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Original Article

Sonohysterography Assessment of the Structural Abnormalities of the Uterus in Women with Infertility in Ethiopia

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Abstract

Background: *Female factor infertility is associated with a high incidence of the uterine cavity and fallopian tube pathology in developing countries with a high prevalence of STDs, therefore various methods are available for structural evaluation of the female reproductive system, among them is saline infusion sonohysterography (SISHG). The study aimed to assess the role of SISHSG in female infertility evaluation in areas where the gold standard investigating modalities are not readily available.*

Methods: *A hospital-based cross-sectional study was carried out in Tikur Anbessa Specialized Hospital (TASH), Addis Ababa, Ethiopia, between January 2019 to August 2019 G.C. SISHSG consists of instillation of saline into the endometrial cavity with simultaneous pelvic ultrasonography (US). Fifty consecutive female patients referred to the Radiology Department for SISHSG are included in the study. Sensitivity, specificity, positive and negative predictive values were calculated for 26 patients who had both SISHSG and conventional HSG.*

Result: *The majority of the patients were in the age group of 35-40(38%) and 34 (68%) had secondary infertility. The commonest abnormalities detected were uterine myoma 10(20%), Asherman syndrome/cervical stenosis 7 (14%), and tubal blockage 6(10%). The sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of SISHSG in normal study, Asherman syndrome/cervical stenosis and chronic endometritis was 100%, as compared to the gold standard conventional HSG. For bilateral tubal blockage the SISHSG had 50% sensitivity, 90% specificity, 66.7% PPV and 81.8% NPV, however, for unilateral tubal blockage SISHSG had low sensitivity 33%.*

Conclusion: *SISHSG is readily available, easy-to-do, safe and radiation-free procedure and has high sensitivity and specificity in detecting uterine cavity abnormality. We advocate its use as a first step of investigation modality in the evaluation of female infertility.*

Keywords: Transvaginal sonography (TVS), saline infusion Sonohysterography (SISHG), infertility, Ethiopia
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Background

The lifetime prevalence of infertility among reproductive-aged couples ranges between 12.6% and 17.5% worldwide, with relatively higher prevalence rates in some regions such as the Americas, Western Pacific, , and European regions. The lifetime prevalence of infertility for the African region is 13%.(1) . The 12-month prevalence of infertility in the was 24.2% for study in Ethiopian patients of which the majority (90.7%) was secondary infertility (2).

Female infertility in sub-Saharan Africa is associated with a high incidence of uterine cavity and fallopian tube pathology due to prevalent Sexually Transmitted Infections (STI). Diverse methods are available for structural evaluation of the female reproductive system while looking for causes of female infertility which include Pelvic Ultrasound, HSG, SISHSG, MRI, and laparoscopy[3). SISHSG provides superior visuals of the endometrial pathologies compared to some of the routinely performed imaging modalities in gynecology and helps differentiate them from sub-endometrial causes thus providing superior diagnostic results. It has the additional advantage of concurrent assessment of tubal patency with comparable precision (4).

Common indications for SISHG include abnormal uterine bleeding, infertility and repeated abortion, congenital abnormality of the uterine cavity, preoperative or postoperative evaluation of uterine myomas, polyps or cysts, suspected uterine synechiae, further evaluation of suspected endometrial abnormalities detected by transvaginal sonogram (TVS) and inadequate imaging by TVS. [4,5]. SISHSG ideally should be performed early in the follicular phase of the menstrual cycle when the endometrium is thin enough for the installed saline to easily distend the uterine cavity and better accentuate endometrial pathology [6].

Anatomic causes of infertility are more common in developing countries like Ethiopia. In the resource limited settings like ours, the gold standard investigation modalities such as hysterosalpingography, hysteroscopy and laparoscopy with chomopertubation (HLC) as well as other investigation modality like magnetic resonance imaging (MRI) are not readily available. In such setting there has to be an alternative investigation modality like SISHSG, which is readily available, easy to interpret, safer and cheaper which is as accurate as HSG in evaluating the fallopian tubes and uterine cavity in infertile patients [7]. Related to the SISHSG, there is minimal risk of pain and infection for which prophylactic non-steroidal anti-inflammatory drugs and antibiotics may be administered to reduce complications. Reasons for an inability to complete the procedure include the presence of a stenotic cervix and cervical scarring causing backflow of saline. Given that SHG is a relatively safe procedure, mortality has not been described.

To the Authors' knowledge, the study (SISHSG in the evaluation of female infertility) is the first of its kind in Ethiopia and no published or documented research result was found from our region. Therefore, this study aimed to assess the role of SISHG in the evaluation of structural causes of female infertility.

Methods

Study setting: The study was conducted in the department of radiology, School of Medicine, Addis Ababa University, TASH in collaboration with the department of gynecology .The patients were referred from outpatient clinic of the gynecology clinic of TASH for infertility work up.

Study design: A prospective hospital-based cross-sectional study was conducted in the Department of Radiology, School of Medicine, Addis Ababa University, TASH from January 2019 to August 2019 on women who came for infertility and needed structure evaluation of the uterus and fallopian tube as part of the work up in the Department of Obstetrics and Gynecology and Radiology Department.

Study population: All patients with infertility referred to the department of radiology for evaluation of the structural cause of infertility during the study period who fulfilled the inclusion criteria.

Sample size and sampling: We used a non-probability convenient sampling by taking all study subjects that fulfilled the inclusion criteria during the study period (January 2019 to August 2019). Hence, a total of 50 consecutive subjects who fulfilled the inclusion criteria were enrolled in the study which lasted for six months.

Inclusion criteria: All subjects with primary and secondary infertility who are suspected to have structural abnormality.

Exclusion criteria: Active pelvic inflammatory disease, suspected pregnancy, active vaginal bleeding, and those who declined the procedure.

Study Variables include demographic characteristics such as age, parity, and experiences in the earlier pregnancies. The main outcome following SISHSG was the recognition of uterine anomalies and tubal patency. The Data was collected using a structured questionnaire prepared in English. Imaging studies were taken before and after the procedure and stored.

Data collection procedures: All patients were informed about the study, and the procedure was performed with their consent. Each participant was given doxycycline 100mg PO BID, two day before the procedure and 3 days post-procedure with a total of 5 days. On the day of the procedure, every patient was given diclofenac 100mg suppository 30 minutes before the procedure. Initially, all patients were evaluated with pelvic ultrasonography using a transabdominal 3.5MHZ transducer as well as a transvaginal probe with a 7.5 MHz transducer (SSI-8000 SonScape Co.). The dimensions and contours of the uterus, the endometrial lining and thickness, and both adnexal structures and the pouch of Douglas were examined. Then, SISHG was performed with the patient in the dorsal lithotomy position. A standard bivalve speculum was inserted after the cervix was cleaned with povidone–iodine solution. A pediatrics size 8F and 10F Foley catheters were used depending on the parity of the participant. It was threaded through the cervix with a ring forceps, into the cervical canal until it reached the fundus. It was then retracted 1.0–1.5 cm back and the catheter balloon was inflated with 2.0 ml sterile saline. The speculum was then removed carefully, so as not to dislodge the Foley catheter, and the trans-vaginal probe was reinserted in the posterior vaginal fornix. The uterine cavity was distended with a sterile isotonic saline infusion through the

catheter at a rate of 10– 20 ml/min until the Whole uterine cavity was visualized with possible pooling of fluid in the pouch of Douglas. All the SISHSG images and videos were saved on the ultrasound machine and the findings were documented in the data collection sheet.

Data analysis: Data entry, coding and analysis were performed using SPSS version 23 software. Frequency distribution, and percentage were used to describe the findings. The sensitivity, specificity, PPV and NPV value of SISHSG were calculated using Conventional HSG and final clinical diagnosis as Gold standard. Results were presented using tables and figures represented in percentage and measures of central tendency, then summarization and comparison of data was done.

Ethical considerations: The ethical clearance was obtained from Addis Ababa University Department of Radiology Research and Ethics Committee and informed consent was obtained from all the study subjects.

Results

Most of the patients were in the age group of 35-40 (38%) (Table1). A great proportion of them had secondary infertility 34(68%). Half 26(52%) and underwent conventional HSG study.

Table 1: Age of patients who underwent SISHSG

Age(in years)	Number of cases	Percentage (%)
20-24	6	12.0
25-29	11	22.0
30-34	10	20.0
35-40	19	38.0
>40	4	8.0
Total	50	100.0

A large portion of Subjects gave a history of abortion 19(38%). Others had, either pelvic surgery 5(8%); or2(4%) treatment for PID. Thirteen (26%) subjects' spouses had sperm analysis work up and only 1(2%) turned out to be abnormal.

All the patients complained of pain during SISHSG; ranging from mild, 40 (80%) patients; moderate in 9 (9%) patients, and severe in one patient (2%). Out of the 50 patients that were investigated, none had nausea, vomiting, or vaginal bleeding during or after the procedure.

Table 2: Gynecological history of the patients

	Category	Frequency	Percentage
History of abortion	No	31	62.0
	Yes	19	38.0
	Total	50	100
History of ectopic pregnancy	No	49	98.0
	Yes	1	2
	Total	50	100
Previous gynecological surgeries	No procedure	45	90.0
	Cesarean section	1	2.0
	Right salpingectomy	1	2.0
Treatment for PID	D&C for abortion	3	6.0
	Total	50	100
	No	48	96.0
	Yes	2	4.0
	Total	50	100

All study subjects underwent SISHSG study and 18(36%) had normal findings, 10(20%) had uterine myoma, 8(16%) had Asherman syndrome/ cervical stenosis, 6(12%) had a tubal blockage, 3 (6%) had hydrosalpinx, 2(4%) had chronic endometritis, 1(2%) had an endometrial polyp, 1(2%) had large submucous myoma and 1(2%) had complex right adnexal mass (Table 3 and figure 1-5). Those patients diagnosed to have uterine myoma had no conventional HSG study and most of them were to be treated surgically based on our findings on SISHSG.

Twenty-six (52%) patients had conventional hysterosalpingography study and 8 (16%) of them had Asherman syndrome/cervical stenosis, 9 (18%) had normal findings, 9(18%) had tubal blockage, and 2(4%) had chronic endometritis.

In this study, the diagnosis of Asherman syndrome/cervical stenosis both in SISHSG and conventional HSG was mainly based on the failure to infuse saline and contrast into the endometrial cavity after catheterization of the cervix respectively otherwise there is no endometrial cavity traversing bands or adhesion seen.

There were two (4%) patients who were diagnosed to have bilateral tubal blockage by conventional HSG, however, both patients showed an adequate amount of saline within the cul-de-sac

post-saline infusion and the earlier diagnosis was possibly due to tubal spasm during the HSG.

Table 3: Saline infusion sonohysterosalpingography findings

SISHG diagnosis	Number of cases	Percentage (%)
Normal	18	36.0
Uterine Myoma	10	20.0
Asherman syndrome/cervical stenosis	7	14.0
Bilateral tubal blockage	5	10.0
Right hydrosalpinx	2	4.0
Chronic endometritis	2	4.0
Left hydrosalpinx	1	2.0
Right tubal blockage	1	2.0
Endometrial polyp	1	2.0
Large submucous myoma with bilateral tubal blockage	1	2.0
Right adnexal complex mass	1	2.0
PCOS with cervical stenosis and right hemorrhagic ovarian cyst	1	2.0
Total	50	100.0

The sensitivity, specificity, PPV and NPV value of SISHSG in diagnosing normal, Asherman syndrome/cervical stenosis as well as chronic endometritis is 100%,100%,100%, 100% respectively.

For bilateral tubal blockage, the SISHSG had 50% sensitivity, 90% specificity, 66.7% PPV, and 81.8% NPV and for unilateral tubal blockage, SISHSG has sensitivity and specificity of 33% and 100% respectively.

Table 4: Sensitivity, specificity, PPV, and NPV of SISHSG as compared to conventional HSG for 26 infertile patients

SISHSG diagnosis	Test (%)			
	Sensitivity	Specificity	PPV	NPPV
Normal	100	100	100	100
Asherman syndrome/ cervical stenosis	100	100	100	100
Chronic endometritis	100	100	100	100
Bilateral tubal blockage	50	90	66.7	81.8

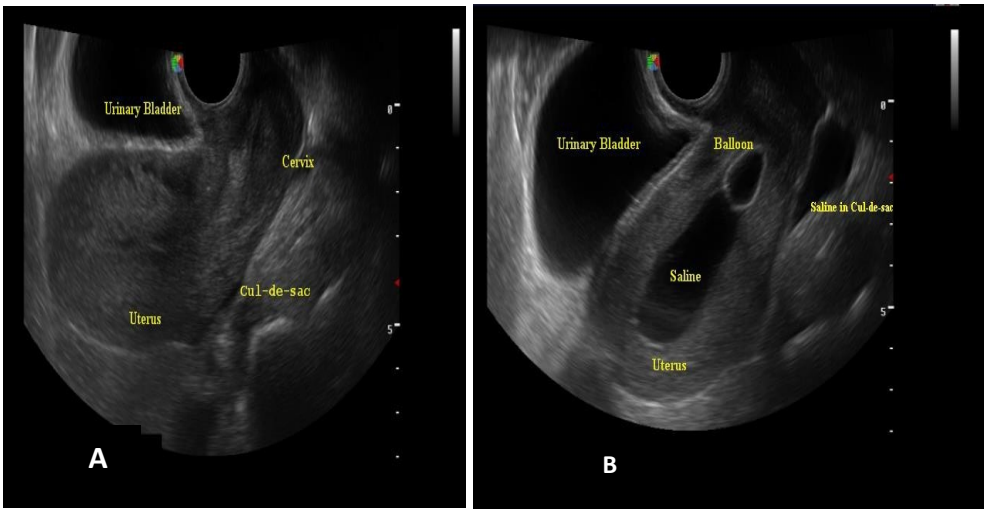

Figure 3: Normal SISHG study: Sagittal transvaginal ultrasound of a 29years old lady with secondary infertility before saline infusion (A) and after saline infusion (B), showing well distended, smoothly outlined endometrial cavity and adequate amount of saline within the cul-de- sac after infusion of saline likely showing patent fallopian tubes

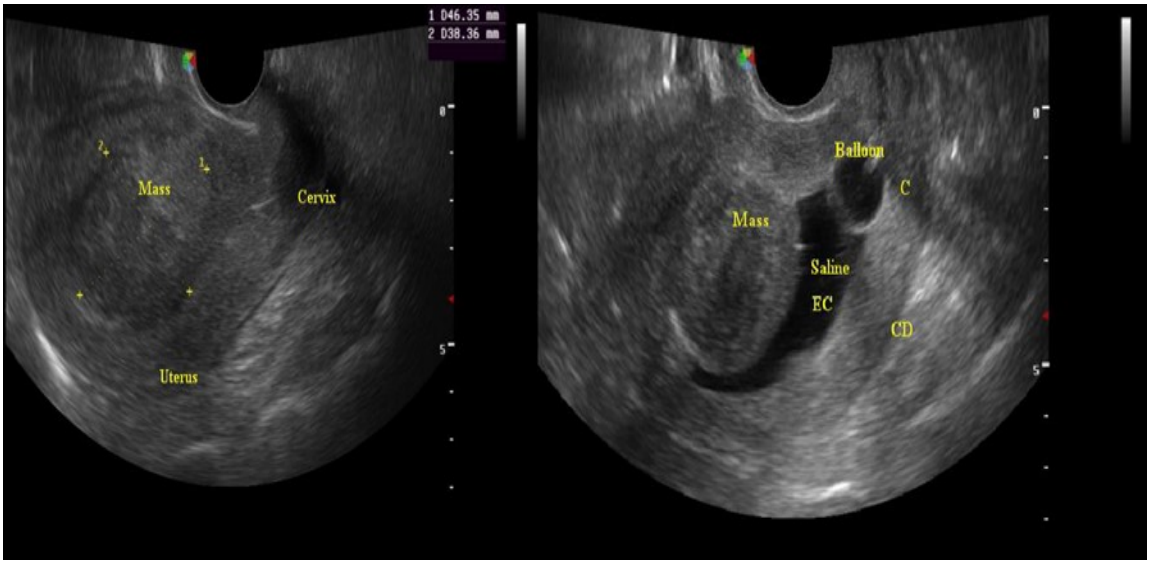

Figure 4: Transvaginal sonogram showing large broad-base submucous myoma with bilateral tubal blockage in a 38-year-old patient with secondary infertility.:

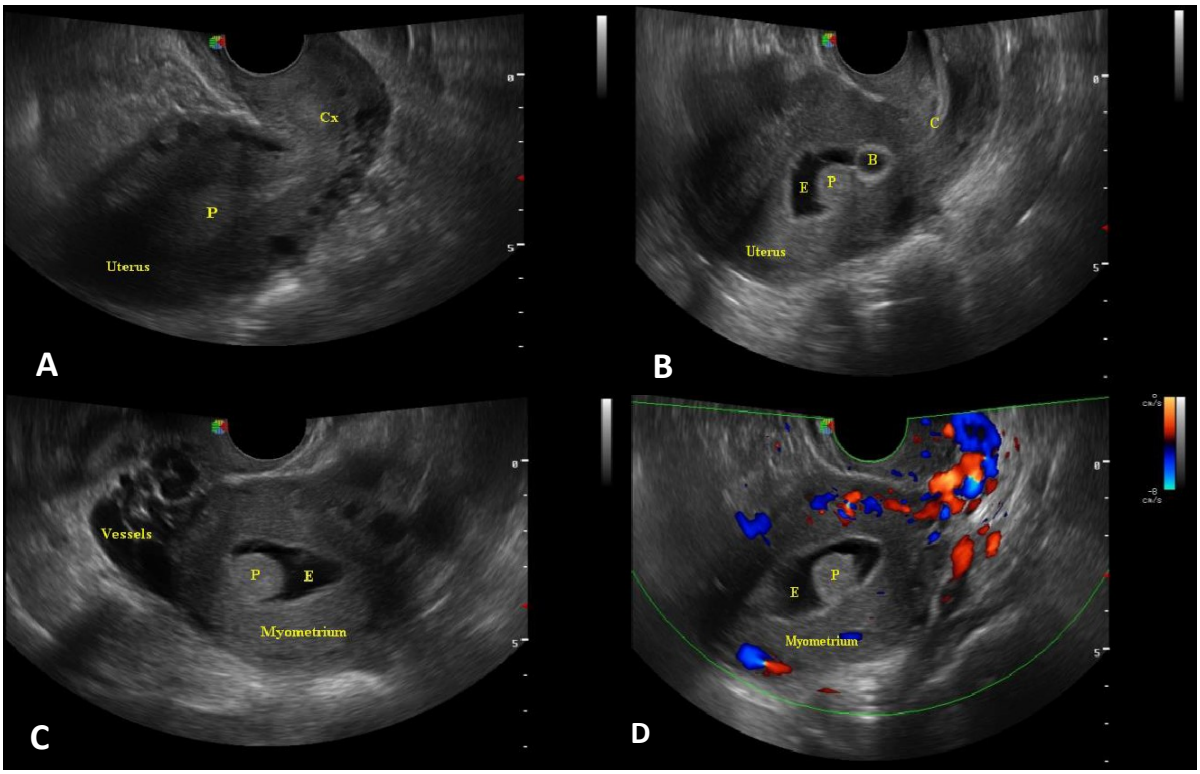

FIGURE 5:- Transvaginal sonogram showing endometrial polyp, making an acute angle with endometrium in a 33 year old woman with primary infertility: The lesion is an ill-defined and difficult to appreciate clearly on pre-saline infusion image **(A)** but well depicted on post-saline infusion images **(B-D)**, [P=polyp, Cx=cervix, E=endometrial cavity filled with saline, B=balloon, C=catheter].

Discussion

Most of the study subjects were in the later part of their reproductive age and two out of three had secondary infertility which is in agreement with a metanalysis done by Abebe et al. which demonstrates secondary infertility of 69.9 % for East African region but a bit higher than the sub-Saharan estimate of about 50% and much higher than estimates for North African (30%) [8]. this could be due to the etiologic factors for various regions.

In our research one-third of the subjects were found to have structural abnormalities of either the tubes or the uterus which is in tandem with research done in Turkey which showed high sensitivity of SISHSG in detecting uterine cavity lesions and intramural lesions as compared to conventional HSG and TVS [9]. Among those patients who underwent SISHSG, the majority of them 18(36%) had normal study which is similar to the study done in Ahvaz, Iran [10].

In this study, the sensitivity, specificity, and predictive value of SISHSG in appreciating diagnosing normal uterine morphology and diagnosing Asherman syndrome/cervical stenosis is comparable to conventional HSG and it is consistent with research done in Nigeria comparing trans abdominal SISHSG with conventional HSG. In bilateral tubal blockage however, SISHSG had 50 % sensitivity, and 90% specificity which was low as compared to the Nigerian research which had 100% sensitivity and specificity [7,11,12].

In our study, the capability of SISHSG to diagnose unilateral tubal blockage was low with a sensitivity of 33% which is similar to the studies done in Nigeria and Turkey [7,9]. Two cases of chronic endometritis diagnosed with SISHSG were consistent with conventional HSG.

All the patients complained of pain during SISHSG; ranging from mild to moderate and severe. This observation is similar to research done in India [11], however, in this study no single patient complained of nausea, vomiting, or vaginal bleeding during or after the procedure which is in contrary to a similar procedure done in the USA in

which few patients had the above complaints [6], suggesting that SISHSG is a tolerable procedure with no significant adverse effect which is in agreement previous studies (12,13).

Conclusion

SISHSG is a cheap, easy to perform, tolerable, and safe procedure with high sensitivity and specificity in detecting uterine cavity abnormality. We therefore advocate its use as a first line investigation modality in the evaluation of female infertility.

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Conflict of interest: All authors declare no conflict of interest in the conduct of this study.

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