Scholars Journal of Applied Medical Sciences
Abbreviated Key Title: Sch J App Med Sci
ISSN 2347-954X (Print) | ISSN 2320-6691 (Online)
Journal homepage: https://saspublishers.com

OPEN ACCESS

Obstetrics & Gynaecology

Diagnostic Performance of Transvaginal Ultrasonography in Detecting Endometrial Pathology in Women with Postmenopausal Bleeding

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DOI: https://doi.org/10.36347/sjams.2025.v13i05.035 | **Received:** 18.04.2025 | **Accepted:** 19.05.2025 | **Published:** 26.05.2025

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Abstract **Original Research Article**

Background: Postmenopausal bleeding (PMB) is a common yet concerning symptom often associated with endometrial pathology, including hyperplasia and carcinoma. Accurate, non-invasive, and accessible diagnostic tools are essential for early detection and appropriate management, especially in resource-limited settings like Bangladesh. ***Aim of the Study:*** The aim of this study was to evaluate the diagnostic performance of transvaginal ultrasonography in detecting endometrial pathology in women with postmenopausal bleeding. ***Methods:*** This cross-sectional study was conducted in Department of Obstetrics & Gynaecology at Dhaka Medical College Hospital, Dhaka, Bangladesh, during the period from June 2022 to May 2023. Total 65 menopausal women presenting with vaginal bleeding were included in this study. ***Result:*** The majority of women (78.5%) were between 45 and 60 years of age, with a mean age of 55.5 ± 7.6 years. Among the participants, 58.5% had an endometrial thickness >5 mm. Histopathological findings revealed that 70.8% had abnormal endometrial pathology, including hyperplasia (47.8%) and carcinoma (13.1%). An endometrial thickness cut-off of ≥4.99 mm showed a sensitivity of 82.61%, specificity of 73.68%, PPV of 88.37%, NPV of 63.64%, and overall accuracy of 80% in detecting any pathology. For detecting carcinoma, a threshold of ≥13.5 mm yielded 100% sensitivity and NPV, with an accuracy of 87.69%. ***Conclusion:*** TVS is a highly effective, non-invasive screening tool for evaluating endometrial pathology of women with postmenopausal bleeding and should be integrated into diagnostic protocols to reduce reliance on invasive procedures.

Keywords: Diagnostic Performance, Transvaginal Ultrasonography, Endometrial Pathology, and Postmenopausal Bleeding.

INTRODUCTION

Postmenopausal bleeding (PMB) remains one of the most critical clinical presentations in gynecologic practice, warranting thorough evaluation to exclude endometrial malignancy. Although it is often attributable to benign etiologies such as endometrial atrophy, hyperplasia, or polyps, approximately 10–15% of women with PMB are eventually diagnosed with endometrial carcinoma, underlining its potential diagnostic gravity [1]. In clinical settings, PMB accounts for a significant portion of referrals to gynecologic services, particularly in women within the first five years of menopause [2]. This symptom is not only common but also often represents the earliest and sometimes the only sign of underlying endometrial pathology. Notably, in a recent Bangladeshi cohort, 16.7% of women presenting with PMB were diagnosed with endometrial carcinoma, confirming the substantial risk in local populations and the pressing need for accurate diagnostic evaluation in resource-limited healthcare systems [3]. Endometrial cancer has become the most frequently diagnosed gynecologic malignancy in developed countries and its incidence is on the rise globally. Early diagnosis significantly improves outcomes, with cure rates exceeding 90% when the disease is detected at stage I [4]. While PMB serves as an essential red flag, its predictive value for malignancy is limited without appropriate imaging or histological correlation. Histopathological evaluation through dilatation and curettage (D&C) remains the gold standard for diagnosing endometrial pathology, offering high

specificity and definitive results [5]. However, D&C is invasive, resource-intensive, and not always feasible in primary care or rural settings, especially in countries like Bangladesh where access to specialized facilities is limited. Furthermore, it carries procedural risks and often requires anesthesia, which poses an added burden on both the patient and the healthcare system. Given these limitations, there has been growing interest in non-invasive yet reliable diagnostic alternatives. Among these, transvaginal ultrasonography (TVS) has emerged as a first-line, accessible, and cost-effective tool for the assessment of endometrial thickness and morphology. TVS offers the advantage of real-time visualization of the uterine cavity, requiring minimal patient preparation while delivering critical diagnostic insight. An endometrial thickness of ≤4 mm in women with PMB has been widely validated to have a negative predictive value of over 99%, effectively ruling out significant pathology and obviating the need for immediate invasive interventions [6]. A large review incorporating more than 35 studies further supports the diagnostic efficacy of TVS, revealing that using a 5 mm threshold allows for the detection of 96% of endometrial cancers and 92% of broader pathologies including polyps and hyperplasia [7]. Recent studies continue to affirm these findings. Yang *et al*., [8], reported that TVS alone achieved a sensitivity of 86.8% and an NPV of 86.1% in identifying atypical hyperplasia or worse, with further improvements seen when combined with cytology. However, the specificity of TVS remains modest, often resulting in false positives that may prompt unnecessary biopsies. Despite its diagnostic promise, one major concern remains: most validation studies have been conducted in high-income or upper-middle-income countries, limiting the generalizability of their findings to low-resource settings. In Bangladesh, only a few hospital-based observational studies have examined TVS performance relative to histopathological outcomes, and these often suffer from small sample sizes or limited diagnostic depth [3-5]. This evidence gap highlights the urgent need for context-specific research evaluating the diagnostic performance of TVS in Bangladeshi women with postmenopausal bleeding. Thus, this study aims to enhance diagnostic efficiency and promote safer, more accessible care for women at risk of postmenopausal bleeding.

Objectives

To evaluate the diagnostic performance of transvaginal ultrasonography in detecting endometrial pathology in women with postmenopausal bleeding.

METHODOLOGY & MATERIALS

This cross-sectional study was conducted in Department of Obstetrics & Gynaecology at Dhaka Medical College Hospital, Dhaka, Bangladesh, during the period from June 2022 to May 2023. Total 65 menopausal women presenting with vaginal bleeding were included in this study. Before initiating the study, ethical approval was obtained from the Ethical Review Committee of Dhaka Medical College (DMC). Based on inclusion and exclusion criteria, 65 postmenopausal women with vaginal bleeding were selected using purposive sampling. Each participant provided informed written consent after being briefed on the study's purpose and procedures. A detailed menstrual and obstetric history was taken using a predesigned data sheet, followed by vital signs assessment and physical examinations, including per abdominal, per speculum, and per vaginal exams. Patients with vulvar, vaginal, or cervical cancers or polyps were excluded. Demographic and clinical data were recorded. Transvaginal ultrasonography (TVS) was performed in the Department of Nuclear Medicine and Allied Sciences by a qualified sonologist using a vaginal probe, with endometrial thickness measured at its maximum in the sagittal plane. Subsequently, all patients underwent fractional curettage under anesthesia or deep sedation; separate endocervical and endometrial samples were collected and sent for histopathological analysis by the Department of Pathology, DMC. The investigator conducted all data collection, and analysis was performed using SPSS version 26.

Inclusion Criteria:

- All menopausal women presenting with vaginal bleeding.
- Who were willing to participate the study.

Exclusion Criteria:

- Women on MHT
- Diagnosed cases of endometrial carcinoma.
- Diagnosed cases of vulvar, vaginal, or cervical cancer.
- Diagnosed cases of cervical polyp, myomatous polyp.
- Patient not willing to give consent.

RESULT

The baseline characteristics of the 65 study participants are summarized in Table I. The majority of women (78.5%) were between 45 and 60 years of age, with a mean age of 55.5 ± 7.6 years. Regarding transvaginal ultrasonography (TVS) findings, 58.5% had an endometrial thickness greater than 5 mm, while 41.5% had ≤5 mm, with a mean thickness of 9.1 ± 6.1 mm. Histopathological examination in table II revealed that 70.8% (n=46) of participants had abnormal endometrial findings, including endometrial hyperplasia (47.8%), atrophy (23.9%), carcinoma (13.1%), and polyps (15.2%), while 29.2% had normal histology. Table III demonstrates a statistically significant association between endometrial thickness on TVS and histopathological outcomes (p=0.001). Among those with endometrial thickness >5 mm, 73.9% had abnormal pathology, while only 21.1% of them had no pathology. Conversely, 78.9% of those with ≤5 mm thickness had no pathology. Table IV further details the distribution of

specific pathologies in relation to endometrial thickness. Endometrial hyperplasia and carcinoma were predominantly associated with >5 mm thickness (57.6% and 18.1%, respectively), while atrophy was more common in those with ≤5 mm (69.2%). This association was statistically significant (p<0.001). In Table V, diagnostic performance analysis using a threshold of ≥4.99 mm for predicting endometrial pathology revealed 38 true positives (TP), 5 false positives (FP), 8 false negatives (FN), and 14 true negatives (TN), indicating a strong diagnostic utility of this cut-off. Similarly, Table VI shows that a threshold of ≥13.5 mm was optimal for detecting endometrial carcinoma, with 6 TP cases, 8 FP, 0 FN, and 51 TN. These findings underscore excellent sensitivity and specificity. Finally, Table VII presents the receiver operating characteristic (ROC) analysis, which showed that a cut-off of 4.99 mm for detecting any endometrial pathology yielded an area under the curve (AUC) of 0.880, sensitivity of 82.61%, specificity of 73.68%, positive predictive value (PPV) of 88.37%, negative predictive value (NPV) of 63.64%, and overall accuracy of 80.00%. For endometrial carcinoma, a higher cut-off of 13.5 mm achieved an AUC of 0.935, with 100% sensitivity and NPV, 86.44% specificity, and an overall accuracy of 87.69%, although the PPV was relatively lower at 42.86%.

Table I: Baseline characteristics of the study people (N=65)

Characteristics	Frequency (N)	Percentage (%)
Age group (years)		
45-60	51	78.5
>60	14	21.5
Mean±SD (years)	55.5±7.6	
Endometrial thickness		
>5mm	38	58.5
≤5mm	27	41.5
Mean±SD (mm)	9.1±6.1	

Table II: Histopathological findings of the study people (N=65)

Histopathological findings	Frequency (N)	Percentage (%)
Abnormal	46	70.8
Endometrial Hyperplasia	22	47.8
Endometrial atrophy	11	23.9
Endometrial carcinoma	6	13.1
Endometrial polyp	7	15.2
Normal	19	29.2

Table III: Association of histopathological findings with endometrial thickness on TVS (N=65)

Endometrial thickness on TVS	Abnormal Pathology (N=46)	No pathology (N=19)	P-value*
>5mm	33 (73.9)	5 (21.1)	0.001
≤5mm	13 (26.1)	14 (78.9)	

Table IV: Association of different type of endometrial pathology of the patients according to endometrial thickness on TVS (N=46)

Endometrial pathology	Endometrial thickness		p-value*
	>5mm (N=33)	≤5mm (N=13)	
Endometrial Hyperplasia	19 (57.6)	3 (23.1)	<0.001
Endometrial atrophy	2 (6.2)	9 (69.2)	
Endometrial carcinoma	6 (18.1)	0 (0)	
Endometrial polyp	6 (18.1)	1 (7.7)	

Table V: Accuracy test of endometrial thickness on TVS in the prediction of endometrial pathology (N=65)

	Abnormal Pathology	No pathology	Total
≥4.99mm	TP	FP	**TP+FP**
	38	5	**43**
<4.99mm	FN	TN	**FN+TN**
	8	14	**22**
Total	**TP+FN**	**FP+TN**	**65**
	46	19	

TP = True Positive
FN = False negative
FP = False positive
TN = True negative

Table VI: Accuracy test of endometrial thickness on TVS in the prediction of endometrial carcinoma among the patients (N=65)

	Endometrial carcinoma	No endometrial carcinoma	Total
≥13.5mm	TP	FP	**TP+FP**
	6	8	**14**
<13.5mm	FN	TN	**FN+TN**
	0	51	**51**
Total	**TP+FN**	**FP+TN**	**65**
	6	**59**	

TP = True Positive
FN = False negative
FP = False positive
TN = True negative

Table VII: ROC analysis summary for predicting endometrial pathology and carcinoma

Condition	Cut-off (mm)	AUC	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy (%)
Endometrial Pathology	4.99	0.880	82.61	73.68	88.37	63.64	80.00
Endometrial Carcinoma	13.5	0.935	100.00	86.44	42.86	100.00	87.69

DISCUSSION

This study aimed to evaluate the diagnostic performance of transvaginal ultrasonography (TVS) in detecting endometrial pathology in women with postmenopausal bleeding, and the results reinforce TVS as a valuable first-line tool for triaging these patients. The majority of participants were aged between 45–60 years, with a mean age of 55.5 ± 7.6 years. This age distribution aligns with previous studies conducted in similar settings, such as Ashmawy *et al*., [9], where the mean age was 57.7 years, indicating that postmenopausal endometrial pathology commonly affects women in their fifth to sixth decades. In our study, endometrial thickness (ET) exceeded 5 mm in 58.5% of patients, with a mean of 9.1 ± 6.1 mm. These figures are slightly lower than those reported by Dhamija [10], who found an average ET of 11.3 mm in benign cases and 21.8 mm in malignancy, but comparable to Bilal *et al*., [11], who noted a diagnostic threshold of around 5 mm as effective for pathology screening.

Histopathologically, 70.8% of our cohort showed abnormal findings—most commonly endometrial hyperplasia (47.8%), followed by atrophy (23.9%), carcinoma (13.1%), and polyps (15.2%). These frequencies are consistent with several prior studies. For instance, Shabir *et al*., [12], in a Bangladesh-based study found hyperplasia in 56.3% and carcinoma in 11% of cases, closely matching our rates. Similarly, Patel *et al*., [13], documented carcinoma in 10.5%, hyperplasia in 9.8%, and atrophy in 65% of cases, although the higher rate of atrophy in that study may reflect differences in diagnostic thresholds or population characteristics.

Importantly, we observed a statistically significant association between ET on TVS and histopathological outcomes ($p = 0.001$). Among women with ET >5 mm, 73.9% had abnormal histology, while 78.9% of those with ET ≤5 mm had no pathology. This supports findings from Swetha *et al*., [14], who reported a significant correlation between ET >4 mm and abnormal pathology in women with PMB. Our analysis further revealed that endometrial hyperplasia (57.6%) and carcinoma (18.1%) were significantly more prevalent among those with ET >5 mm, whereas atrophy (69.2%) was more common in those with ≤5 mm thickness ($p < 0.001$). These trends are corroborated by Krishnamoorthy *et al*., [15], who found hyperplasia and carcinoma primarily associated with ET ≥10 mm, and atrophy associated with thinner endometrium.

In evaluating the diagnostic accuracy of TVS, we found that an ET threshold of ≥4.99 mm provided strong performance characteristics: sensitivity of 82.61%, specificity of 73.68%, PPV of 88.37%, and overall accuracy of 80%. These metrics align closely with Bashir *et al*., [16], who reported a sensitivity of 94.1%, specificity of 88.9%, and PPV of 91.7% at a comparable cut-off. Similarly, Elmorsy *et al*., [17], used a threshold of 14.2 mm for carcinoma detection, achieving 80% sensitivity and 100% specificity, aligning with our results using a 13.5 mm threshold, which yielded an AUC of 0.935, 100% sensitivity, 86.44% specificity, and 87.69% accuracy. Our findings are also consistent with the large-scale ROC analysis by Patel *et al*., [13], which demonstrated optimal test performance at higher ET thresholds for malignancy prediction, reinforcing the practical application of ET-based stratification in PMB evaluation.

Though some researchers, such as Yaşa *et al*., [18], caution against relying solely on ET in asymptomatic women due to poor AUC values (0.52), our study focuses on symptomatic women where

diagnostic performance is notably higher. The discrepancy further highlights the importance of contextual validation-underscoring why population-specific data, like those derived from our Bangladeshi cohort, are essential for refining clinical protocols in resource-constrained settings.

Overall, this study affirms that TVS, using a contextually validated threshold, is highly effective in stratifying in women with postmenopausal bleeding. It provides high sensitivity and predictive value, particularly for ruling out significant pathology and guiding the selective use of invasive diagnostic procedures.

Limitations of the Study

In our study, there was small sample size and absence of control for comparison. Study population was selected from one center in Dhaka city, so may not represent wider population. Sample was taken purposively, so randomization was not done. Sample was not compared with healthy subjects.

CONCLUSION AND RECOMMENDATIONS

Transvaginal ultrasonography (TVS) is a reliable, non-invasive diagnostic tool for evaluating endometrial pathology in women with postmenopausal bleeding. An endometrial thickness cut-off of ≥4.99 mm showed strong diagnostic performance, while ≥13.5 mm effectively predicted carcinoma. Transvaginal sonography can be considered early screening method to detect endometrial pathology in post-menopausal women with vaginal bleeding. Further multicenter study with larger sample size is recommended.

REFERENCES

1. Ashworth P, Whelan E. Postmenopausal bleeding and endometrial cancer. InnovAiT. 2016;9(9):656–662.
2. Ülgüt C, Păiușan L, Furău G, Stănescu C. Endometrial histopathology findings in postmenopausal women. Obstet Gynecol Hosp Arad. 2015.
3. Begum S, Rikta SN, Rahman M, Areen S. Association of postmenopausal bleeding with endometrial cancer. Int J Reprod Contracept Obstet Gynecol. 2024;13(1):1–5.
4. Beeresh CS, Doopadapalli D, Gangadharan K, Pradeep S. Assessment of endometrial thickness by ultrasonography and its histological correlation in postmenopausal women. Int J Clin Obstet Gynaecol. 2020;4(1):243–247.
5. Ferdous F, Begum F, Sultana N, Akter T. Histopathological study of endometrium in postmenopausal bleeding. Bangladesh J Obstet Gynaecol. 2022;35(2):112–116.
6. Langer RD, Pierce JJ, O'Hanlan KA, Palmer JR, Hendrickson MR. Transvaginal ultrasonography compared with endometrial biopsy for the detection of endometrial disease. JAMA. 1997;277(6):457–462.
7. Shipp TD. Does ultrasound have a role in the evaluation of postmenopausal bleeding and among postmenopausal women with endometrial cancer? Menopause. 2005;12(1):8–11.
8. Yang M, Zhou L, Ma Z, Ma R. A study evaluating a liquid-based endometrial cytology test combined with TVS in the diagnosis of endometrial carcinoma and atypical hyperplasia. Medicine (Baltimore). 2023;102(17):e33625.
9. Ashmawy M, Assar A, Abdel Gawad N. Ultrasound findings versus hysteroscopic guided biopsy in the evaluation of postmenopausal bleeding. Menoufia Med J. 2024;37(1):272–278.
10. Dhamija A. Evaluation of endometrial thickness in females with postmenopausal bleeding and correlation with histopathological findings. Int J Clin Obstet Gynaecol. 2020;4(1):173–176.
11. Bilal S, Gulshan N, Ahmed S, Ahmad F. Role of transvaginal ultrasonography in diagnosing endometrial pathology in women with postmenopausal bleeding. Pak J Med Health Sci. 2021;15(3):527–531.
12. Shabir S, Afshan N. Sensitivity and specificity of transvaginal sonography in detecting endometrial pathology in patients with postmenopausal bleeding. Bangladesh J Obstet Gynaecol. 2019;34(1):14–19.
13. Patel MK, Wilkinson J, Sultana S. Endometrial thickness as measured by transvaginal ultrasound as a predictor of pathology in postmenopausal bleeding: A prospective study. Obstet Gynecol Int J. 2017;7(4):238–243.
14. Swetha C, Rao D. Evaluation of endometrial thickness by transvaginal sonography in women with postmenopausal bleeding. Int J Reprod Contracept Obstet Gynecol. 2024;13(1):123–128.
15. Krishnamoorthy P, Balakrishnan S. Association of endometrial thickness with histopathological findings in postmenopausal bleeding. Int J Reprod Contracept Obstet Gynecol. 2018;7(2):674–678.
16. Bashir MA, Nisar A, Yousuf S, Jabeen A, Qureshi R, Saba K. Diagnostic accuracy of transvaginal ultrasound in evaluation of endometrial pathology in postmenopausal bleeding taking histopathology as gold standard. Pak J Med Health Sci. 2025;19(1):290–294.
17. Elmorsy S, Al-Ebiary A, Elmedany A. Accuracy of three-dimensional ultrasound and power Doppler in predicting endometrial pathology in women with postmenopausal bleeding. Egypt J Hosp Med. 2025;89(1):1234–1241.
18. Yaşa C, Dural O, Sancı M. Is an endometrial thickness of ≥4 mm on transvaginal ultrasound an appropriate threshold for endometrial biopsy in asymptomatic postmenopausal women? Turk J Obstet Gynecol. 2016;13(2):94–99.