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THE ROLE OF TRANSABDOMINAL AND TRANSVAGINAL ULTRASOUND IN DETECTING ENDOMETRIAL HYPERPLASIA IN PERIMENOPAUSAL AND POSTMENOPAUSAL WOMEN

Original Research

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ABSTRACT

Background: Endometrial hyperplasia (EH) is a frequently encountered gynecological disorder marked by abnormal proliferation of the endometrial lining, often due to prolonged estrogen stimulation without progesterone opposition. It is a precursor to endometrial carcinoma, particularly in high-risk groups such as perimenopausal and postmenopausal women. Abnormal uterine bleeding is the most common clinical presentation. While transvaginal sonography (TVS) and transabdominal sonography (TAS) are routinely used for endometrial evaluation, their diagnostic reliability remains debated.

Objective: To assess the effectiveness of TVS and TAS in identifying endometrial hyperplasia in perimenopausal and postmenopausal women presenting with abnormal uterine bleeding.

Methods: A descriptive cross-sectional study was conducted at DHQ Hospital Kasur over three months following ethical approval. A total of 122 women aged ≥40 years, either perimenopausal or postmenopausal, presenting with abnormal uterine bleeding were included using non-probability convenient sampling. Exclusion criteria were recent pregnancy, confirmed malignancy, chemo/radiotherapy, and uterine fibroids. All participants underwent ultrasound using Toshiba Nemio XG equipment—TAS with a 2–5 MHz probe and TVS with a 5–9 MHz probe. Endometrial thickness, echotexture, and clinical symptoms were recorded. Data were analyzed using SPSS v25.0 to calculate sensitivity, specificity, and predictive values.

Results: Out of 122 participants, 71 (58.2%) were below 50 years and 88 (72.1%) were postmenopausal. Clinical symptoms included pelvic pain (74.6%), heavy bleeding (64.8%), and spotting (35.2%). TAS was performed in 113 cases (92.6%) and TVS in 19 cases (15.6%). Abnormal endometrial thickness was observed in 75 women (61.5%). TVS showed a sensitivity of 100% and specificity of 32.9%, while TAS demonstrated 40% sensitivity and 96.3% specificity. Positive and negative predictive values of TAS were 84.2% and 76.7%, respectively. No statistically significant association was found between clinical symptoms or menopausal status and ultrasound findings ($p > 0.05$).

Conclusion: Although both TVS and TAS detect endometrial abnormalities, neither modality alone effectively predicts clinical symptom patterns or endometrial thickness. TVS is more suitable for detecting abnormalities, while TAS provides better specificity. A combined diagnostic strategy is advised to ensure accurate assessment and management.

Keywords: Endometrial hyperplasia, Menopause, Pelvic pain, Transabdominal ultrasound, Transvaginal ultrasound, Uterine bleeding, Vaginal discharge.

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INTRODUCTION

Endometrial hyperplasia (EH) is a common pathological condition of the endometrium characterized by an abnormal proliferation of endometrial glands relative to stroma, often due to prolonged exposure to unopposed estrogen. This hormonal imbalance, whether from endogenous sources such as obesity, anovulation, and estrogen-secreting ovarian tumors, or exogenous sources like hormone replacement therapy and tamoxifen, disrupts the normal cyclical regeneration of the endometrium and predisposes women to abnormal uterine bleeding (AUB) and a heightened risk of progression to endometrial carcinoma—particularly in cases of atypical hyperplasia (1,2). Though the link between unopposed estrogen and endometrial changes is well-established, the rising global prevalence of obesity, metabolic syndrome, and polycystic ovary syndrome (PCOS) has amplified the burden of EH, especially in lower- and middle-income countries like Pakistan, where lifestyle shifts have significantly altered reproductive health dynamics (2,3). Despite being a recognized precursor of endometrial cancer—the most frequently diagnosed gynecologic malignancy in developed nations with an incidence of 23.2 per 100,000 women—the true prevalence of EH remains underreported, largely due to limited access to timely and accurate diagnostic assessments (3). Clinical presentations, typically including menorrhagia, menometrorrhagia, or postmenopausal bleeding, prompt gynecological evaluations, but many women remain undiagnosed until the disease has advanced, particularly in settings where screening and diagnostic facilities are inadequate (4). While EH is more prevalent during perimenopause or postmenopause due to hormonal imbalances and chronic anovulation, younger premenopausal women with risk factors such as obesity, PCOS, and tamoxifen therapy are also increasingly being diagnosed (4,5).

Hormonal fluctuations during menopause, the peripheral conversion of androgens to estrogens in adipose tissue, and tamoxifen's agonistic effect on the endometrium all contribute to the pathophysiological changes associated with EH (6). Additionally, chronic metabolic disorders such as diabetes mellitus and insulin resistance, which share a pathophysiological link with inflammatory and hormonal pathways, further increase the susceptibility of the endometrium to hyperplastic changes (7,8). The rising incidence of these contributing factors has led to an increased demand for reliable and non-invasive diagnostic modalities. Transabdominal ultrasound (TAS) and transvaginal sonography (TVS) are among the most widely used imaging techniques for evaluating the female pelvis in cases of AUB and suspected EH. TAS provides an overall view of pelvic structures and is particularly useful when large masses or uterine enlargement limits the efficacy of other imaging tools (9). However, TVS has emerged as the gold standard due to its superior resolution, ability to assess endometrial thickness and echogenicity, and potential to evaluate blood flow patterns using Color Doppler imaging (10). Its role is especially prominent in the evaluation of postmenopausal bleeding, where it offers real-time, non-invasive assessment without radiation exposure (11,12). Although histopathological examination of endometrial biopsy remains the definitive diagnostic tool, TVS's accessibility, affordability, and clinical utility make it an essential first-line investigation (13). Given the increasing burden of endometrial hyperplasia and its implications for endometrial carcinoma, timely detection through imaging is paramount. However, despite the availability of various diagnostic tools, there is a lack of standardization in diagnostic thresholds and interpretation criteria, leading to variability in clinical outcomes. Therefore, this study aims to evaluate the diagnostic accuracy of TAS and TVS in the identification of endometrial hyperplasia, establish more standardized diagnostic parameters, and explore the complementary value of both imaging modalities in improving early detection and clinical management.

METHODS

A cross-sectional study was carried out over a period of three months at the District Headquarters (DHQ) Hospital, Kasur, following ethical approval from the institutional review board (IRB). The study aimed to evaluate the diagnostic accuracy of transabdominal (TAS) and transvaginal sonography (TVS) in detecting endometrial hyperplasia among women presenting with abnormal uterine bleeding (AUB). The sample size was calculated based on a presumed 15% prevalence of endometrial hyperplasia, a 95% confidence level, and a 10% margin of error, yielding a required sample of 122 participants. A non-probability convenient sampling technique was employed for patient recruitment, which may limit the generalizability of the results. Participants included women aged 40 years or older who were either peri- or postmenopausal and had documented AUB. Only those with an endometrial thickness of ≥4 mm on initial TVS screening were enrolled. Informed consent was obtained from all participants prior to inclusion. Women were excluded if they had a recent history of pregnancy within the last six months, any clinical suspicion or histological confirmation of endometrial or other

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gynecologic malignancies, ongoing chemotherapy or radiotherapy, or the presence of uterine fibroids, as these conditions could confound the assessment of endometrial morphology and thickness (6,14).

Ultrasound evaluations were conducted using a Toshiba Nemio XG system. TAS was performed using a 2–5 MHz convex transducer to visualize the general pelvic anatomy, while TVS was performed using a 5–9 MHz endocavitary probe to obtain high-resolution images of the endometrial lining. Both imaging techniques were carried out by qualified sonologists under standardized conditions to minimize inter-operator variability. Data collection included demographic variables, clinical history, sonographic measurements, and findings. Statistical analysis was performed using IBM SPSS version 25.0 and Microsoft Excel 2016. Descriptive statistics were used to summarize the baseline characteristics of the participants. Diagnostic parameters such as sensitivity, specificity, positive predictive value, and negative predictive value were calculated to assess the performance of TAS and TVS in identifying endometrial hyperplasia. Continuous variables were reported as means and standard deviations, while categorical variables were expressed as frequencies and percentages.

RESULTS

A total of 122 women were enrolled in the study. The majority, 71 participants (58.2%), were under 50 years of age, while 51 (41.8%) were above 50. Most women (n=88, 72.1%) were postmenopausal at the time of enrollment. Heavy menstrual bleeding was the most reported symptom, present in 79 women (64.8%), followed by pelvic pain in 91 (74.6%), irregular menstrual cycles in 62 (50.8%), and vaginal discharge in 43 participants (35.2%). Spotting was reported in 43 women (35.2%). Regarding imaging modality usage, transabdominal sonography (TAS) was performed in 113 cases (92.6%), whereas transvaginal sonography (TVS) was conducted in 19 cases (15.6%). Abnormal endometrial thickness (≥4 mm) was observed in 75 patients (61.5%). However, statistical analysis revealed no significant association between clinical symptoms such as pelvic pain or vaginal discharge and abnormal TAS findings, including homogenous thickened lining, diffuse thickening, or irregular echotexture ($p>0.05$ for all tests). Similarly, no significant correlation was found between endometrial thickness and ultrasound abnormalities on either TAS or TVS. When comparing diagnostic performance, TVS demonstrated a sensitivity of 100% but had low specificity (32.9%). In contrast, TAS showed a higher specificity (96.3%) but considerably lower sensitivity (40%). The positive predictive value (PPV) and negative predictive value (NPV) of TAS were 84.2% and 76.7%, respectively, both higher than those of TVS. This highlights the complementary roles of TAS and TVS in endometrial evaluation: TAS offers stronger specificity for ruling out disease, while TVS is more sensitive in detecting abnormalities. Chi-square analyses confirmed the lack of statistically significant associations between pelvic pain and ultrasound findings across both imaging modalities. The same was observed for vaginal discharge. No statistically significant association was observed between endometrial thickness and specific echotexture patterns ($p>0.05$), nor between clinical symptoms and homogenous thickening or irregular echotexture on TVS.

Table 1: Demographic and Clinical Characteristics of Study Participants (N=122)

Variable	Category	Frequency	Percent (%)
Age Group	Below 50	71	58.2
	Above 50	51	41.8
Menopausal Status	Menopausal	88	72.1
	Non-menopausal	34	27.9
Heavy Bleeding	Present	79	64.8
	Absent	43	35.2
Spotting	Present	43	35.2
	Absent	79	64.8
Pelvic Pain	Present	91	74.6
	Absent	31	25.4
Vaginal Discharge	Present	43	35.2
	Absent	79	64.8
Menstrual Cycle Pattern	Irregular Cycle	62	50.8
	Regular Cycle	60	49.2
TAS Performed	Yes	113	92.6

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Variable	Category	Frequency	Percent (%)
	No	8	6.6
	Missing	1	0.8
TVS Performed	Yes	19	15.6
	No	102	83.6

Table 2: Association Between Pelvic Pain and Sonographic Findings on TAS (Homogenous Thickened Lining and Irregular Echotexture) (N=122)

TAS Finding	Pelvic Pain	Absent	Present	Total
Homogenous Thickened Lining	Absent	31	86	117
	Present	0	5	5
	Total	31	91	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 1.776, df = 1, p = 0.183			
Fisher's Exact Test	2-tailed p = 0.328, 1-tailed p = 0.224			
Likelihood Ratio	3.004			
Irregular Echotexture	Absent	29	85	114
	Present	2	6	8
	Total	31	91	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.001, df = 1, p = 0.978			
Fisher's Exact Test	2-tailed p = 1.000, 1-tailed p = 0.671			
Likelihood Ratio	0.001			

Table 3: Association of Vaginal Discharge and Endometrial Thickness with TAS Sonographic Patterns (N=122)

TAS Finding	Variable	Absent	Present	Total
Homogenous Thickened Lining	Vaginal Discharge Absent	74	5	79
	Vaginal Discharge Present	43	0	43
	Total	117	5	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 2.838, df = 1, p = 0.092			
Fisher's Exact Test	2-tailed p = 0.160, 1-tailed p = 0.109			
Likelihood Ratio	4.461			
Irregular Echotexture	Vaginal Discharge Absent	73	6	79
	Vaginal Discharge Present	41	2	43
	Total	114	8	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.394, df = 1, p = 0.530			
Fisher's Exact Test	2-tailed p = 0.711, 1-tailed p = 0.417			
Likelihood Ratio	0.415			
Diffuse Thickening	Endometrial Thickness Normal	45	0	45
	Endometrial Thickness Abnormal	73	4	77
	Total	118	4	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 2.417, df = 1, p = 0.120			
Fisher's Exact Test	2-tailed p = 0.295, 1-tailed p = 0.154			
Likelihood Ratio	3.761			

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Table 4: Association Between Pelvic Pain and Sonographic Findings on TVS (Homogenous Thickened Lining and Irregular Echotexture) (N=122)

TVS Finding	Pelvic Pain	Absent	Present	Total
Homogenous Thickened Lining	Absent	19	57	76
	Present	11	34	45
	Total	30	91	121
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.005, df = 1, p = 0.945			
Fisher's Exact Test	2-tailed p = 1.000, 1-tailed p = 0.563			
Likelihood Ratio	0.005			
Irregular Echotexture	Absent	24	65	89
	Present	7	26	33
	Total	31	91	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.421, df = 1, p = 0.517			
Fisher's Exact Test	2-tailed p = 0.642, 1-tailed p = 0.345			
Likelihood Ratio	0.431			

Table 5: Association of Vaginal Discharge and Endometrial Thickness with TVS Sonographic Findings (Homogenous Thickened Lining and Irregular Echotexture) (N=122)

TVS Finding	Variable	Absent	Present	Total
Homogenous Thickened Lining	Vaginal Discharge Absent	51	28	79
	Vaginal Discharge Present	25	17	42
	Total	76	45	121
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.297, df = 1, p = 0.586			
Fisher's Exact Test	2-tailed p = 0.693, 1-tailed p = 0.362			
Likelihood Ratio	0.296			
Irregular Echotexture	Vaginal Discharge Absent	58	21	79
	Vaginal Discharge Present	31	12	43
	Total	89	33	122
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.025, df = 1, p = 0.875			
Fisher's Exact Test	2-tailed p = 1.000, 1-tailed p = 0.518			
Likelihood Ratio	0.025			
Homogenous Thickened Lining	Endometrial Thickness Normal	29	16	45
	Endometrial Thickness Abnormal	47	29	76
	Total	76	45	121
Chi-Square Test Results				
Pearson's Chi-Square	Value = 0.082, df = 1, p = 0.775			
Fisher's Exact Test	2-tailed p = 0.847, 1-tailed p = 0.465			
Likelihood Ratio	0.082			

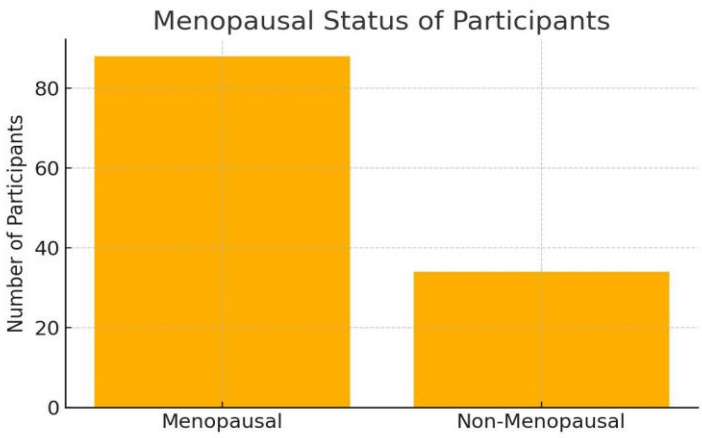

Figure 1 Menopausal Status of Participants

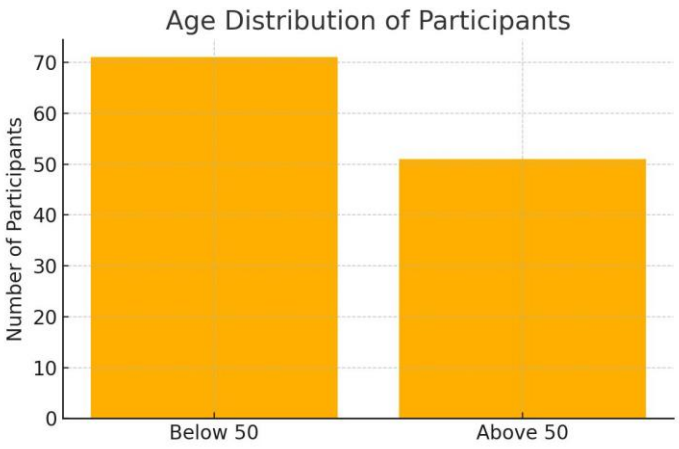

Figure 2 Age Distribution of Participants

DISCUSSION

The present study highlighted a significant prevalence of abnormal uterine bleeding (AUB) and related symptoms among women aged 40 years and above, with heavy bleeding, pelvic pain, and irregular menstrual cycles being predominant clinical features. More than 70% of participants were postmenopausal, and a notable proportion exhibited abnormal endometrial thickness on sonographic evaluation. These findings reaffirm the critical role of sonographic assessment in perimenopausal and postmenopausal women presenting with AUB, especially in settings where histopathological screening may not be immediately accessible. The detection of endometrial thickening in 61.5% of women underscores the relevance of screening protocols in symptomatic individuals (15,16). Comparative analysis with previously published literature supports the reliability of transvaginal sonography (TVS) in detecting endometrial abnormalities. One study involving both premenopausal and postmenopausal women reported that TVS detected endometrial hyperplasia in 70.8% of cases, with high accuracy confirmed via histopathology. Sensitivity and specificity values in postmenopausal women approached 100%, reinforcing TVS as a highly sensitive diagnostic tool in this subgroup (17-19). Similarly, another study evaluating 200 patients found that 59% screened positive for hyperplasia via TVS, with histopathological correlation revealing a positive predictive value exceeding 75% (20). These findings align with the present study's observation that TVS exhibited superior sensitivity compared to transabdominal sonography (TAS), although at the expense of lower specificity.

The complexity of gynecological symptoms such as heavy bleeding, spotting, and pelvic pain in women with suspected endometrial pathology limits the diagnostic capability of ultrasound alone. The lack of statistically significant associations between individual symptoms and specific sonographic findings in the current study supports the notion that symptoms are not always reliable indicators of endometrial pathology. This reinforces the need for a multimodal approach incorporating clinical risk stratification, imaging, and histopathological confirmation (21,22). A key strength of this study lies in its attempt to analyze and compare the diagnostic performance of TAS and TVS in a clinical context. TAS demonstrated high specificity and acceptable predictive values, making it valuable where TVS is contraindicated or inaccessible. However, the lower sensitivity of TAS suggests that it may miss a significant number of cases with pathology, thereby supporting the preferential use of TVS where feasible. The study also benefited from a clearly defined inclusion criterion based on endometrial thickness, aiding in the identification of at-risk individuals.

Nonetheless, the study had several limitations. The use of a non-probability sampling technique limits the generalizability of findings. Additionally, the absence of histopathological confirmation for all sonographic diagnoses prevents definitive assessment of diagnostic accuracy, particularly the calculation of true sensitivity, specificity, and predictive values. Another limitation includes the underutilization of TVS, possibly due to patient reluctance or logistical constraints, which may have skewed comparative diagnostic outcomes. Furthermore, the study did not stratify findings based on additional risk factors such as parity, diabetes, or history of hormone use, which could have enhanced the depth of clinical interpretation. Future research should incorporate histopathological correlation to establish true diagnostic accuracy and consider larger, multicenter cohorts to enhance external validity. Stratification based on clinical

risk profiles and menopausal status may also offer more refined diagnostic algorithms (23). Additionally, evaluating patient-centered outcomes such as acceptability and comfort with different imaging modalities could inform more practical diagnostic pathways, especially in resource-limited settings. Overall, while sonography remains an essential tool in the evaluation of AUB, its interpretation must be contextualized within a broader diagnostic framework to ensure accurate detection and timely intervention for conditions like endometrial hyperplasia.

CONCLUSION

This study concludes that while transabdominal and transvaginal sonography remain essential tools in the initial evaluation of abnormal uterine bleeding, neither modality alone offers sufficient predictive accuracy for diagnosing endometrial pathology. The lack of significant correlation between clinical symptoms, menopausal status, and sonographic findings highlights the complexity of endometrial assessment and reinforces the need for a more integrated diagnostic strategy. These findings support the importance of combining imaging with clinical evaluation and, where appropriate, histopathological confirmation to guide effective management. Continued research is essential to enhance diagnostic precision and ensure timely intervention in women presenting with gynecological symptoms.

AUTHOR CONTRIBUTION

Author	Contribution
Eman Iftikhar*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Yousra Liaqat	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Anmol Riaz	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Bisma Zahid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Amna Zahid	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Haroon Raza	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Amna Batool	Contributed to study concept and Data collection Has given Final Approval of the version to be published

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