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Original Research Article

EVALUATION OF ABNORMAL UTERINE BLEEDING THROUGH TRANSVAGINAL SONOGRAPHY-A CROSS SECTIONAL STUDY

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ABSTRACT

Background: Any variation from a woman's normal cycle in terms of menstrual regularity, flow, frequency, and/or duration is referred to as abnormal menstrual bleeding. Among all age groups, abnormal uterine bleeding is a highly prevalent gynecological symptom. The objective is to evaluate the uterine and endometrial pathology using Transvaginal Sonography (TVS) and to correlate the findings with histopathological examination (HPE) for accurate diagnosis.

Materials and Methods: The present hospital-based prospective observational study was carried out in the Department of Radiology, Rohilkhand Medical College, Bareilly, U.P, among 61 female patients who are clinically suspected for abnormal uterine bleeding referred from the Department of Obstetrics and Gynecology, Rohilkhand Medical College, Bareilly, U.P. for TVS in Department of Radio-diagnosis.

Results: Most patients were in the peri-menopausal age-group (41–50 years), with menorrhagia being the most typical bleeding pattern. The majority of women were multiparous, and half had a normal-sized uterus on sonography. The mean endometrial thickness was found to be 6.2 mm in the proliferative phase, 10.5 mm in the secretory phase, and 4.3 mm in post-menopausal women. Fibroid uterus (32.8%) was the most common TVS finding, followed by endometrial hyperplasia (18%), adenomyosis (14.8%), and endometrial polyp (9.8%). When compared with histopathological results, TVS showed a diagnostic accuracy of 91.8% overall. The correlation between endometrial thickness & histopathology was statistically significant ($p < 0.001$).

Conclusion: Transvaginal Sonography (TVS) is a reliable, safe, and accurate diagnostic tool in the evaluation of Abnormal uterine bleeding.

Keywords: Abnormal Uterine Bleeding, Transvaginal Sonography, endometrial thickness.

INTRODUCTION

An episode of bleeding significant enough to necessitate prompt medical attention in order to stop more blood loss in a woman of reproductive age who is not pregnant is known as acute abnormal bleed from uterus. An abnormal amount, duration, frequency, or bulk of bleeding from uterus that has persisted for the majority of the past six months is referred to as chronic abnormal uterine bleeding.

Transvaginal ultrasonography is helpful in identifying endometrial thickness, shape, and regularity of the endo-myometrial border in addition to detecting fibroids, adenomyosis, endometrial

polyps, and adnexal pathology.[1] Transvaginal ultrasonography is the first test carried out in cases with abnormal uterine bleeding, although even in the best of circumstances, it is not 100% sensitive due to the difficulties in detecting tiny lesions and polyps.

Transvaginal ultrasonography serves as a diagnostic instrument for intramural fibroids and adenomyosis; nevertheless, it is incapable of differentiating between endometrial hyperplasia and early cancers, according to prior investigations. Transvaginal ultrasonography exhibits comparatively lower specificity in detecting focal intrauterine pathology and may not definitively exclude malignancy or sessile and pedunculated endometrial lesions.[2]

Patients with abnormal uterine bleeding are optimally evaluated by transvaginal ultrasonography during initial presentation or in an outpatient context. A scan should be regarded as an integral component of the comprehensive clinical evaluation of the patient and never assessed in isolation. The gynaecologist conducting the scan possesses distinct advantages, as they can evaluate all pertinent patient information and contextualise the scan results appropriately.[3] A precise scan can allow the doctor to forgo surgery in certain instances and determine the appropriate surgical method in others. In women with abnormal uterine bleeding, transvaginal sonography can be integrated with outpatient endometrial sample methods as a comprehensive diagnostic and therapeutic strategy. The fundamental prerequisites for ultrasonography include a transvaginal probe (5–7.5 MHz), a 3.5-MHz transabdominal transducer, and capabilities for picture acquisition, either in hard copy or digital format.[4] The capability to conduct Doppler examinations or execute three- dimensional ultrasonography is not required. The transducer must be sanitised with a germicidal cloth or spray, such as 70% alcohol, to prevent cross-contamination.

Transvaginal ultrasonography, being non-invasive, is the primary diagnostic instrument employed to investigate the aetiology of abnormal uterine bleeding.[5] The lack of familiarity with the range of normal appearances and common benign asymptomatic conditions of the cervix can lead to diagnostic errors, resulting in a recommendation for unnecessary additional imaging or interventions.[6]

As transvaginal ultrasonography is non-invasive, it is the foremost diagnostic tool utilized to look into the source of irregular uterine bleed. The studies conducted previously have been very limited. The objective is to identify, characterise, and assess the prevalence of uterine diseases, so equipping clinicians with pertinent information to facilitate informed decisions on early diagnosis, therapy, and enhanced quality of care.

MATERIALS AND METHODS

This cross sectional study was carried out in Patients referred to the department of Radio-diagnosis, Rohilkhand Medical College and Hospital, Bareilly presenting with abnormal uterine bleeding in collaboration with OBGY department. Duration of study was one year. The study was done after approval from Institutional Ethics Committee (IEC).

Sample Size: - A sample in this study was consist of 61 patients calculated by using 4pq/L2 formula

p=prevalence of abnormal uterine bleeding 1= 4.0%

L is allowable error taken as 5%

q is 100-p= 96%. 4 x 4 x 96 / 5 x 5

~61

Inclusion Criteria

The study included patients above 18 years who were referred to the Department of Radiodiagnosis at the hospital for radiological assessment of abnormal uterine bleeding.

Exclusion Criteria

- Pregnant women.
- Unmarried patients.

Methodology: The study population was informed about the role of transvaginal sonography in case of abnormal uterine bleeding and only then they were included in the study after proper written and informed consent.

The patient was instructed to void their bladder before TVS. With a pillow beneath the patient's buttocks, the examination was conducted while the patient was kept in the lithotomy posture. The condom that held the coupling gel was punctured to reveal the probe inside. The covered probe was covered with more gel. The uterus was transversely and longitudinally scanned when the transducer is put into the posterior vaginal fornix.

The thickest area in the longitudinal plane was take into consideration to measure the endometrial thickness. The highly reflective interface where the myometrium and endometrium meet was used to measure it. When the endometrial canal was filled with fluid, the two half thicknesses of endometrium was added together. Any structural abnormalities in uterine cavity were documented. The results were correlated with other appropriate diagnostic methods wherever applicable.

Transvaginal ultrasonography scanning- Transvaginal ultrasonography is the first- line imaging for assessment of abnormal uterine bleeding. Endometrium is best visualised with high resolution transvaginal ultrasound probe (5 - 12MHz). In our department, we used Samsung HS70A, Samsung HS40, Samsung V7 and Samsung RS80 which are high-end diagnostic ultrasound systems particularly designed to fit into a general ultrasound imaging setting. A permanent record was taken on a thermal paper roll on a Sony videographic printer.

Statistical Analysis: All the data was compiled in excel sheet. The Data was entered in SPSS

(Statistical Package for Social Science) licensed version 23.0. Appropriate statistical tests were applied depending on the type and distribution of data. P if < 0.05 was considered significant.

RESULTS

The maximum number of patients belonged to the 41–50 years age group (42.6%), indicating that AUB is most prevalent during the perimenopausal period. This was followed by the 31–40 years group (27.9%), reflecting a high prevalence even in the reproductive age. Postmenopausal women (>50 years) accounted for 16.4% of cases, while the lowest proportion was seen in the 21–30 years group (13.1%).

The majority of women affected were multiparous (62.3%). A substantial proportion were grand multipara with more than three births (26.2%), while only a small percentage of cases were seen among nulliparous women (11.5%).

Menorrhagia (36.1%) was the most common presenting symptom. Menometrorrhagia (23%) represented the next frequent pattern, characterized by mixed heavy and irregular bleeding. Metrorrhagia (14.8%) involved episodes of irregular spotting or bleeding. Polymenorrhea (13.1%) indicated more frequent menstrual cycles, while oligomenorrhea (8.2%) was relatively less common. Postmenopausal bleeding accounted for 4.9% of cases, occurring infrequently but carrying high clinical significance.

Half of the patients (50.8%) had a uterus of normal size (<8 cm). Mild enlargement (8–10 cm) was observed in 24.6% of cases, suggestive of early fibroid or adenomyosis. Moderate enlargement (10–12 cm) was present in 16.4% of patients, while gross enlargement (>12 cm) was seen in 8.2%, most likely indicative of large fibroids or significant structural pathology.

Table 1: Endometrial Echotexture Pattern on TVS.

Endometrial Pattern	No. of Cases	Percentage (%)
Homogeneous thin	11	18
Homogeneous thick	18	29.5
Heterogeneous / irregular	14	23
Cystic / polypoidal	10	16.4
Atrophic	8	13.1
Total	61	100

Homogeneous thick endometrium (29.5%) was the most common finding on TVS. A heterogeneous or irregular endometrial pattern was seen in 23% of cases, suggestive of possible hyperplasia or adenomyosis. A homogeneous thin endometrium was observed in 18%, typically corresponding to normal proliferative-phase or postmenopausal women. Cystic or polypoidal patterns were present in 16.4%, indicative of endometrial polyps or cystic hyperplasia. An atrophic endometrium was noted in 13.1%, commonly seen in postmenopausal women.

Normal ovaries were observed in 77% of patients, indicating that ovarian factors are not the primary contributors to AUB in most cases. Simple ovarian cysts were seen in 11.5% of women and are generally benign and common. Complex cysts were present in 6.6% and warrant further evaluation or follow-up. A polycystic ovary (PCOS) pattern was detected in 4.9% of patients.

Table 2: Endometrial Thickness by Menstrual Phase

Menstrual Status	Range (mm)	Mean ± SD (mm)	No. of Cases
Proliferative phase	4–8	6.2 ± 1.1	25
Secretory phase	8–14	10.5 ± 2.3	23
Postmenopausal	2–6	4.3 ± 1.0	13

In the proliferative phase, the mean endometrial thickness was 6.2 mm, which falls within the normal physiological range. During the secretory phase, the mean thickness increased to 10.5 mm, reflecting expected physiological thickening. In postmenopausal women, the mean endometrial thickness was 4.3 mm, which is normal; however, values exceeding 5 mm in this group require further evaluation for possible pathology.

Table 3: Transvaginal Sonographic (TVS) Findings in AUB

TVS Finding	No. of Cases	Percentage (%)
Normal endometrium	7	11.5
Endometrial hyperplasia	11	18
Fibroid uterus	20	32.8
Adenomyosis	9	14.8
Endometrial polyp	6	9.8
Ovarian pathology / cyst	8	13.1
Total	61	100

Fibroid uterus was the most common pathology detected on TVS, accounting for 32.8% of cases. Endometrial hyperplasia was observed in 18%, occurring more frequently in older women.

Adenomyosis was identified in 14.8% of patients, while endometrial polyps were present in 9.8%. Only 11.5% of women demonstrated a normal endometrium on ultrasound.

Table 4: Correlation Between TVS and Histopathological Findings.

TVS Diagnosis	HPE Confirmed (n)	Not Confirmed (n)	Diagnostic Accuracy (%)
Fibroid uterus	19	1	95.0
Endometrial hyperplasia	10	1	90.9
Endometrial polyp	5	1	83.3
Adenomyosis	8	1	88.9
Overall Accuracy	—	—	91.3

TVS demonstrated high diagnostic reliability when compared with histopathology, with accuracy rates of 95% for fibroid uterus, 90.9% for endometrial hyperplasia, 83.3% for polyps, and 88.9% for adenomyosis. The overall diagnostic accuracy of TVS for structural and endometrial abnormalities was 91.3%, confirming its value as a sensitive and non-invasive modality for evaluating abnormal uterine bleeding.

Table 5: Comparison Between Reproductive and Postmenopausal Women.

Parameter	Reproductive Age (n = 48)	Postmenopausal (n = 13)
Mean age (years)	38.6 ± 5.2	55.3 ± 3.8
Common symptom	Menorrhagia (37.5%)	Postmenopausal bleeding (100%)
Common TVS finding	Fibroid (33.3%)	Endometrial hyperplasia (38.4%)
Mean endometrial thickness (mm)	8.9 ± 2.2	4.3 ± 1.0
TVS–HPE correlation (%)	90.4	93

The reproductive-age group had a mean age of 38.6 years. Menorrhagia was the most common presenting symptom in this group. The predominant TVS finding was fibroid uterus (33.3%). The mean endometrial thickness measured 8.9 mm, which is consistent with physiological thickening during the reproductive years.

Table 6: Diagnostic Accuracy Parameters of TVS in AUB (n = 61)

Diagnosis	True Posi- tive (TP)	False Posi- tive (FP)	True Nega- tive (TN)	False Nega- tive (FN)	Sensi- tivity (%)	Speci- ficity (%)	PPV (%)	NP V (%)
Fibroid uterus	19	1	39	2	90.5	97.5	95	95.1
Endometrial hyperplasia	10	1	48	2	83.3	97.9	90.9	96
Adenomyosis	8	1	50	2	80	98	88.9	96.1
Endometrial polyp	5	1	53	2	71.4	98.1	83.3	96.4
Overall (all lesions)	42	4	48	7	85.7	92.3	91.1	87.2

Sensitivity was highest for fibroid detection (90.5%), while the lowest sensitivity was observed for endometrial polyps (71.4%). Specificity values were consistently high for all lesions, exceeding 97%, indicating excellent control of false-positive results. The positive predictive value (PPV) was highest for fibroids at 95%, and the negative predictive value (NPV) was also high across lesions, averaging around 96%, demonstrating strong overall diagnostic reliability of TVS.

Fibroid uterus demonstrated the highest diagnostic accuracy at 95%. Endometrial hyperplasia (90.9%) and adenomyosis (88.9%) also showed high accuracy levels. Endometrial polyps had the lowest accuracy at 83.3%, reflecting diagnostic limitations for focal lesions. The overall diagnostic accuracy of TVS for all AUB pathologies combined was 91.8%, indicating strong overall performance.

Table 7: Correlation Between Type of Bleeding and TVS Findings (n = 61).

Type of Bleeding	Fib- roid (%)	Hyper- plasia (%)	Adeno- myosis (%)	Polyp (%)	Normal (%)	P-value
Menorrhagia	45.5	22.7	18.2	9.1	4.5	0.012 *(significant)
Metrorrhagia	22.2	33.3	22.2	11.1	11.1	0.041 *(significant)
Menometrorrha gia	35.7	14.3	28.6	14.3	7.1	0.021 *(significant)
Polymenorrhea	25	25	25	12.5	12.5	0.067 #(not significant)
Post- menopausal	0	66.7	0	0	33.3	0.004 *(significant)

Menorrhagia was predominantly associated with fibroids, seen in 45.5% of such cases. Metrorrhagia showed the strongest association with endometrial hyperplasia (33.3%). Menometrorrhagia was most frequently linked to adenomyosis (28.6%). Polymenorrhea demonstrated a mixed pattern of underlying causes without a single dominant pathology. Postmenopausal bleeding was chiefly related to endometrial hyperplasia, accounting for 66.7% of cases.

A row-wise Chi-square goodness-of-fit test was applied to determine whether the distribution of

TVS findings within each bleeding type differed significantly from the expected overall distribution. Menorrhagia (p=0.012), metrorrhagia (p=0.041), menometrorrhagia (p=0.021), and postmenopausal bleeding (p=0.004) showed statistically significant deviation in TVS patterns, Polymenorrhea did not show a significant pattern (p=0.067).Menorrhagia significantly correlated with fibroid uterus, metrorrhagia with hyperplasia, menometrorrhagia with both fibroid and adenomyosis, and postmenopausal bleeding strongly correlated with endometrial hyperplasia.

There was a moderate positive correlation between age and TVS findings (r = 0.58). The correlation between bleeding pattern and TVS findings was also significant (r = 0.49). Endometrial thickness showed the strongest correlation with histopathology (r= 0.71), indicating a high predictive value. All correlations were statistically significant, with p-values less than 0.05.

DISCUSSION

TVS being a first-line modality demonstrated its strength in picking up fibroids and adenomyosis reliably. However, small polyps or focal hyperplasia may be missed due to limitations in resolution or endometrial phase variability, the distribution of histopathological patterns among women with AUB. The most common HPE- confirmed diagnosis was endometrial hyperplasia, particularly in women with metrorrhagia and postmenopausal bleeding. This aligns with global data indicating that perimenopausal and postmenopausal women have a higher risk of proliferative lesions due to hormonal imbalance or unopposed estrogen. Adenomyosis, although often visible on TVS, is less often confirmed on HPE unless hysterectomy specimens are available. Endometrial polyps showed moderate detection rates; small focal lesions may regress or be missed depending on curettage adequacy.

The findings of our study indicate that abnormal uterine bleeding is most prevalent among perimenopausal women (41–50 years), primarily due to hormonal imbalance and anovulatory cycles. The results are consistent with studies by Jain M et al. (2017) and Singh et al. (2013), which also reported a higher incidence of AUB in this age group.[7,8]

Transvaginal Sonography (TVS) proved to be a valuable, non-invasive, and accurate diagnostic tool for evaluating endometrial and myometrial pathology. Its high sensitivity in detecting fibroids and hyperplasia agrees with findings from Sinha P et al. (2015).[9]

A significant correlation between endometrial thickness and histopathology supports the use of TVS for early screening of endometrial abnormalities. TVS was especially effective in differentiating structural causes such as fibroids and adenomyosis, reducing the need for invasive procedures like hysteroscopy and biopsy in many cases. Thus, TVS serves as an essential first-line investigation for all women presenting with AUB, enabling prompt diagnosis and appropriate management.

Endometrial hyperplasia was more frequently detected in women with metrorrhagia and postmenopausal bleeding, reflecting unopposed estrogenic stimulation. Adenomyosis, which often presents with menometrorrhagia and dysmenorrhea, was also a significant finding on TVS. Menorrhagia emerged as the most common symptom, consistent with previous reports by Shah et al,[10] (2023) who also noted menorrhagia as the leading clinical presentation of AUB.

Fibroid uterus was the most frequent pathological finding (32.8%) on TVS, supporting the results of Vidhya et al (2025),[11] who identified leiomyoma as the predominant structural cause of AUB. Fibroid-related bleeding patterns were confirmed on HPE in a significant proportion of cases where TVS detected leiomyomas, validating the role of histology in structural pathologies as well.

The diagnostic accuracy of TVS in correlation with HPE, the gold standard. TVS showed the highest accuracy for diagnosing fibroid uterus (95%), followed by endometrial hyperplasia (90.9%), adenomyosis (88.9%), and endometrial polyp (83.3%). The overall diagnostic accuracy of 91.3% shows that TVS is a strong screening tool for AUB evaluation, which is in agreement with studies by Iqbal I et al (2023),[12] establishing TVS as a highly sensitive and specific imaging modality for evaluating uterine pathology.

Thus, the strong correlation between TVS and HPE in most categories underscores the value of TVS as a first-line imaging modality, particularly in resource- limited settings. However, HPE remains essential for confirmatory diagnosis, especially for hyperplasia and suspected atypical lesions.

CONCLUSION

Transvaginal Sonography (TVS) is a reliable, safe, and accurate diagnostic tool in the evaluation of Abnormal uterine bleeding. Perimenopausal women are most frequently affected, with menorrhagia being the commonest symptom. Fibroid uterus is the leading cause of AUB, followed by endometrial hyperplasia and adenomyosis. There exists a strong correlation between TVS findings and histopathological diagnosis (overall accuracy 91.8%). Endometrial thickness measurement is a simple yet effective predictor of pathology. TVS should be used as the primary imaging modality in AUB cases before opting for invasive diagnostic methods.

REFERENCES

1. Jain M, Chate P.TAS/TVS versus histopathological diagnosis in abnormal uterine bleeding: A comparative study.

International Journal of Clinical Obstetrics and Gynaecology.2020;4(1):282-6.
2. Schwärzler P, Concin H, Bösch H, Berlinger A, Wohlgenannt K, Collins WP, et al. An evaluation of sonohysterography and diagnostic hysteroscopy for the assessment of intrauterine pathology. Ultrasound in Obstetrics and Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology. 1998;1;11(5):337-42.
3. Widrich T, Bradley LD, Mitchinson AR, Collins RL. Comparison of saline infusion sonography with office hysteroscopy for the evaluation of the endometrium. American journal of obstetrics and gynecology. 1996;1;174(4):1327-34.
4. Timmerman D, Deprest J, Bourne T, Van den Berghe I, Collins WP, Vergote I. A randomized trial on the use of ultrasonography or office hysteroscopy for endometrial assessment in postmenopausal patients with breast cancer who were treated with tamoxifen. American journal of obstetrics and gynecology. 1998;1;179(1):62-70.
5. Granberg S, Wikland M, Karlsson B, Norström A, Friberg LG. Endometrial thickness as measured by endovaginal ultrasonography for identifying endometrial abnormality. American journal of obstetrics and gynecology. 1991;1;164(1):47-52.
6. Wildenberg JC, Yam BL, Langer JE, Jones LP. US of the nongravid cervix with multimodality imaging correlation: normal appearance, pathologic conditions, and diagnostic pitfalls. Radiographics. 2016;36(2):596-617.
7. Jain M, Chakraborty S. Evaluation of abnormal uterine bleeding with transvaginal sonography. Int J Reprod Contracept Obstet Gynecol. 2017:24;6(7):2794-9.
8. Singh S, Best C, Dunn S, Leyland N, Wolfman WL, Wolfman W, et al. Abnormal uterine bleeding in pre-menopausal women. Journal of obstetrics and gynaecology Canada. 2013 May 1;35(5):473-5.
9. Sinha P, Gupta U, Waris B, Dubey A. Evaluation of abnormal uterine bleeding by transvaginal sonography, sonohysterography and correlation with endometrial histopathology. Int J Reprod Contracept Obstet Gynecol. 2015;1374–9.
10. Sah S, Dangal G, Jha M. Correlation of Endometrial Thicknessby Transvaginal Sonography with Histopathological Examination in Abnormal uterine bleeding in Perimenopausal Age Group. Journal of Nepal Health Research Council. 2023;21(1):114.
11. Vidhya V, Muralidhar A, Minal J, Nirupama M. Histopathological spectrum of endometrial lesions in abnormal uterine bleeding and its association with endometrial thickness. J Med Sci Health. 2025;11(1):42-47.
12. Iqbal I, Saeed S, Sarwar U, Khan A, Rehman S, Qavi Y. Diagnostic accuracy of transvaginal sonography in adenomyosis taking histopathology as gold standard in infertile women. Esculapio. 2023; 20:21–24.