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Role of Transvaginal Ultrasonography in Predicting Endometrial Carcinoma in Women with Postmenopausal Bleeding

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Abstract

Background: *Postmenopausal bleeding (PMB) is a critical clinical symptom that warrants thorough evaluation to exclude endometrial carcinoma. Transvaginal ultrasonography (TVS) is widely used as a first-line diagnostic tool, but optimal cut-off thresholds for malignancy prediction remain variable across populations. This study aimed to evaluate the diagnostic performance of TVS in predicting histopathologically confirmed endometrial carcinoma in women with PMB.*

Methods: *A cross-sectional study was conducted at Dhaka Medical College Hospital from June 2022 to May 2023 among 65 postmenopausal women presenting with vaginal bleeding. All participants underwent TVS to measure endometrial thickness (ET), followed by endometrial sampling for histopathological confirmation. Diagnostic performance metrics of TVS were calculated at a threshold of ≥13.5 mm.*

Results: *Endometrial carcinoma was histologically confirmed in 6 cases (9.2%). TVS correctly identified all 6 cases (100% sensitivity) and 51 of 59 non-carcinoma cases (86.44% specificity). The positive predictive value was 42.86%, and the negative predictive value was 100%. The diagnostic accuracy was 87.69%, and the area under the ROC curve was 0.935 (95% CI: 0.875–0.995, p < 0.001).*

Conclusion: *TVS with an endometrial thickness threshold of ≥13.5 mm demonstrates excellent diagnostic performance in predicting endometrial carcinoma and can serve as an effective, non-invasive triage tool in evaluating postmenopausal bleeding.*

Keywords: *Transvaginal Ultrasonography, Endometrial Carcinoma, Postmenopausal Bleeding, Endometrial Thickness, Diagnostic Accuracy*

1. INTRODUCTION

Postmenopausal vaginal bleeding (PMB) is a critical clinical symptom that affects approximately 4% to 11% of women after menopause, often signifying underlying endometrial pathology, including carcinoma (1,2). Although most causes of PMB are benign, such as atrophic endometritis or endometrial polyps, endometrial carcinoma (EC) is detected in up to 10–19% of cases, making PMB a red flag symptom that mandates timely evaluation (3). EC remains one of the most common gynecologic malignancies globally, and in low- and middle-income countries such as Bangladesh, the burden is exacerbated by late detection, resource constraints, and lack of routine screening.

While specific cancer registry data from Bangladesh remains limited, studies from comparable South Asian settings suggest rising incidence rates of endometrial malignancies among aging female populations with increasing comorbidities like obesity and diabetes (4,5). The urgency to diagnose EC early is heightened by

the fact that delayed diagnosis due to underestimated PMB or poor triage leads to more advanced stages at presentation, associated with reduced survival and higher treatment burdens. The standard diagnostic cascade for evaluating PMB begins with clinical history-taking and pelvic examination, followed by transvaginal ultrasonography (TVS) to assess endometrial thickness (ET), and ultimately, histopathological confirmation through endometrial biopsy, pipelle sampling, dilatation and curettage (D&C), or hysteroscopy. While histopathology remains the gold standard, invasive procedures like D&C are not without drawbacks: they are resource-intensive, require anesthesia, carry procedural risks, and suffer from 2–6% sampling failure rates (6). In contrast, TVS is widely regarded as a safe, non-invasive, and accessible frontline modality, offering high-resolution imaging and reproducible measurement of endometrial thickness. Multiple studies have consistently reported that an ET ≤4 mm on TVS yields a negative predictive value (NPV) exceeding 99% for endometrial malignancy, rendering it a reliable triage tool for excluding carcinoma and reducing unnecessary biopsies (7,8). However, establishing optimal ET thresholds for predicting the *presence* rather than the *absence* of endometrial carcinoma remains contentious.

While cut-offs ≤4 mm are widely accepted for safely excluding malignancy, thresholds for positively identifying EC vary across studies, typically ranging from 10 mm to 15 mm. Temur et al. identified ≥13.5 mm as the optimal diagnostic threshold for EC, reporting 75% sensitivity and 83.6% specificity (9). Nguyen & Nguyen also validated a threshold of >12.5 mm, achieving 93.8% sensitivity and 77.8% specificity in a large cohort (10). Conversely, lower cut-offs, though more sensitive, reduce specificity and may lead to unnecessary invasive procedures. Patel et al. demonstrated that using a 3–4 mm cut-off achieved 96.9% sensitivity but compromised specificity and positive predictive value, resulting in over-diagnosis and excess procedural costs (11). This trade-off between early detection and over-intervention necessitates localized validation of diagnostic thresholds, particularly in resource-limited settings like Bangladesh where healthcare infrastructure and cost-efficiency are critical considerations.

2. METHODS

This was a hospital-based cross-sectional study conducted in the Department of Obstetrics and Gynaecology at Dhaka Medical College Hospital, Bangladesh, over a one-year period from June 2022 to May 2023. The study population comprised menopausal women who presented with postmenopausal vaginal bleeding at the outpatient department during the study period. A total of 65 patients were enrolled using purposive sampling. Inclusion criteria included women who had attained menopause and presented with vaginal bleeding and who consented to participate in the study. Patients were excluded if they were already diagnosed with endometrial carcinoma or with other known causes of genital tract bleeding such as vulvar, vaginal or cervical cancer, cervical polyp, or myomatous polyp, or were on menopausal hormone therapy (MHT). After obtaining written informed consent, demographic and clinical data were recorded using a predesigned structured questionnaire. Each patient underwent a transvaginal ultrasonographic (TVS) examination performed by a qualified sonologist using a high-frequency vaginal probe. Endometrial thickness (ET) was measured at the thickest part of the endometrium in the sagittal view, including both endometrial layers, with the measurement expressed in millimeters.

Following TVS, each participant underwent fractional curettage under anesthesia or deep sedation. The endometrial and endocervical samples were collected separately and submitted for histopathological evaluation at the Department of Pathology, Dhaka Medical College. Data were analyzed using SPSS version 26.0. Descriptive statistics were used to summarize demographic variables. The patients were categorized based on histopathological outcomes into carcinoma and non-carcinoma groups. A receiver operating characteristic (ROC) curve analysis was performed to determine the optimal ET threshold for predicting endometrial carcinoma. Diagnostic performance measures—including sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and overall accuracy—were calculated using 2×2 contingency tables. A cut-off value of ≥13.5 mm was identified as the optimal threshold, with associated diagnostic metrics calculated against histopathology as the reference standard. All statistical tests were two-tailed, and a p-value <0.05 was considered statistically significant. Ethical approval for the study was obtained from the Ethical Review Committee of Dhaka Medical College, and all ethical principles including patient autonomy, confidentiality, and right to withdraw were strictly maintained.

3. RESULTS

Table 1. *Baseline and Demographic Characteristics of the Study Participants (n=65)*

Category	Frequency (N)	Percentage (%)
Age Group (years)		
45–60	51	78.5%
>60	14	21.5%
Mean Age (years)	55.5 ± 7.6	
Parity		
Nullipara	5	7.6%
Para 1–3	51	78.5%
Para 4–6	9	13.8%

A total of 65 postmenopausal women were included in the study. The majority (78.5%) were between 45 and 60 years of age, while 21.5% were older than 60 years. The mean age of the participants was 55.5 ± 7.6 years. In terms of parity, most women (78.5%) had 1 to 3 children, 13.8% had 4 to 6 children, and 7.6% were nulliparous.

Table 2. *Distribution of Endometrial Thickness on Transvaginal Ultrasonography (TVS) (n=65)*

Endometrial Thickness	Frequency (N)	Percentage (%)
>13.5 mm	14	21.5%
≤13.5 mm	51	78.5%

Transvaginal ultrasonography (TVS) revealed that 21.5% of the participants had an endometrial thickness greater than 13.5 mm, while the remaining 78.5% had an endometrial thickness of 13.5 mm or less.

Table 3. *Histopathological Diagnosis of Endometrial Carcinoma (n=65)*

Histopathological Diagnosis	Frequency (N)	Percentage (%)
Endometrial Carcinoma	6	9.2%
No Carcinoma	59	90.8%

Histopathological examination confirmed endometrial carcinoma in 6 patients (9.2%), whereas 59 patients (90.8%) showed no evidence of carcinoma.

Table 4. *Diagnostic Accuracy Table of TVS in Predicting Endometrial Carcinoma (n=65)*

Diagnostic Category	Frequency (N)
True Positive (TP)	6
False Positive (FP)	8
False Negative (FN)	0
True Negative (TN)	51

Based on the cut-off value of endometrial thickness ≥13.5 mm, transvaginal ultrasonography accurately identified all 6 true positive cases of endometrial carcinoma, with no false negatives. There were 8 false positive cases, while 51 cases were correctly identified as true negatives.

Table 5. *Diagnostic Performance of TVS in Predicting Endometrial Carcinoma*

Metric	Value
Cut-off Value	≥13.5 mm
Sensitivity	100%
Specificity	86.44%
Positive Predictive Value	42.86%
Negative Predictive Value	100%
Accuracy	87.69%
Area Under Curve (AUC)	0.935
95% Confidence Interval	0.875–0.995
P-value	<0.001

Using a cut-off value of ≥13.5 mm for endometrial thickness, TVS demonstrated 100% sensitivity and 86.44% specificity for predicting endometrial carcinoma. The positive predictive value was 42.86%, while the negative predictive value reached 100%. Overall diagnostic accuracy was 87.69%, and the AUC was 0.935 (95% CI: 0.875–0.995), with statistical significance ($p < 0.001$).

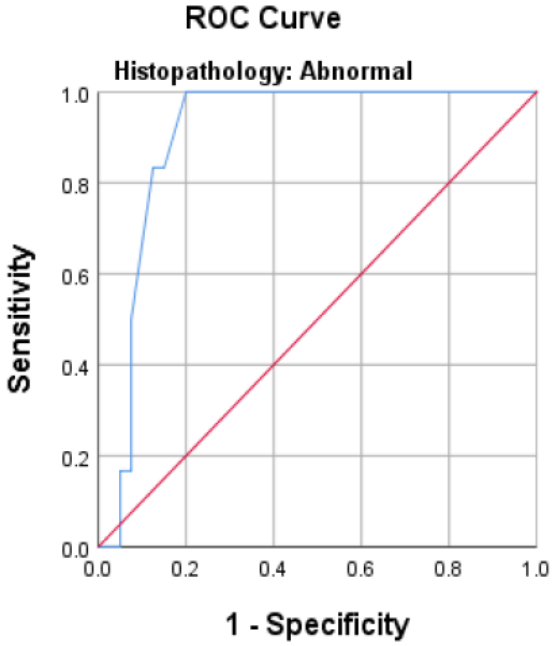

Figure 1. *ROC curve analysis of endometrial thickness on TVS in the prediction of endometrial carcinoma among the patients (n=65)*

The ROC curve illustrates the diagnostic performance of endometrial thickness measured by transvaginal ultrasonography (TVS) in predicting endometrial carcinoma among postmenopausal women. The curve shows excellent discrimination, with an area under the curve (AUC) of 0.935, indicating high overall accuracy.

4. Discussion

The present study demonstrated that transvaginal ultrasonography (TVS) using an endometrial thickness (ET) threshold of ≥13.5 mm achieved excellent diagnostic performance for detecting endometrial carcinoma in postmenopausal bleeding (PMB), with 100% sensitivity, 86.4% specificity, 42.9% positive predictive value (PPV), 100% negative predictive value (NPV), 87.7% accuracy, and an AUC of 0.935 ($p < .001$). These findings align closely with Bashir et al., who reported 94.1% sensitivity, 88.9% specificity, 91.7% PPV, 92.3% NPV, and 92.0% accuracy for TVS at their optimal threshold, underscoring the robustness of high-sensitivity cut-offs in carcinoma detection (12). Nawab et al. similarly found 93.1% sensitivity and 86.5% specificity with an overall accuracy of 93.6%, further validating the reliability of TVS as a frontline, non-invasive screening tool in diverse populations (13). Our cohort had a mean age of 55.5 ± 7.6 years, with 78.5% aged 45–60 years, mirroring Talwar et al.'s mean age of 54.97 ± 5.86 years and the typical postmenopausal age distribution reported globally (2). The parity profile—78.5% with 1–3 children and only 7.6% nulliparous—also corresponds with Agrawal's finding that parity of 2–3 is most common in PMB patients and Kavitha's observation of similar reproductive histories, suggesting consistent demographic risk patterns across settings (14,15). In our study, 21.5% of women exhibited ET >13.5 mm. Roy et al. reported that 25.3% of PMB patients exceeded a 12 mm threshold, indicating comparable proportions of high-risk sonographic findings (16). Agrawal (2017) observed a mean ET of 17.7 ± 10 mm in carcinoma cases, supporting the clinical relevance of higher ET thresholds for malignancy prediction (14). Histopathology confirmed carcinoma in 9.2% of cases, falling within the 5–15% range reported by Solomi (2017) and the 23% observed by Jadoon et al (17). The slightly lower prevalence in our cohort may reflect demographic or referral differences but remains consistent with regional data demonstrating that EC accounts for a substantive minority of PMB etiologies (17,18). The PPV of 42.9% in our study was lower than the 91.7% and 82% reported by Bashir et al. and Tinelli et al., respectively, likely due to differences in pretest

probability and threshold selection (12,19). Conversely, our NPV of 100% confirms TVS's exceptional ability to rule out malignancy, consistent with other reports of NPVs >90% across various cut-offs (12). Our diagnostic accuracy (87.7%) and AUC (0.935) exceed the 87% accuracy and AUC of 0.853 seen when combining TVS with cytology, highlighting that a well-validated single-modality cut-off can rival multimodal approaches in symptomatic women (20). Kasraeian et al. also reported an AUC of 0.853 in asymptomatic cohorts, underscoring the enhanced performance of TVS in high-risk, symptomatic populations (21). The statistical significance of our cut-off ($p < .001$) underscores its robustness; similar significance has been demonstrated in studies employing adaptive cut-offs based on menopausal duration, which improved specificity without sacrificing sensitivity (22). In summary, our findings reinforce that TVS with a ≥13.5 mm ET threshold is a highly sensitive, specific, and reliable non-invasive screening tool for endometrial carcinoma in PMB. The perfect NPV supports its use to safely exclude malignancy in low-risk patients, potentially reducing unnecessary invasive procedures and optimizing resource utilization in tertiary care settings. Future multicenter studies should further refine threshold selection by incorporating patient-specific factors such as years since menopause and comorbidity profiles.

5. Limitations of the Study

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

6. Conclusion

This study confirms that transvaginal ultrasonography (TVS) is a highly effective non-invasive diagnostic tool for predicting endometrial carcinoma in women presenting with postmenopausal bleeding. Using an endometrial thickness cut-off value of ≥13.5 mm, TVS demonstrated 100% sensitivity, 86.44% specificity, and 100% negative predictive value, with an area under the ROC curve of 0.935, indicating excellent diagnostic performance. The statistically significant findings ($p < 0.001$) reinforce the clinical reliability of this threshold in identifying high-risk patients. The absence of false negatives in this study further supports the use of TVS as a first-line triage modality to safely rule out carcinoma and reduce unnecessary invasive procedures. These findings highlight the potential role of TVS in optimizing patient care, reducing resource burden, and facilitating timely diagnosis in resource-limited healthcare settings such as Bangladesh.

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Conflict of Interest

None declared

Ethical Approval

The study was approved by the Institutional Ethics Committee

References

[1] Fatima SS, Naib JM, Sharafat Z, Mazhar T. Postmenopausal Bleeding-An Alarming Symptom of Endometrial Carcinoma. Journal of Medical Sciences. 2014 Dec 11; 22(4):166–70.

[2] Talwar S, Kaur H, Tapasvi I, Nibhoria S, Tapasvi C. Clinical and Histopathological Characteristics in Women With Postmenopausal Bleeding: A Study of 120 Women in a Tertiary Care Hospital in Punjab. Cureus. 2024; 16(1):e51690.

[3] Kumari K, Paswan MK, Kundan M, Ambedkar SN. A prospective study of endometrial histopathology in post-menopausal women in Jharkhand. Journal of Family Medicine and Primary Care. 2024 May; 13(5):1696.

[4] Rathi S, Sangeeta K, Manisha K. Histopathological evaluation in women with postmenopausal bleeding and associated risk factors for endometrial carcinoma. Journal of Evolution of Medical and Dental Sciences. 2013; 2(24):4397–403.

[5] Shrestha N, Shad MY, Ulvi O, Khan MH, Karamehic-Muratovic A, Nguyen USDT, et al. The impact of COVID-19 on globalization. One Health. 2020 Dec 20; 11:100180.

[6] Bakos O, Smith P, Heimer G. Transvaginal ultrasonography for identifying endometrial pathology in postmenopausal women. Maturitas. 1994 Dec; 20(2–3):181–9.

[7] Karlsson B, Granberg S, Wikland M, Ylöstalo P, Torvid K, Marsal K, et al. Transvaginal ultrasonography of the endometrium in women with postmenopausal bleeding — a Nordic multicenter study. American Journal of Obstetrics and Gynecology. 1995 May 1; 172(5):1488–94.

[8] ACOG Committee. ACOG Committee Opinion No. 734: The Role of Transvaginal Ultrasonography in Evaluating the Endometrium of Women with Postmenopausal Bleeding. Obstetrics & Gynecology. 2018 May; 131(5):e124.

[9] Temur M, Taşgöz FN, Çakmak BD, Çift T, Üstünel S, Korkmazer E, et al. Relationship between endometrial thickness and neutrophil/lymphocyte ratio with endometrial malignancy in 386 postmenopausal uterine bleeding cases. Journal of Obstetrics and Gynecological Investigations. 2018; 1(1):29–34.

[10] Nguyen PN, Nguyen VT. Endometrial thickness and uterine artery Doppler parameters as soft markers for prediction of endometrial cancer in postmenopausal bleeding women: a cross-sectional study at tertiary referral hospitals from Vietnam. Obstet Gynecol Sci. 2022 Sep; 65(5):430–40.

[11] Patel V, Wilkinson EJ, Chamala S, Lu X, Castagno J, Rush D. Endometrial Thickness as Measured by Transvaginal Ultrasound and the Corresponding Histopathologic Diagnosis in Women With Postmenopausal Bleeding. Int J Gynecol Pathol. 2017 Jul; 36(4):348–55.

[12] Bashir N, Nisar U, Jamil M, Bilqees, Wahid S. DIAGNOSTIC ACCURACY OF TRANSVAGINAL ULTRASOUND IN DETECTION OF ENDOMETRIAL CARCINOMA IN POST-MENOPAUSAL BLEEDING KEEPING HISTOPATHOLOGY AS GOLD STANDARD. Insights-Journal of Health and Rehabilitation. 2025 Jan 20; 3(1 (Health&Rehab)):138–48.

Nawab K, Afridi F, Khattak MA, Gul H, Khan N, Shoaib I. A Cross-Sectional Study Examined the use of Transvaginal Ultrasound in Assessing Endometrial Cancer in Postmenopausal Women. Pakistan Journal of Medical & Health Sciences. 2023 Jun 9; 17(03):758–758.

[13] Agarwal N, Roy MP, Singh MK. Clinical and Biochemical Findings in Confirmed Pediatric Dengue Cases in Delhi. Journal of Pediatric Infectious Diseases. 2017 May 30; 13:015–9.

[14] Kavitha T. Study on endometrial histopathology of women with postmenopausal bleeding and its clinical correlation [PhD Thesis]. Madras Medical College, Chennai; 2015.

[15] Roy PK, Singh P, Singh VK, Mahadik K, Jain R. Endometrial thickness as a test for endometrial cancer in women with abnormal postmenopausal and perimenopausal vaginal bleeding & its histopathological correlation. 2013 [cited 2025 May 9]; Available from: https://pesquisa.bvsalud.org/portal/resource/pt/sea-152332

[16] Jadoon S, Shah MK, Qadir M, Bibi N. Postmenopausal bleeding-a strong indicator of endometrial carcinoma. Pakistan Armed Forces Medical Journal. 2019; (2):368.

[17] Carolin Solomi V. A Prospective Observational Study to Determine the Aetiology of Postmenopausal Bleeding and Correlation of Endometrial Thickness in Endometrial Carcinoma in Our Population [PhD Thesis]. Christian Medical College, Vellore; 2017.

[18] Tinelli R, Tinelli FG, Cicinelli E, Malvasi A, Tinelli A. The role of hysteroscopy with eye-directed biopsy in postmenopausal women with uterine bleeding and endometrial atrophy. Menopause. 2008; 15(4 Pt 1):737–42.

[19] Yang X, Ma K, Chen R, Meng YT, Wen J, Zhang Q qiong, et al. A study evaluating liquid-based endometrial cytology test and transvaginal ultrasonography as a screening tool for endometrial cancer in 570 postmenopausal women. Journal of Gynecology Obstetrics and Human Reproduction. 2023 Oct 1; 52(8):102643.

[20] Kasraeian M, Asadi, N., Ghaffarpasand, F., and Karimi AA. Value of transvaginal ultrasonography in endometrial evaluation of non-bleeding postmenopausal women. Climacteric. 2011 Feb 1; 14(1):126–31.

[21] Afzal S, Manzoor R, Tazion S, Hafeez M, Badar N. Transvaginal ultrasound for diagnosing endometrial hyperplasia in perimenopausal women with abnormal uterine bleeding. Pakistan Journal of Medical and Health Sciences. 2018; 12(1):400–3.

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