.3 (A) Dated. 29-2-2008 of the MHRD, Government of India under Section 3 of the UGC Act, 1956)

The Constituent College

SHRI. B. M. PATIL MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTRE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Institutional ethical committee of this college met on 11-01-2021 at 11-00 am to scrutinize the synopsis of Postgraduate students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has been accorded Ethical Clearance

Title: The Efficacy of transvaginal ultrasonography & office Hysteroscopy in evaluation of abnormal uterine bleeding (AUB)

Name of PG student: Dr M.R.Sona Tejaswi, Department of Obst/Gynaec

Name of Guide/Co-investigator: Dr S R Mudanur, Professor & HOD of Obst/Gynaec

DR .S.V.PATIL
CHAIRMAN, IEC

Institutional Ethical Committee
B L D E (Deemed to be University)
Shri B.M. Patil Medical College,
VIJAYAPUR-586103 (Karnataka)

Following documents were placed before Ethical Committee for Scrutinization:

1. Copy of Synopsis / Research project
2. Copy of informed consent form
3. Any other relevant documents.

ANNEXURE – II
CONSENT FORM

INFORMED CONSENT FOR PARTICIPATION IN DISSERTATION/RESEARCH

I, the undersigned,_____, D/O W/O_____, aged____years, ordinarily resident of_____do hereby state/declare that Dr M.R.SONA TEJASWI of Shri. B. M. Patil Medical College Hospital and Research Centre have examined me thoroughly on_____at_____(place) and it has been explained to me in my own language that I am suffering from_____disease (condition) and this disease/condition mimic following diseases. Further Dr. M.R.SONA TEJASWI informed me that he/she is conducting dissertation/research titled " THE EFFICACY OF TRANSVAGINAL ULTRASONOGRAPHY AND OFFICE HYSTEROSCOPY IN EVALUATION OF ABNORMAL UTERINE BLEEDING (AUB) A COMPARATIVE STUDY" under the guidance of Dr.S.R.MUDANUR requesting my participation in the study. The doctor has also informed me that during the conduct of this procedure adverse results may be encountered. Among the above complications, most of them are treatable but are not anticipated hence there is a chance of aggravation of my condition and in rare circumstances, it may prove fatal despite the anticipated diagnosis and best treatment made available. Further Doctor has informed me that my participation in this study would help in the evaluation of the results of the study which is a useful reference to the treatment of other similar cases shortly, and also I may be benefited in getting relieved of suffering or cure of the disease I am suffering.

The Doctor has also informed me that information given by me, observations made photographs video graphs taken upon me by the investigator will be kept secret and not assessed by the person other than me or my legal hirer except for academic purposes. The Doctor did inform me that though my participation is purely voluntary, based on the

information given by me, I can ask for any clarification during the course of treatment/study related to diagnosis, the procedure of treatment, result of treatment, or prognosis. At the same time, I have been informed that I can withdraw from my participation in this study at any time if I want or the investigator can terminate me from the study at any time study but not the procedure of treatment and follow-up unless I request to be discharged. After understanding the nature of dissertation or research, diagnosis made,mode of treatment, I the undersigned Smt_____under my full conscious state of mind agree to participate in the said research/dissertation.

Signature of patient:

Signature of doctor:

Date:

Place

ANNEXURE – III

PROFORMA

NAME:

AGE:

INPATIENT NUMBER (I.P No.):

DATE OF ADMISSION :

ADDRESS AND PHONE NUMBER :

SIGNS AND SYMPTOMS

MENSTRUAL HISTORY::

MENARCHE:

MENSTRUAL CYCLES:

UPT:

LMP:

MENOPAUSE(if attained):

MARITAL HISTORY:

RELATED DRUG HISTORY:

PAST HISTORY:

PERSONAL HISTORY:

GENERAL PHYSICAL EXAMINATION:

PALLOR: TEMPERATURE: PULSE:

BLOOD PRESSURE:

CARDIOVASCULAR SYSTEM:

RESPIRATORY SYSTEM

PER ABDOMEN:

P/S:

P/V:

INVESTIGATIONS:

TVS FINDINGS:

OH FINDINGS:

ENDOMETRIAL BIOPSY AND HPE REPORT:

OTHERS:

TREATMENT ADVISED:

IMMEDIATE COMPLICATIONS:

EARLY COMPLICATIONS:

OUTCOME OF TREATMENT:

ANNEXURE – IV
MASTER CHART

S.No	Name	IP NO	Age(yrs	Symptoms	old terminology	Dysmenorrhoea	Parity	Bimanual examination	Hb%	TSH	TVS	OH	HPE	Diagnosis	Medical disorders
1	Rushika	30555	30	Irregular cycles	metrorrhagia	no	Nulli	Ut normal size AV ff nt	10.2	4.04	Endometrial polyp	Endometrial polyp	Endometrial polyp	AUB	none
2	Kamalabai	117218	36	Heavy bleeding	menorrhagia	yes	Multi	Ut 8-10 wks AV ff nt	11.3	1.32	proliferative	proliferative	proliferative	AUB	none
3	Shobha	131659	32	Heavy bleeding	menorrhagia	no	Multi	Ut bulky AV ff nt	9.4	1.8	Hyperplasia	Hpyerplasia	Hyperplasia without Atypia	AUB	none
4	Rajeshwari	135265	36	Infrequent menses	metrorrhagia	yes	Multi	Ut normal size AV ff nt	11.9	0.2	proliferative	Hpyerplasia	Hyperplasia without Atypia	AUB	none
5	Mahadevi	94412	40	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	13.1	2.76	Hyperplasia	Hpyerplasia	proliferative	AUB	none
6	Shashikala	135156	29	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12.2	2.1	Endometrial polyp	Endometrial polyp	Endometrial polyp	AUB	none
7	Deepa	48707	32	Irregular cycles	metrorrhagia	no	Nulli	Ut normal size AV ff nt	12.8	1.9	Submucous fibroid	Submucous fibroid	proliferative	AUB	none
8	Roopa	98231	20	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	11.6	1.4	proliferative	subseptate uterus, proliferative	proliferative	AUB	none
9	Sangeeta	94366	42	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10.9	2.3	IM Fibroid	secretory	secretory	AUB	none
10	Kamala	59452	38	Heavy bleeding	menorrhagia	no	Multi	ut 10-12 wks AV ff nt	12.7	2.5	proliferative	Hpyerplasia	proliferative	AUB	none
11	Pooja	132590	23	Infrequent menses	metrorrhagia	no	Nulli	Ut normal size AV ff nt	12.5	0.3	proliferative	proliferative	proliferative	AUB	Hyperthyroidism
12	Keerti	148099	32	Heavy bleeding	menorrhagia	no	Nulli	Ut normal size AV ff nt	11.7	1.7	proliferative	Endometrial polyp	Endometrial polyp	AUB	none
13	Varsha	145951	28	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	11.4	2.3	proliferative	proliferative	proliferative	AUB	none
14	Rajashree	156815	27	Infrequent menses	Oligomenorrhoea	no	primi	Ut normal size AV ff nt	13.9	1.6	proliferative	Subseptate uterus, proliferative	proliferative	AUB	none
15	Sheela rani	164231	30	Infrequent menses	Oligomenorrhoea	no	Nulli	Ut normal size AV ff nt	10.4	3	proliferative	proliferative	proliferative	AUB	Hypothyroidism
16	Pradeepa	36459	34	Heavy bleeding	menorrhagia	no	Nulli	Ut normal size AV ff nt	11.2	1.8	proliferative	proliferative	proliferative	AUB	none
17	Bhagya	179444	29	Irregular cycles	metrorrhagia	no	primi	Ut normal size AV ff nt	13	0.8	proliferative	proliferative	proliferative	AUB	none
18	Laxmi	184989	37	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10.8	2.2	proliferative	hyperplasia	proliferative	AUB	none
19	Pooja	187718	23	Irregular cycles	metrorrhagia	no	Nulli	Ut normal size AV ff nt	11.9	3.9	proliferative	proliferative	proliferative	AUB	none
20	Jyothi	189923	29	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	12.5	2.3	proliferative	hyperplasia	proliferative	AUB	none
21	Savitri	179330	45	Heavy bleeding	menorrhagia	no	primi	Ut normal size AV ff nt	10.2	1.6	Submucous fibroid	Submucous fibroid	proliferative	AUB	none
22	Sweta	210923	34	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12.4	3.1	proliferative	proliferative	proliferative	AUB	none
23	Vijayalaxmi	215599	23	Irregular cycles	metrorrhagia	no	Nulli	Ut normal size AV ff nt	10.6	1.2	secretory	secretory	secretory	AUB	none
24	Vidyashree	220094	28	Infrequent menses	Oligomenorrhoea	no	Nulli	Ut normal size AV ff nt	11.6	2.3	secretory	secretory	secretory	AUB	none
25	jayashri	201813	32	Light bleeding	hypomenorrhoea	no	Multi	Ut normal size AV ff nt	9.9	1.4	proliferative	secretory	secretory	AUB	Hypothyroidism
26	Asma	275037	27	Irregular cycles	Oligomenorrhoea	no	Nulli	Ut normal size AV ff nt	11.8	2.3	proliferative	proliferative	proliferative	AUB	none
27	Bouramma	287880	46	Irregular cycles	metrorrhagia	no	Multi	Ut bulky AV ff nt	10	2.3	proliferative	Endometrial polyp	Endometrial polyp	AUB	none
28	Saraswathi	248518	40	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12.6	0.6	proliferative	proliferative	proliferative	AUB	none
29	Shreedevi	23465	35	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	11	1.7	proliferative	Endometrial polyp	Endometrial polyp	AUB	none
30	Shridevikumbar	286597	27	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	8.9	2.8	proliferative	proliferative	proliferative	AUB	none
31	Pragathi	3517	35	Irregular cycles	Oligomenorrhoea	no	Nulli	Ut normal size AV ff nt	11.6	2.4	proliferative	septum+hyperplasia	proliferative	AUB	diabetes mellitus
32	Jyothi	227813	20	Heavy bleeding	metrorrhagia	no	primi	Ut normal size AV ff nt	8.6	2.06	Endometrial polyp	Endometrial polyp	proliferative	AUB	none
33	Husenbi	18444	28	Irregular cycles	metrorrhagia	yes	Multi	Ut normal size AV ff nt	10.2	3.24	proliferative	hyperplasia	Hyperplasia without Atypia	AUB	none
34	Sweety	263076	27	Heavy bleeding	menorrhagia	no	primi	Ut normal size AV ff nt	9.2	2.1	proliferative	proliferative	proliferative	AUB	none
35	Sunanda	42814	45	Heavy bleeding	menorrhagia	yes	Multi	Ut normal size AV ff nt	12.6	2	proliferative	proliferative	proliferative	AUB	none
36	Shakuntala	64228	45	Heavy bleeding	menorrhagia	yes	Multi	Ut normal size AV ff nt	11.7	1.7	Hyperplasia	hyperplasia	proliferative	AUB	none
37	Renuka	69265	36	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	10.2	2.6	Endometrial polyp	Endometrial polyp	Endometrial polyp	AUB	none

38	sharadha	69140	52	Irregular cycles	metrorrhagia	no	Multi	Ut small AV ff nt	12.1	1.23	atrophy	atrophy	atrophy	AUB	none
39	Shakuntala	64228	45	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11.2	2.1	proliferative	proliferative	proliferative	AUB	none
40	Fatima	108827	45	Heavy bleeding	menorrhagia	yes	Multi	Ut bulky AV ff nt	11.1	2.2	Hyperplasia	hyperplasia	secretory	AUB	none
41	Allamma	116146	50	Irregular cycles	metrorrhagia	yes	Multi	Ut normal size AV ff nt	11.3	2.1	atrophy	atrophy	atrophy	AUB	none
42	Jayashree	248801	36	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	9.6	1.3	Submucous fibroid	submucous fibroid	proliferative	AUB	none
43	Latha	117590	51	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	9	2.1	proliferative	proliferative	proliferative	AUB	none
44	Sharada	88559	47	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	10	1.8	secretory	secretory	secretory	AUB	none
45	Laxmi	93499	42	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10.9	2.3	secretory	secretory	secretory	AUB	none
46	Nirmala	119071	43	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10.4	0.69	proliferative	secretory	secretory	AUB	none
47	Fatima	108827	45	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	11.7	2.3	secretory	secretory	secretory	AUB	none
48	Savitri	124601	31	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12.2	1.73	proliferative	proliferative	proliferative	AUB	none
49	Mallamma	126393	45	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	9.3	2.2	secretory	secretory	secretory	AUB	none
50	Savitri	133125	38	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	9.5	1.8	proliferative	proliferative	proliferative	AUB	none
51	Shobha	167895	42	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	12.9	2.6	Submucous fibroid	submucous fibroid	proliferative	AUB	none
52	Savitri	167681	42	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11	1.7	proliferative	proliferative	proliferative	AUB	none
53	Reshma	158503	35	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	13.3	2.4	proliferative	uterine synechea	proliferative	AUB	none
54	Sunanda	123581	35	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	9.6	2.3	proliferative	proliferative	proliferative	AUB	none
55	Neelamma	183185	48	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12	1.23	Hyperplasia	hyperplasia	secretory	AUB	none
56	Danamma	156493	52	Irregular cycles	metrorrhagia	no	Multi	Ut small AV ff nt	13.3	1.02	atrophy	atrophy	atrophy	AUB	none
57	Vilasmathi	147678	55	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	12.7	2.13	proliferative	proliferative	proliferative	AUB	none
58	Arundathi	271186	45	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	12	1.5	proliferative	proliferative	proliferative	AUB	none
59	Drakshayani	271185	47	Heavy bleeding	menorrhagia	yes	Multi	Ut normal size AV ff nt	11	2.7	proliferative	Endometrial polyp	Endometrial polyp	AUB	none
60	Nainatara	271187	32	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11.9	1.3	Endometrial polyp	Endometrial polyp	Endometrial polyp	AUB	none
61	RenukaAgasar	120774	32	Irregular cycles	menorrhagia	no	Multi	Ut normal size AV ff nt	12.8	2.9	proliferative	hyperplasia	Hyperplasia without Atypia	AUB	none
62	Renukapatil	239611	32	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11.7	1.4	proliferative	proliferative	proliferative	AUB	none
63	Shivubai	305555	45	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	9.8	9.1	secretory	Endometrial polyp	Endometrial polyp	AUB	Hypothyroidism
64	Rekhamalpatil	305553	23	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	12	1.6	proliferative	proliferative	proliferative	AUB	none
65	Parvati	305556	22	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11.4	2	secretory	secretory	secretory	AUB	none
66	Sumitha	361578	47	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10	1.6	hyperplasia	hyperplasia	Hyperplasia without Atypia	AUB	none
67	Suman	361577	54	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	10.4	2.1	proliferative	endometrial polyp	endometrial polyp	AUB	none
68	Jagadevi	361576	43	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11	3	proliferative	proliferative	proliferative	AUB	none
69	Tarabai	223041	59	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	10	3.6	Hyperplasia	hyperplasia	Hyperplasia without Atypia	AUB	none
70	Suneetha	338938	39	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11.3	3.9	proliferative	proliferative	proliferative	AUB	none
71	Roopa	221087	31	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	10.8	1.06	secretory	secretory	secretory	AUB	none
72	Pooja	351700	22	Heavy bleeding	menorrhagia	no	primi	Ut normal size AV ff nt	11.1	2.7	proliferative	hyperplasia	Hyperplasia without Atypia	AUB	none
73	Sharanamma	305549	26	Light bleeding	hypomenorrhoea	no	Multi	Ut normal size AV ff nt	12.3	3.4	proliferative	proliferative	proliferative	AUB	none
74	Pushpavathi	361317	38	Heavy bleeding	menorrhagia	no	Multi	Ut normal size AV ff nt	11	1.2	Endometrial polyp	Endometrial polyp	Endometrial polyp	AUB	none
75	Jayashree	360149	40	Irregular cycles	metrorrhagia	no	Multi	Ut normal size AV ff nt	12.1	2.3	proliferative	proliferative	proliferative	AUB	none

PLAGIARISM REPORT

20BMOBG013-SONAREDDY-THE EFFICACY OF TRANSVAGINAL ULTRASONOGRAPHY AND OFFICE HYSTEROSCOPY IN EVALUATION OF ABNORMAL UTERINE BLEEDING (AUB)

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