

Role of saline infusion sonohysterography in abnormal uterine bleeding: a hospital-based observational study.

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Abstract

Introduction

Abnormal uterine bleeding is a common gynaecological complaint, particularly among perimenopausal and postmenopausal women. Focal intracavitary lesions such as endometrial polyps and submucosal fibroids may be difficult to characterize on transvaginal sonography. Saline infusion sonohysterography improves delineation of the endometrial cavity and may enhance diagnostic assessment.

Materials and Methods

A hospital-based observational study was conducted among 50 perimenopausal and postmenopausal women presenting with abnormal uterine bleeding. Participants underwent clinical evaluation, transvaginal sonography and saline infusion sonohysterography. Women with suspected intracavitary lesions or increased endometrial thickness underwent appropriate definitive procedures, including dilatation and curettage, hysteroscopy-guided biopsy or polypectomy, or hysterectomy. Histopathological examination was used as the reference standard.

Results

Among 50 women, 33 (66.0%) were perimenopausal and 17 (34.0%) were postmenopausal, with a mean age of 49.9 ± 9.08 years. Menorrhagia was the most common symptom (48.0%). Transvaginal sonography showed polypoidal thickening in 26 (52.0%), while saline infusion sonohysterography identified endometrial polyps in 31 (62.0%) and submucous fibroids in 8 (16.0%). Histopathology demonstrated endometrial polyps in 31 (62.0%), endometrial hyperplasia in 10 (20.0%), fibroid uterus in 5 (10.0%), and normal endometrium in 4 (8.0%). The association between saline infusion sonohysterography and histopathological diagnosis was significant ($p < 0.001$). Sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy were 83.0%, 100.0%, 100.0%, 27.27% and 84.0%, respectively.

Conclusion

Saline infusion sonohysterography demonstrated good diagnostic performance for intracavitary lesions in women with abnormal uterine bleeding and is a useful complementary investigation following transvaginal sonography.

Recommendations

Saline infusion sonohysterography should be considered when transvaginal sonography demonstrates endometrial thickening or suspected intracavitary pathology.

Keywords: Abnormal uterine bleeding; saline infusion sonohysterography; transvaginal sonography; endometrial polyp; submucous fibroid.

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Introduction

Abnormal uterine bleeding (AUB) is one of the most common presenting complaints among women attending gynaecological clinics and is particularly prevalent during the perimenopausal and postmenopausal periods [1]. It may result from a wide range of structural and non-structural causes, including endometrial polyps, submucosal fibroids, endometrial hyperplasia, hormonal disturbances, and malignancy [2]. In perimenopausal women, variations in ovarian function and anovulatory cycles frequently contribute to abnormal bleeding, whereas postmenopausal bleeding warrants careful evaluation because of its potential association with endometrial malignancy [3]. Accurate identification of the

underlying cause is therefore essential for appropriate management.

Initial evaluation of women with AUB generally includes detailed clinical assessment and transvaginal sonography (TVS) [4]. TVS is a readily available, minimally invasive, and cost-effective imaging modality that provides useful information regarding endometrial thickness, myometrial abnormalities, uterine morphology, and adnexal pathology [5]. However, conventional TVS may have limitations in differentiating focal intracavitary lesions such as endometrial polyps and submucosal fibroids, particularly when the endometrium appears thickened or heterogeneous [6]. These limitations may lead to diagnostic uncertainty and the need for further invasive evaluation.

Saline infusion sonohysterography (SIS), also referred to as saline infusion sonography, is an enhanced ultrasound technique in which sterile saline is instilled into the uterine cavity to provide controlled distension and separation of the endometrial surfaces [7]. This facilitates direct visualization of the endometrial cavity and improves the detection and characterization of focal lesions such as endometrial polyps and submucosal fibroids [8]. SIS is relatively simple, minimally invasive, and can often be performed as an outpatient procedure. It may therefore provide additional diagnostic information following TVS and help in selecting appropriate treatment, potentially reducing unnecessary invasive procedures in selected patients [9].

Histopathological examination remains an important reference standard for establishing the definitive diagnosis of endometrial and intracavitary pathology [10]. Comparing SIS findings with histopathological findings can help determine its diagnostic usefulness in women presenting with AUB. Despite the availability of hysteroscopy, SIS remains an attractive diagnostic modality because of its relatively simple technique, accessibility, and ability to provide detailed assessment of the uterine cavity. Therefore, the present study was aimed to evaluate the role of saline infusion sonohysterography in the assessment of women with abnormal uterine bleeding, to compare its findings with transvaginal sonography and histopathological examination, and to determine its diagnostic performance in identifying intrauterine lesions.

Materials and methods

Study Design

A hospital-based observational study was conducted among perimenopausal and postmenopausal women presenting with abnormal uterine bleeding (AUB). A total of 50 women fulfilling the predefined eligibility criteria were included in the study.

Study Area and Setting

The study was conducted in the Department of Obstetrics and Gynaecology, ESIC Medical College, PGIMSR and Model Hospital, Rajajinagar, Bengaluru, Karnataka, India, a tertiary-care teaching hospital providing comprehensive obstetric and gynaecological services. The department manages routine and high-risk gynaecological conditions, including abnormal uterine bleeding, endometrial thickening, endometrial polyps, fibroids, and other intracavitary pathologies requiring imaging and histopathological evaluation. The study population comprised perimenopausal and postmenopausal women presenting with abnormal uterine bleeding who fulfilled the predefined eligibility criteria.

Study Duration

The study was conducted from 01/06/2025 to 31/12/2025.

Study Population

The study population comprised perimenopausal women presenting with abnormal uterine bleeding in the form of menorrhagia, metrorrhagia, or polymenorrhoea and postmenopausal women presenting with postmenopausal bleeding. A detailed clinical history was obtained, with particular emphasis on menstrual history, duration and pattern of bleeding, and relevant medical and drug history. Specific history was elicited to identify systemic disorders and drug-induced causes of abnormal uterine bleeding. All participants underwent general, breast, abdominal, and pelvic examination followed by relevant laboratory investigations.

Inclusion criteria

Women fulfilling any of the following criteria were included in the study: perimenopausal women with abnormal uterine bleeding; postmenopausal women with postmenopausal bleeding; menorrhagia with more than 7 days of bleeding associated with clots; and women with ultrasonographic evidence of endometrial or intracavitary pathology, including endometrial thickness >8 mm in perimenopausal women, endometrial thickness >4 mm in postmenopausal women, intramural or submucosal myomas, or endometrial polyps.

Exclusion criteria

Women with pregnancy, acute or chronic pelvic inflammatory disease, obesity, postmenopausal women receiving hormone replacement therapy, vaginal infections, a history of associated malignancy, or current tamoxifen therapy were excluded from the study.

Sampling technique

Consecutive women presenting to the Department of Obstetrics and Gynaecology during the study period who fulfilled the predefined inclusion and exclusion criteria were considered for participation. After obtaining informed consent, eligible participants underwent clinical evaluation and imaging investigations. A total of 50 women were included in the final analysis.

Study Size

The sample size was calculated using the single-population proportion formula, $n = Z^2 p(1-p)/d^2$, where n is the required sample size, Z is the standard normal deviate at a 95% confidence level (1.96), p is the anticipated proportion (10%), and d is the allowable absolute precision (8.3%). Substituting these values, $n = (1.96)^2 \times 0.10 \times (1-0.10)/(0.083)^2 = 50.16$, which was rounded to 50 participants. Accordingly, 50 eligible

women fulfilling the predefined inclusion and exclusion criteria were included in the study.

Data collection

Baseline demographic and clinical information was recorded using a structured proforma. Data regarding age, menopausal status, parity, presenting symptoms, duration of symptoms, clinical examination findings, and relevant laboratory investigations were documented. Imaging findings on transvaginal sonography (TVS) and saline infusion sonohysterography (SIS), subsequent treatment, and histopathological findings were also recorded.

Transvaginal sonography

After obtaining informed consent, participants were asked to empty their urinary bladder and were placed in the supine position with the legs flexed. A baseline TVS examination was performed using a 7.5-MHz transvaginal transducer covered with a condom. The endometrium, myometrium, and adnexa were systematically evaluated, and endometrial thickness was measured. The presence of endometrial thickening, polypoidal lesions, fibroids, bulky uterus, or other abnormalities was documented. Women with suspected intracavitary lesions or thickened endometrium subsequently underwent SIS.

Saline infusion sonohysterography

SIS was performed under aseptic precautions following the baseline TVS examination. The cervix was visualised using a Sims' speculum and cleansed with povidone-iodine solution. The anterior lip of the cervix was held with a vulsellum. A 20-mL syringe containing sterile normal saline was connected to a No. 8 paediatric Foley catheter, and the catheter was flushed to remove air. The catheter was gently introduced into the cervical canal using forceps, and the balloon was inflated with approximately 1.5–2 mL of distilled water so that it was positioned just above the internal os. The speculum was subsequently removed and the vaginal transducer was reintroduced.

SIS assessment

Sterile normal saline was gently instilled into the uterine cavity under real-time transvaginal sonographic guidance. The saline distended the endometrial cavity and provided separation of the anterior and posterior endometrial surfaces, allowing detailed assessment of the uterine cavity. The cavity was examined in the longitudinal plane from one cornua to the other and in the coronal plane from the fundus to the endocervix. Particular attention was given to the presence of endometrial polyps and submucosal myomas. Any intracavitary projection was assessed with respect to its morphology, size, location, and echogenicity. Abnormal endometrial thickening and other intracavitary abnormalities were also documented.

Following completion of the examination, the balloon was deflated and the catheter was gently removed.

Histopathological evaluation

Following SIS, participants underwent appropriate definitive evaluation and treatment based on the clinical and imaging findings. These procedures included dilatation and curettage, hysteroscopy-guided endometrial biopsy, hysteroscopic polypectomy, or hysterectomy, as clinically indicated. The tissue obtained during these procedures was subjected to histopathological examination. The final histopathological diagnosis was recorded and compared with the findings obtained on SIS.

Outcome assessment

The primary outcome was the diagnostic performance of SIS in identifying intrauterine lesions in women with AUB, using histopathological examination as the reference standard. The secondary outcomes included comparison of SIS findings with TVS findings and documentation of the subsequent treatment undertaken following SIS. The diagnostic performance of SIS was assessed in terms of sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy.

Bias

Potential selection bias was minimized by using consecutive sampling and applying predefined inclusion and exclusion criteria to all women presenting during the study period. Information bias was minimized by recording demographic, clinical, imaging, treatment, and histopathological findings using a structured proforma. The same imaging protocol and predefined assessment criteria were applied to eligible participants. Histopathological examination was used as the reference standard for assessing the diagnostic performance of SIS.

Statistical analysis

Data were entered and analysed using STATA/IC version 12.1. Continuous variables were expressed as mean $\pm$ standard deviation or median with range, as appropriate, while categorical variables were presented as frequencies and percentages. The chi-square test was used when expected cell frequencies were adequate, whereas Fisher's exact test was used when expected cell frequencies were small. Thus, both tests were used as appropriate. The association between SIS findings and TVS findings, as well as between SIS findings and histopathological diagnosis, was assessed using the appropriate test. Sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of SIS were calculated using histopathological examination as the reference standard. A p -value <0.05 was considered statistically significant.

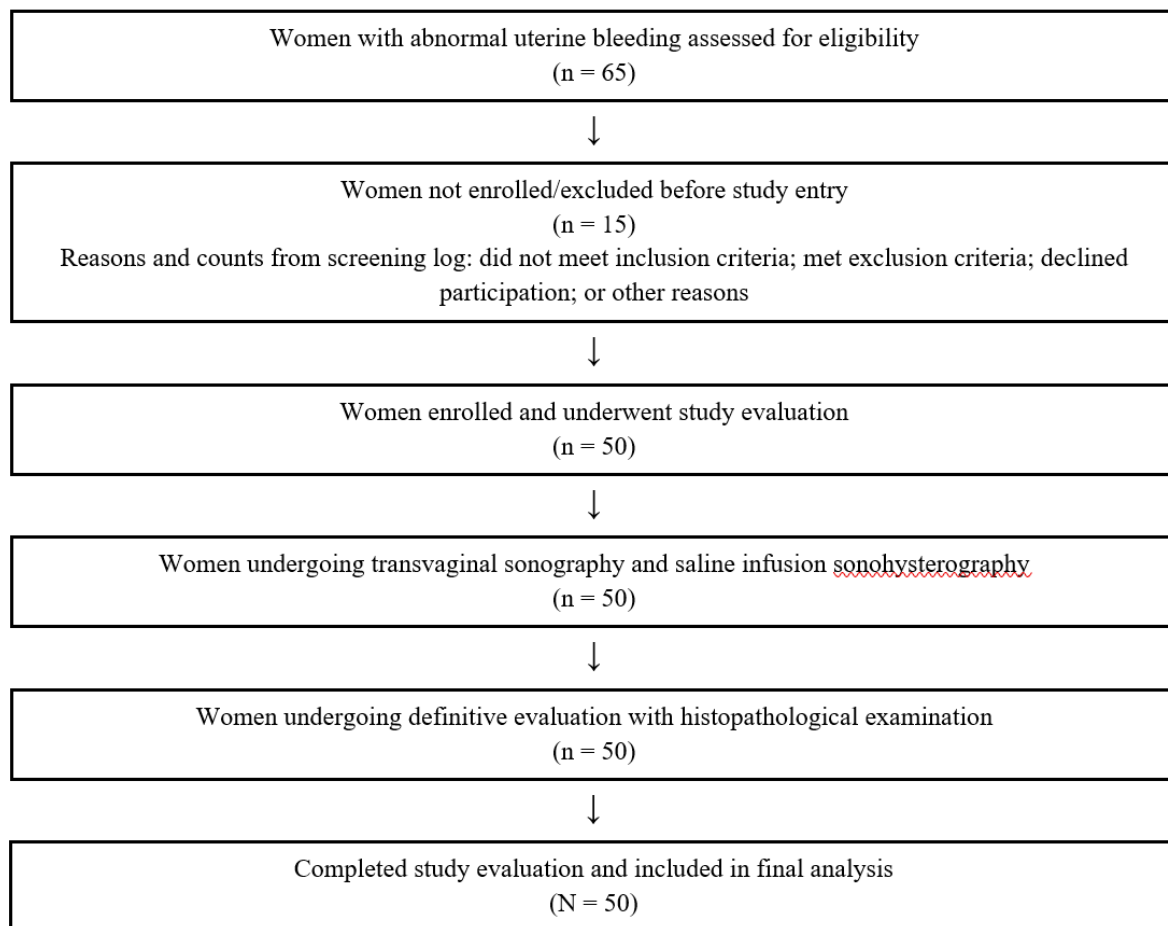
Ethical considerations

Written informed consent was obtained from all participants before undertaking the imaging and subsequent diagnostic procedures. The study was

conducted in accordance with institutional ethical requirements, and confidentiality and privacy of participant information were maintained throughout the study. Ethical clearance was obtained from the Institutional Ethics Committee of ESIC Medical College, PGIMSR and Model Hospital, Rajajinagar, Bengaluru, Karnataka, India, with ethical clearance number 30-2025.

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Figure 1: Participant flow through the study



Results

A total of 50 women with abnormal uterine bleeding were included in the study. Among them, 33 (66.0%) were perimenopausal and 17 (34.0%) were postmenopausal.

The mean age of the study population was 49.9 ± 9.08 years. Most participants were multiparous (40 [80.0%]), while 10 (20.0%) were primiparous. Menorrhagia was the most common presenting symptom, reported in 24 (48.0%) women, followed by postmenopausal bleeding in 17 (34.0%). (Table 1)

Table 1: Demographic and Clinical Characteristics of the Study Participants (N = 50)

Variable	Category	n (%)
Menopausal status	Perimenopausal	33 (66.0)
	Postmenopausal	17 (34.0)
Age (years)	35–45	22 (44.0)

Parity	46–55	12 (24.0)
	56–65	12 (24.0)
	>65	4 (8.0)
	Primiparous	10 (20.0)
	Multiparous	40 (80.0)
Presenting symptom	Menorrhagia	24 (48.0)
	Meno-metrorrhagia	8 (16.0)
	Polymenorrhagia	1 (2.0)
	Postmenopausal bleeding	17 (34.0)

Note. Values are presented as number (percentage). Percentages are based on the total study population (N = 50).

The duration of symptoms ranged from 1 month to more than 12 months, with a mean duration of 6.24 ± 6.37

months. The largest proportion of women, 20 (40.0%), had symptoms for 4–6 months, followed by 18 (36.0%) with symptoms for 1–3 months. Symptoms persisted for 7–9 months in 5 (10.0%), 9–12 months in 4 (8.0%), and more than 12 months in 3 (6.0%) women. (Table 2)

Table 2: *Duration of Symptoms Among Study Participants (N = 50)*

Duration of symptoms	n (%)
1–3 months	18 (36.0)
4–6 months	20 (40.0)
7–9 months	5 (10.0)
9–12 months	4 (8.0)
>12 months	3 (6.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). Percentages are based on the total study population (N = 50).

On transvaginal ultrasonography, polypoidal endometrial thickening was the most frequent finding, observed in 26 (52.0%) women. Endometrial thickening was noted in 17 (34.0%), fibroid uterus in 5 (10.0%), and bulky uterus in 2 (4.0%) women. (Table 3)

Table 3: *Transvaginal Ultrasonography Findings Among Study Participants (N = 50)*

TVS finding	n (%)
Endometrial thickening	17 (34.0)
Polypoidal thickening	26 (52.0)
Fibroid uterus	5 (10.0)
Bulky uterus	2 (4.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). TVS = transvaginal sonography.

Saline infusion sonohysterography demonstrated an endometrial polyp in 31 (62.0%) women, making it the

most common intracavitary lesion identified. Submucous fibroids were detected in 8 (16.0%) women, while 11 (22.0%) had no demonstrable intracavitary lesion on SIS. (Table 4)

Table 4: *Saline Infusion Sonohysterography Findings Among Study Participants (N = 50)*

SIS finding	n (%)
Normal/no intracavitary lesion	11 (22.0)
Endometrial polyp	31 (62.0)
Submucous fibroid	8 (16.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). SIS = saline infusion sonohysterography.

Following SIS evaluation, dilatation and curettage was performed in 23 (46.0%) women, while 11 (22.0%)

underwent hysteroscopy with polypectomy. Hysteroscopy with D&C/biopsy was performed in 7 (14.0%) women, whereas 9 (18.0%) underwent total abdominal hysterectomy. (Table 5)

Table 5: Treatment Undertaken Following Saline Infusion Sonohysterography (N = 50)

Treatment	n (%)
Dilatation and curettage	23 (46.0)
Hysteroscopy + D&C/biopsy	7 (14.0)
Hysteroscopy + polypectomy	11 (22.0)
Total abdominal hysterectomy	9 (18.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). D&C = dilatation and curettage.

Overall, 41 (82.0%) women underwent conservative or less invasive treatment, including D&C, hysteroscopy with biopsy, or hysteroscopic polypectomy, whereas 9

(18.0%) required total abdominal hysterectomy. (Table 6)

Table 6: Distribution According to Definitive Treatment (N = 50)

Treatment category	n (%)
Conservative/less invasive treatment	41 (82.0)
Total abdominal hysterectomy	9 (18.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). Conservative/less invasive treatment included dilatation and curettage, hysteroscopy with biopsy, and hysteroscopic polypectomy.

Histopathological examination revealed endometrial polyps in 31 (62.0%) women, followed by endometrial hyperplasia in 10 (20.0%) and fibroid uterus in 5 (10.0%). Normal endometrial histology was observed in 4 (8.0%) women. (Table 7)

Table 7: Histopathological Examination Findings (N = 50)

Histopathological diagnosis	n (%)
Normal endometrium	4 (8.0)
Endometrial polyp	31 (62.0)
Endometrial hyperplasia	10 (20.0)
Fibroid uterus	5 (10.0)
Total	50 (100.0)

Note. Values are presented as number (percentage). Histopathological examination was used as the reference standard for comparison with SIS findings.

Comparison of TVS and SIS findings showed that among 17 women with endometrial thickening on TVS, SIS

identified endometrial polyps in 8 (47.1%), submucous fibroids in 4 (23.5%), and no intracavitary lesion in 5 (29.4%). Of the 26 women with polypoidal thickening on TVS, 22 (84.6%) had endometrial polyps on SIS, while 4 (15.4%) had no intracavitary lesion. Among the 5 women with fibroid uterus on TVS, 4 (80.0%) had submucous fibroids on SIS and 1 (20.0%) had no intracavitary lesion. (Table 8)

Table 8: Comparison of TVS Findings With Saline Infusion Sonohysterography Findings (N = 50)

TVS finding	No intracavitary lesion on SIS, n	Endometrial polyp on SIS, n	Submucous fibroid on SIS, n	Total, n
Endometrial thickening	5	8	4	17
Polypoidal thickening	4	22	0	26

Bulky uterus	1	1	0	2
Fibroid uterus	1	0	4	5
Total	11	31	8	50

Note. Values are presented as frequencies. SIS = saline infusion sonohysterography; TVS = transvaginal sonography.

intracavitary lesion on SIS and 5 had no lesion; corresponding figures were 22 and 4 for polypoidal thickening, 1 and 1 for bulky uterus, and 4 and 1 for fibroid uterus, respectively. (Table 9)

There was no statistically significant association between the findings on TVS and SIS ($p=0.478$). Among women with endometrial thickening on TVS, 12 had an

Table 9: Association Between TVS Findings and Saline Infusion Sonohysterography Findings ($N = 50$)

TVS finding	No intracavitary lesion on SIS, n	Intracavitary lesion on SIS, n	<i>p</i>
Endometrial thickening	5	12	
Polypoidal thickening	4	22	
Bulky uterus	1	1	
Fibroid uterus	1	4	0.478

Note. Values are presented as frequencies. The *p*-value represents the overall association between TVS findings and SIS findings. SIS = saline infusion sonohysterography; TVS = transvaginal sonography.

and 5 with fibroid uterus on histopathology had corresponding intracavitary lesions on SIS. Among women with endometrial hyperplasia, 2 had an intracavitary lesion and 8 had no lesion on SIS, while among those with normal endometrium, 1 had an intracavitary lesion and 3 had no lesion. The association between SIS findings and histopathological diagnosis was statistically significant ($p<0.001$). (Table 10)

Comparison of SIS findings with histopathological diagnosis showed that 31 women with endometrial polyps

Table 10: Comparison of Saline Infusion Sonohysterography Findings With Histopathological Diagnosis ($N = 50$)

Histopathological diagnosis	No intracavitary lesion on SIS, n	Intracavitary lesion on SIS, n	<i>p</i>
Normal endometrium	3	1	
Endometrial hyperplasia	8	2	
Endometrial polyp	0	31	
Fibroid uterus	0	5	<.001

Note. Values are presented as frequencies. The *p*-value represents the overall association between SIS findings and histopathological diagnosis. SIS = saline infusion sonohysterography.

The sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic accuracy of SIS were 83.0%, 100.0%, 100.0%, 27.27%, and 84.0%, respectively. The diagnostic performance of SIS compared with histopathology was statistically significant ($p<0.001$). (Table 11)

Using histopathology as the reference standard, SIS correctly identified 39 true-positive and 3 true-negative cases, with 8 false-negative and no false-positive cases.

Table 11: Diagnostic Performance of Saline Infusion Sonohysterography Compared With Histopathology ($N = 50$)

SIS versus HPE	HPE positive	HPE negative	Total
SIS positive	39	0	39
SIS negative	8	3	11
Total	47	3	50

Note. Values are presented as frequencies. HPE = histopathological examination; SIS = saline infusion sonohysterography.

Discussion

Abnormal uterine bleeding is a common gynaecological problem, particularly during the perimenopausal and postmenopausal periods, and accurate identification of intracavitary pathology is important for appropriate management. In the present study, 66.0% of women were perimenopausal and 34.0% were postmenopausal, with a mean age of 49.9 ± 9.08 years. Menorrhagia was the most frequent presentation (48.0%), followed by postmenopausal bleeding (34.0%). Endometrial polyps were the predominant pathology on both SIS and histopathology, accounting for 62.0% of cases. These

findings are consistent with previous literature demonstrating that focal endometrial lesions, particularly polyps, are common causes of AUB. In a prospective study of perimenopausal and postmenopausal women, Pasirja et al. similarly identified endometrial polyps, fibroids and endometrial growths among women evaluated with SIS, while demonstrating that TVS could miss focal intracavitary lesions [11].

In the present study, TVS demonstrated polypoid endometrial thickening in 52.0% and endometrial thickening in 34.0% of women, whereas SIS provided more specific characterization of the intracavitary lesions, identifying endometrial polyps in 62.0% and submucous fibroids in 16.0%. Among women with polypoid thickening on TVS, SIS demonstrated an endometrial polyp in 84.6%, while among those with endometrial thickening, SIS identified a polyp in 47.1% and a submucous fibroid in 23.5%. This additional ability of SIS to differentiate focal from nonspecific endometrial thickening is consistent with earlier comparative studies. De Vries et al. reported that TVS had a sensitivity of 60% for directly visualizing intracavitary abnormalities in women with AUB, whereas SIS improved visualization and diagnostic assessment of the uterine cavity [12]. Similarly, a prospective study involving both premenopausal and postmenopausal women reported sensitivity and specificity of 83.0% and 70.6% for TVS compared with 97.7% and 82.4% for SIS; for endometrial polyps, SIS demonstrated 100% sensitivity and 91.8% specificity [13].

The diagnostic performance observed in the present study further supports the usefulness of SIS for evaluating intracavitary pathology. When histopathology was considered the reference standard, SIS demonstrated a sensitivity of 83.0%, specificity of 100.0%, positive predictive value of 100.0%, negative predictive value of 27.27%, and overall diagnostic accuracy of 84.0%. The absence of false-positive cases resulted in the very high specificity and positive predictive value observed in this study. Although the sensitivity was somewhat lower than

that reported in several previous studies, the overall findings remain consistent with evidence demonstrating superior diagnostic performance of SIS compared with conventional TVS. Chawla et al., in a study of 60 premenopausal and postmenopausal women with AUB,

reported sensitivity, specificity, PPV and NPV of 89.1%, 100%, 100% and 73.7%, respectively, for SIS, compared with 43.48%, 78.57%, 86.96% and 29.73% for TVS [14]. A systematic review and meta-analysis by Kaveh et al. also demonstrated good diagnostic accuracy of SIS for endometrial polyps, with pooled sensitivity of 87% and specificity of 86%, compared with 62% and 73%, respectively, for TVS [15].

The findings are particularly relevant to women with postmenopausal bleeding, in whom focal endometrial lesions require accurate characterization and appropriate tissue diagnosis. In the present study, SIS identified intracavitary lesions in 78.0% of women, with endometrial polyps being the predominant lesion. A prospective study of 137 postmenopausal women with AUB reported overall sensitivity and specificity of 89.6% and 77.3%, respectively, for SIS, compared with 70.0% and 50.0% for TVS, demonstrating the greater diagnostic value of cavity distension [16]. Furthermore, a meta-analysis evaluating saline contrast sonohysterography for endometrial polyps in women with postmenopausal bleeding reported pooled sensitivity of 86.5% and specificity of 91.1% when histopathology was used as the reference standard [17]. These findings support the use of SIS as an important complementary investigation following TVS, particularly when the endometrium is thickened or a focal intracavitary lesion is suspected. Nevertheless, SIS remains an imaging-based diagnostic technique and cannot replace histopathological examination when tissue diagnosis is required, particularly in women with suspected endometrial hyperplasia or malignancy.

Generalizability

The findings of the present study should be interpreted in the context of its hospital-based observational design, relatively small sample size, and inclusion of women presenting with abnormal uterine bleeding at a single tertiary care centre. Although the study provides useful information regarding the diagnostic utility of saline infusion sonohysterography (SIS) in women with perimenopausal and postmenopausal bleeding, the findings may not be directly generalizable to other geographical regions, healthcare settings, or populations with different demographic and clinical characteristics. Nevertheless, the study provides relevant insights into the ability of SIS to characterize intracavitary lesions following transvaginal sonography and its correlation with histopathological findings. These findings may assist clinicians in selecting appropriate diagnostic and therapeutic approaches for women presenting with abnormal uterine bleeding.

Conclusion

The present study demonstrates that saline infusion sonohysterography is a useful adjunct to transvaginal

sonography in the evaluation of women with abnormal uterine bleeding, particularly for identifying and characterizing focal intracavitary lesions. Endometrial polyps were the most common pathology identified on SIS and histopathological examination. SIS demonstrated a sensitivity of 83.0%, specificity of 100.0%, positive predictive value of 100.0%, and diagnostic accuracy of 84.0% when compared with histopathology. The significant association between SIS findings and histopathological diagnosis highlights its value in further evaluation of women with suspected intracavitary pathology. SIS may therefore facilitate more accurate characterization of endometrial lesions and help guide appropriate minimally invasive or definitive treatment.

Limitations

The study was conducted at a single tertiary care centre and included a relatively small sample of 50 women, which limit the generalizability of the findings to other populations and healthcare settings. The observational design may also have introduced selection bias, as SIS was performed in women with suspected intracavitary lesions or increased endometrial thickness on TVS. The study did not include a healthy control group, and the number of women with individual histopathological abnormalities was relatively small. Furthermore, the diagnostic performance of SIS may be influenced by the experience of the operator, quality of ultrasonographic equipment, adequacy of uterine cavity distension, and characteristics of individual lesions. Histopathology was obtained through different procedures, including D&C, hysteroscopic biopsy, polypectomy, and hysterectomy, which may also introduce variability in tissue sampling. Long-term clinical outcomes following treatment were not assessed.

Recommendations

SIS may be considered as an important complementary investigation in women with abnormal uterine bleeding when TVS demonstrates endometrial thickening, polypoidal changes, or suspected intracavitary pathology. Careful evaluation of the uterine cavity using SIS can help differentiate focal lesions such as endometrial polyps and submucosal fibroids and may assist in selecting women who require hysteroscopic evaluation or definitive treatment. Adequate patient selection, appropriate counselling, aseptic technique, and experienced sonographic assessment should be ensured to optimize diagnostic yield. Histopathological examination should remain essential whenever tissue diagnosis is required, particularly in women with suspected endometrial hyperplasia or malignancy. Larger prospective multicentre studies comparing SIS directly with hysteroscopy and histopathology, with standardized lesion classification and assessment of interobserver reproducibility, are recommended to further establish the diagnostic role of SIS in abnormal uterine bleeding.

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Conflict of Interest

The authors declare no conflict of interest.

Data Availability

The data supporting the findings of this study are available upon reasonable request from the corresponding author, subject to applicable institutional and ethical requirements.

Author Contributions

Dr. Swetha K. M. contributed to participant recruitment, investigation, data collection, data curation, and validation. Dr. Keerti Shivaputrappa contributed to conceptualization, study design, methodology, investigation, and supervision. Dr. Sonia H. contributed to formal analysis, interpretation of findings, literature synthesis, and preparation of the original manuscript draft. All authors contributed to critical revision of the manuscript, approved the final version for submission, and agreed to be accountable for the integrity and accuracy of the work.

List of Abbreviations:

AUB, abnormal uterine bleeding; **D&C**, dilatation and curettage; **HPE**, histopathological examination; **SIS**, saline infusion sonohysterography; **TVS**, transvaginal sonography; **SD**, standard deviation; **STATA**, Statistics and Data Analysis; **USG**, ultrasonography.

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