ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
SCHOOL OF GRADUATE STUDIES
DEPARTMENT OF RADIOLOGY

THE ROLE OF SALINE INFUSION SONO HYSTEROSALPINGOGRAPHY IN THE EVALUATION OF INFERTILITY IN TIKUR ANBESSA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA: CROSS-SECTIONAL STUDY.

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A SENIOR PAPER TO BE SUBMITTED TO RADIOLOGY DEPARTMENT, COLLEGE OF HEALTH SCIENCES, ADDIS ABABA UNIVERSITY, IN PREPARATION FOR PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE POST GRADUATE STUDY IN RADIOLOGY.

September, 2019 G.C.

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ABBREVIATIONS AND ACRONYMS

HSG---hysterosonography.

NPV--- Negative predictive value.

PPV--- positive predictive value.

SISHG--- Saline infusion sonohysterography

TASCSH--- Transabdominal Saline Contrast Sonohysterography.

TASH--- Tikur Anbessa Specialized Hospital.

US--- ultrasound.

ABSTRACT

BACKGROUND: Female infertility is associated with high incidence of uterine cavity and fallopian tube pathology in developing countries with a high prevalence of STDs, therefore various methods are available for structural evaluation of female reproductive system, among them is saline infusion sonohysterography (SISHG).

Objective: This study is designed to asses the role of SISHSG in the evaluation of infertility in area where the gold standard investigation modalities are not readily available.

METHODS: A hospital based cross-sectional study was carried out in Tikur Anbessa specialized hospital, 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), typically transvaginal US. Fifty consecutive infertile patients referred to radiology unite for SISHSG included in the study. Sensitivity, specificity, positive and negative predictive values were calculated for 26 patients who had both SISHSG and conventional HSG. Data was collected using structured questionnaires, entered and analyzed by SPSS version 23.0 software.

Result: A total of 50 patients had undergone SISHSG at the radiology unit for the clinical indication of infertility during the study period. Out of the included patients the majority of the patients were in the age group of 35-40(38%). Thirty four (68%) had secondary infertility and 16(32%) had primary infertility. Eighteen (36%) patients had normal study and the commonest abnormalities detected were 10(20%) myomatous uterus and 7(14%), Asherman syndrome/cervical stenosis followed by 5(10%) bilateral tubal blockage, 2(4%) right hydrosalpinx, 2(4%) chronic endometritis, 1(2%)left hydrosalpinx, 1(2%)right tubal blockage, 1(2%)endometrial polyp, 1(2%) large submucous myoma, as well as one(2%) patient with concomitant PCOS with cervical stenosis and right hemorrhagic ovarian cyst.

Among 50 patients, 26(52%) had both SISHSG and conventional HSG study, the sensitivity, specificity, PPV and NPV of SISHSG in normal study, Asherman syndrome/cervical stenosis and chronic endometritis were 100%, 100%,100% and 100% respectively 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 evaluation of infertility.

Key words; TVS, SISHG, infertility, TASH.

CHAPTER ONE: INTRODUCTION

BACKGROUND

Female infertility is associated with high incidence of uterine cavity and fallopian tube pathology therefore various methods are available for structural evaluation of female reproductive system[1) among these evaluation method saline infusion sonohysterography (SISHSG) also referred as hysterosonography(HSG), sonohysterography(SHG) is one of them and it was first described by Parson and Lence in 1993, SISHSG is a technique that may help improve visualization of the endometrium and endometrial cavity, distinguish between lesions of endometrial and myometrial origin, and assess tubal patency. It consists of instillation of fluid into the endometrial cavity with simultaneous pelvic ultrasonography (US), typically transvaginal ultrasound (TVS).[2]

Key indications for SHG 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; and inadequate imaging by TVS. The main contraindications of SISHSG include pregnancy, pelvic infection and excessive vaginal bleeding[2,3,]. SISHSG ideally should be performed early in the follicular phase of the menstrual cycle (after cessation of menstrual flow) before day 10 because the endometrium is thin at this point[12]. A thin endometrium is critical so that the saline can more easily distend the uterine cavity and better accentuate endometrial pathology.

PROBLEM OF STATEMENT

Globally 10–15% of the couples are infertile [13]. Most infertile couples around the world suffer from primary infertility, which means that the woman has never conceived. Sub-Saharan Africa is a striking exception to this pattern: in this region most couples 52% suffered from secondary infertility—that is, a woman cannot conceive even though she previously has conceived. Latin America also has a relatively high rate of secondary infertility 40 % .In contrast, only 23 percent of infertile couples in Asia and 16 percent in North Africa suffered from secondary infertility [14].

For a great many women in developing countries, infertility results from untreated pelvic inflammatory disease (PID), a sequela of an STD or other reproductive tract infection. PID can scar

the fallopian tubes, either blocking them completely or damaging the mucosa and cilia needed for them to function. The risk of tubal-factor infertility doubles with each successive episode of PID and is five times greater after a severe infection than a mild infection [15]. Abnormalities of the fallopian tubes are responsible for infertility in affected couples in about 30 % of cases[16] In Ethiopia the prevalence of primary infertility has declined from 4.4% in 2000 to3.3% in 2005 whereas secondary infertility increased from 4.3% in 2000 to 4.6% in 2005. [17]

One of the initial investigations when determining reproductive ability thus is evaluation of the fallopian tubes as well as uterine cavity. Anatomic causes of infertility are more common in developing countries like Ethiopia, in such low resource setting 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 and it is not only safer and cheaper but it's as accurate as HSG in evaluating the fallopian tubes and uterine cavity in infertile patients . TASCSH had 100% sensitivity, specificity and positive predictive value for uterine synechiae, hydrosalpinges and bilateral tubal blockade but 31% sensitivity for unilateral tubal blockade. TASCSH also showed 100% concordance with HSG in submucous masses (polyps & Fibroids) and found to be less painful by 80% of the patients [11].

CHAPTER TWO: LITRATURE REVIEW

Saline infusion sonohysterosalpingography (SISHSG) enhances the endometrial visualization achieved with standard TVS [4]. It serves as a supplementary methodology to TVS to better evaluate the endometrium. Specifically, it entails instillation of normal saline into the endocervical canal to enhance detection of endometrial abnormalities, further define potential abnormalities initially detected by standard TVS[2], and evaluate anatomical causes of infertility, namely submucosal myomas, endometrial polyps, anomalies and intrauterine adhesions[3,4]. Distension of the endometrial cavity in patients with endometrial stripes too difficult to detect on TVS can enable the radiologist to better visualize and characterize pathologies.

SISHSG is most commonly performed to evaluate abnormal uterine bleeding in pre- and postmenopausal women (2,3). Other indications include infertility, recurrent miscarriage, and suspected congenital uterine abnormalities (5). SISHSG is more accurate than TVUS for depicting endometrial conditions and is less invasive than hysteroscopy (6,7). Although tubal patency may be indirectly assessed at SIS by measuring the amount of free fluid that accumulates during the procedure, a more quantitative evaluation requires the use of contrast material or air injection.

A comparative evaluations of SISHSG and hysterolaparoscopy for diagnosis of uterine cavity abnormalities and tubal patency in infertility. A one year cross sectional study was done in assisted reproduction center at Dr Prabhakar Kore Hospital and Medical Research Center, Belgamum, India. in the research 60 patients with primary and secondary infertility were participated and the result was for evaluation of uterine cavity when compared with hysteroscopy, SIS had a sensitivity of 97.8%, specificity of 88.8% positive predictive value(PPV) of 97.8% and negative predictive value(NPV) of 88.8%. For evaluation of tubal patency when SIS was compared to laparoscopy with chomopertubation SIS has a sensitivity of 83.3%, specificity of 82.9% , PPV of 42.9% and NPV of 97.5% (8).

In Ankara, Turkey, American Hospital of Istanbul, IVF Unit, a comparative evaluation of intrauterine abnormalities in infertile patients by sonohysterography was done and transvaginal ultrasonography, sonohysterography, hysterosalpingography and finally hysteroscopy were performed in 37 patients with primary and 25 patients with secondary infertility. Suspected uterine,

anomalies were also confirmed by laparoscopy. Trans-vaginal ultrasonography and hysterosalpingography were able to detect 36.3 and 72.7% of uterine pathologies respectively. Sonohysterography was able to detect all the anomalies except for a single endometrial polyp (90.3%). However, there was no significant difference between the diagnostic capabilities of these methods.[9]. Another research done in Turkey, Istanbul in Zeynep Kamil Maternity Hospital, and Marmara University School of Medicine, on evaluation of tubal patency by transvaginal sonosalpingography, The results obtained from transvaginal sonosalpingography and laparoscopy were completely consistent for 29 cases (76.32%) and partially consistent for 8 cases (21.05%). Transvaginal sonosalpingography accurately showed patency in 26 patients and bilateral non patency in 3 patients.[10]

Research done in Nigeria on one hundred consecutive patients referred to the radiology unit for Hysterosalpingography and who gave consent for TASCSH as well HSG were included in the study. Sensitivity specificity, positive and negative predictive values of TASCSH was calculated using the widely used HSG as the gold standard. Transabdominal Saline Contrast Sonohysterography (TASCSH) had 100% sensitivity, specificity and positive predictive value for uterine synechiae, hydrosalpinges and bilateral tubal blockade but 31% sensitivity for unilateral tubal blockade. TASCSH also showed 100% concordance with HSG in submucous masses (polyps & Fibroids) and found to be less painful by 80% of the patients.[11]

Based on a prospective study of 1153 patients who underwent SHG, complications have been documented. Complications of SHG include failure to complete the procedure owing mainly to patient noncompliance (7% of patients), pelvic pain (3.8% of patients), vaginal symptoms (3.5% of patients), nausea (1% of patients) and post procedure fever (0.8% of patients)[12]. Preprocedurally, 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.

SIGNIFICANCE OF THE STUDY

The cultural practices and attitudes of nations and nationalities in Ethiopia uphold reproduction as the most important function of families. Childlessness remains to be the most undesirable experience within marriage for most couples. Unfortunately, due to the long standing traditional outlooks of the vast majority of the society, women are expected to carry the burden of impaired fertility in a family. Like in many other populations, impaired fertility is an important health concern for Ethiopian women and most common cause of infertility in Sub-Saharan Africa countries including Ethiopia, is secondary infertility due to STD and genital tuberculosis.[16]. In order to lessen women burden and concern they should get appropriate treatment, however to initiate the right treatments the exact cause of the infertility should be sought. In this low resource setting, readily available, easy to interpret, safe, cheap and as accurate as HSG investigation modality like sonohysterography should be available in evaluating the fallopian tubes and uterine cavity in infertile patients[11]. The purpose of this study is to assess the role of sonohysterography in the detection of abnormalities of the uterine cavity and fallopian tubes in infertile patients in areas where the gold standard investigation modalities are not readily available.

CHAPTER THREE: OBJECTIVES

GENERAL OBJECTIVE

- To assess the role of saline infusion sonohysterosalpingography in the evaluation of infertility in TASH between January 2019G.C. to August 2019 G.C.

SPECIFIC OBJECTIVE

- Assessing the role of SISHG in detection of uterine cavity abnormalities in infertile patients.
- To determine role of SISHG in assessing fallopian tubes patency in infertile patients.
- To describe the various SISHG findings in patients with infertility.
- Comparing the specificity, sensitivity, positive and negative predictive value of SISHG with those patients who had conventional HSG.

CHAPTER FOUR: METHODS AND MATERIALS

STUDY AREA

The study was conducted in the Department of Radiology, School of Medicine, Addis Ababa University, Tikur Anbessa Specialized Hospital (TASH). TASH is one of the largest governmental teaching hospitals in the country situated at its capital with 700 beds, 200 doctors, 379 nurses and 115 other health professional. The radiology department has two CT scans (64 and 128 slice), 1MRI machine (1.5T), 3 X-ray machines, an adult and a pediatric ultrasound unit.

STUDY DESIGN AND PERIOD

A prospective hospital based cross-sectional study has been carried out to assess role of SISHG in the evaluation of infertility in Tikur Anbessa specialized hospital between January 2019 to August 2019 G.C.

POPULATION

SOURCE POPULATION

The source population was all women who visited gynecology and obstetrics (Gyn and OBS) department in TASH.

STUDY POPULATION

The study population was all women who have primary or secondary infertility who were visited gynecology and obstetrics (Gyn and OBS) department in TASH.

SAMPLE POPULATION

Two cases of women with infertility who fulfilled the inclusion criteria and was willing to participate in the study were selected each week. Consecutive 50 cases have been enrolled over the 6 months study period.

INCLUSION / EXCLUSION CRITERIA

Inclusion criteria:-

All women presented to Gyn and OBS department for primary or secondary infertility and referred to radiology department for pelvic ultrasound.

Exclusion criteria:-

- Patient who have pelvic inflammatory diseased
- Pregnant women.
- Patient who have active vaginal bleeding.

SAMPLING TECHNIQUE AND SAMPLE SIZE DETERMINATION

All patients who had both primary and secondary infertility who were sent to radiology department for pelvic ultrasound and fulfilled the inclusion criteria as well as who were willing to participate in the research were subject to SISHG. The patients had been selected based on convenience sampling method and a total of 50 patients were participated in 6 months period (two patients per week).

MEASUREMENT

STUDY VARIABLES

Dependent variables;

- Uterine abnormalities(Congenital or acquired uterine cavity abnormality)
- Tubal patency

Independent variables:-

- ✓ Age.
- ✓ Parity

DATA COLLECTION METHOD

Using structured questionnaire prepared in English.

DATA COLLECTION TECHNIQUE

All patients were informed about the study, and the procedure was performed with their permission. The entire participants were given doxycycline 100mg PO BID, two day prior to the procedure and 3 days post procedure with a total of 5 days. On the day of the procedure every patient had given diclofenac 100mg suppository once 30 minute prior to the procedure. Initially, all patients were evaluated with pelvic ultrasonography using a transabdominal with probe a 3.5MHZ transducer as well as transvaginal probe with a 7.5 MHz transducer (SSI-8000 SonScape Co.). The dimensions and contours of the uterus, the endometrial lining and thickness, both adnexal structures and pouch of Douglas has been examined. And then, SISHG was performed with the patient in the dorsal lithotomy position. A standard bivalve speculum was inserted, the cervix has been cleaned with povidone–iodine solution but tenaculum was not used. A pediatrics both 8F and 10F Foley catheter used depending on the parity of the participant, threaded with a ring forceps, has been inserted through the cervical canal, until it reaches the fundus. It was then drawn 1.0–1.5 cm back and the catheter was fixed by inflating its balloon with 2.0 ml sterile saline. The speculum then removed carefully, so as not to dislodge the Foley

catheter, and the transvaginal probe was reinserted in the posterior vaginal vault. 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 as well as fluid extra sating to pouch of Douglas, infusions was slowly because rapid infusion causes abdominal cramp. All the SISGH images and videos were saved on the ultrasound machine and report of the study given to patients.

DATA QUALITY CONTROL

The collected data was cross-checked by my advisors and data completeness and consistency checked and confirmed throughout the study period.

DATA ENTRY AND ANALYSIS

Data entry, coding and analysis were performed using SPSS version 23 software. Results were presented using tables and figures represented in percentage and measures of central tendency, then summarization and comparison of data was done. P-values less than 0.05 were considered statically significant.

OPERATIONAL DEFINITION

- **Infertility:-** A failure to conceive within one or more years of regular unprotected coitus.
- **Primary infertility: -** Those patients who have never conceived
- **Secondary infertility: -** Indicates previous pregnancy but failure to conceive subsequently
- **Uterine cavity abnormality:-** That includes congenital and acquired lesions.
- **Normal SISHG study:-** Symmetrically expanded uterine cavity upon saline instillation. The endometrial lining should appears smooth, with symmetric depth to both sides of the canal as well as the presence of fluid in pouch of Douglas, otherwise referred as abnormal study.
- **Tubal patency**: - The presence of fluid in pouch of Douglas following transcervical injection of a sterile isotonic solution of saline.
- **Bilateral tubal blockage:** Absence of saline in cul-de-sac despite well distended endometrial cavity after saline infusion.
- **Asherman syndrome/cervical stenosis:** unable to infuse saline into the endometrial cavity after cervix with successfully catheterize in a patient who had non physiologic ammenonriea had history procedure for abortion treatment, caesarian section or genitourinary Tuberculosis.
- **Myomatous uterus:** The presence of multiple either both intramural and submocous masses or intramural masses that have resulted in endometrial cavity outline distortion.

ETHICAL CONSIDERATION

The ethical clearance was obtained from Addis Ababa University Department of radiology Research and ethical Committee and informed consent taken from all the study subjects following a brief discussion about the purpose and importance of the study. The procedure as well as data has been collected only from those who were willing to participate in the research. Detail emphasis has given the privacy and confidentiality given to all the information gathered from all participant subjects. There were no financial benefit for those who were participated in the study and those who said no have not been harmed in any way.

CHAPTER FIVE: RESULT.

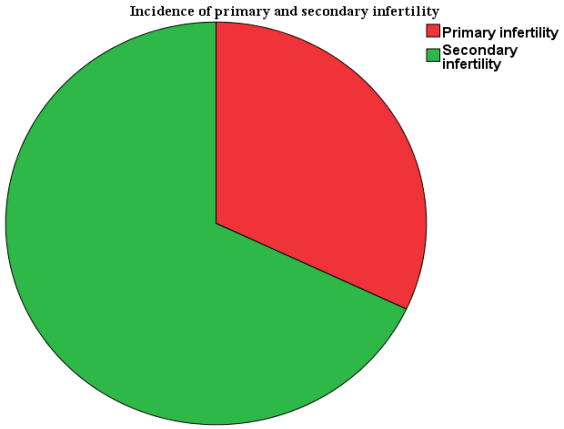
In this prospective study a total of 50 patients who fulfilled the inclusion criteria were underwent saline infusion sonohysterosalpingography. The majority of the patient were in the age group of 35-40(38%)(Table1). Thirty four (68%) had secondary infertility and 16(32%) had primary infertility. Out of these 50 patients 26(52%) had undergone conventional hysterosalpingography study.

Table 1: Age incidence of patients who underwent SISHSG study in Tikur Anbessa Hospital radiology department between January 2019 to August 2019G.C.

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

Out of 50 patients 19(38%) had history of abortion, 5(8%) gynecological procedure, among the procedures majority 3(6%) were dilatation and curettage for the treatment of abortion. Besides, the above reproductive history, 1(2%) patient had previous right tubal ectopic pregnancy and 2(4%) had history of treatment for pelvic inflammatory disease. Thirteen (26%) women husband had sperm analysis work up and only 1(2%) was turned out to be abnormal.

Figure1: Incidence of primary and secondary infertility in patient who underwent SISHSG study in Tikur Anbessa Hospital radiology department between January 2019 to August 2019G.C.



All the patients complained of pain during SISHSG; ranging from mild 40 (80%) patients; moderate in 9 (9%) patients and severe in one patients (2%). Out of the 50 patients no single patient had nausea, vomiting or vaginal bleeding during or after the procedure.

Table 2: Gynecological history of patients with infertility who undergone saline infusion sonohysterosalpingography at Tikur Anbessa Hospital radiology unit between January 2019 and August 2019 G.C

	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 procedures	**No procedure**	**45**	**90.0**
	Cesarean section	**1**	**2.0**
	Right salpingectomy	**1**	**2.0**
	D&C for abortion	3	6.0
	Total	50	100
Treatment for PID	**No**	48	96.0
	Yes	2	4.0
	Total	50	100

All of the 50 patients underwent SISHSG study and 18(36%) have normal study, 10(20%) myomatous uterus 7(14%), Asherman syndrome/cervical stenosis, 5(10%) bilateral tubal blockage, 2(4%) right hydrosalpinx, 2(4%) chronic endometritis, 1(2%)left hydrosalpinx, 1(2%)right tubal blockage, 1(2%)endometrial polyp, 1(2%) large submucous myoma, as well as 1(2%)right adnexal complex mass as well as one(2%) patient with concomitant PCOS with cervical stenosis and right hemorrhagic ovarian cyst. (Table 3 and figure 1-5). Those patient who diagnosed to have Myomatous uterus had no conventional HSG study and most of them were treated and appointed to be treated surgically based on our findings on SISHSG.

Twenty six (52%) patients had conventional hysterosalpingography study and 7 (14%) of them diagnosed to have Asherman syndrome/cervical stenosis, 9(18%) normal study, 5(10%) bilateral tubal blockage, 3(6%) right tubal blockage and 2(4%)chronic endometritis.

In this study all patients diagnosed to have Asherman syndrome/cervical stenosis both in SISHSG and conventional HSG mainly based on 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%) patient who diagnosed to have bilateral tubal blockage by conventional HSG, however, both patient showed adequate amount of saline within the cul-de-sac post saline infusion.

Table 3: Saline infusion sonohysterosalpingography final diagnosis in infertility patients at Tikur Anbessa Hospital radiology unit between January 2019 and August 2019

SISHG diagnosis	Number of cases	Percentage (%)
Normal	18	36.0
Myomatous uterus	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

There was one (2%) patient who had history of previous left ectopic pregnancy for which left salpingectomy was done and her conventional HSG interpreted as right tubal blockage and on SISHS study there was no saline is in the cul-de-sac and diagnosed to have unilateral right tubal blockage.

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.

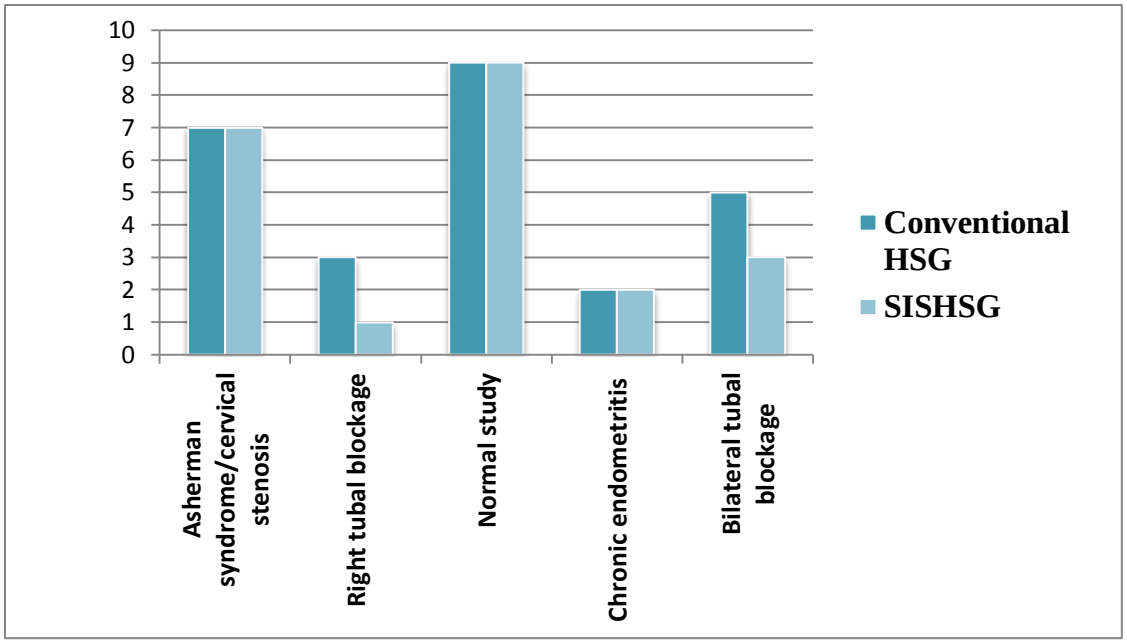


Figure 2: Final diagnosis of infertile patients who had both SISHSG and conventional HSG attended radiology department in Tikur Anbessa Hospital between January 2019 to August 2019 G.C.

Table 4: Sensitivity, specificity ,PPV and NPV of SISHSG as compared to conventional HSG for 26 infertile patient who had both modalities who attended radiology department in Tikur Anbessa Hospital between January 2019G.C to August 2019G.C.

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

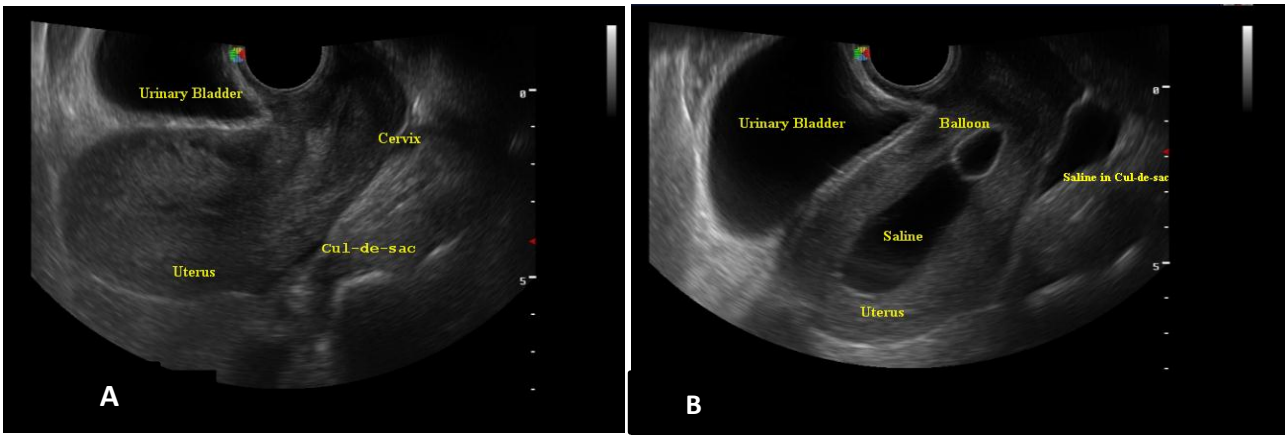


FIGURE 3: Normal SISHG study: Sagittal transvaginal ultrasound of a 29years old lady with secondary infertility before saline infusion **(A)** and after saline infusion **(B)** showing well distended, smoothly outlined endometrial cavity and adequate amount of saline within the posterior cul-de-sac after infusion of saline likely showing patent fallopian tubes. **Tikur Anbessa Hospital, 2019.**

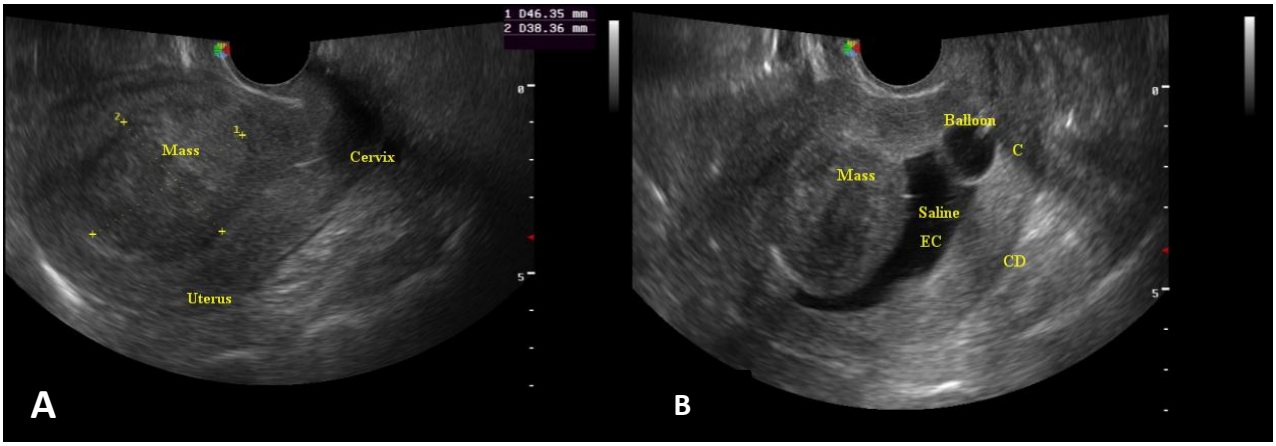


FIGURE 4: Large submucous myoma with bilateral tubal blockage: A 38year old lady presented with secondary infertility, sagittal trans vaginal ultrasound showing heterogeneous intracavitary lesion filing the endometrial cavity,**(A),** and poorly distended endometrial cavity by saline with broad based anterior uterine mass protruding into endometrial cavity. The lesion has endometrial lining suggesting sumocosal nature of the mass **(B).** There is no saline before and after saline infusion in cul-de-sac representing bilateral tubal blockage.[EC=endometrial cavity, CD=cul-de-sac]. **Tikur Anbessa Hospital, 2019**

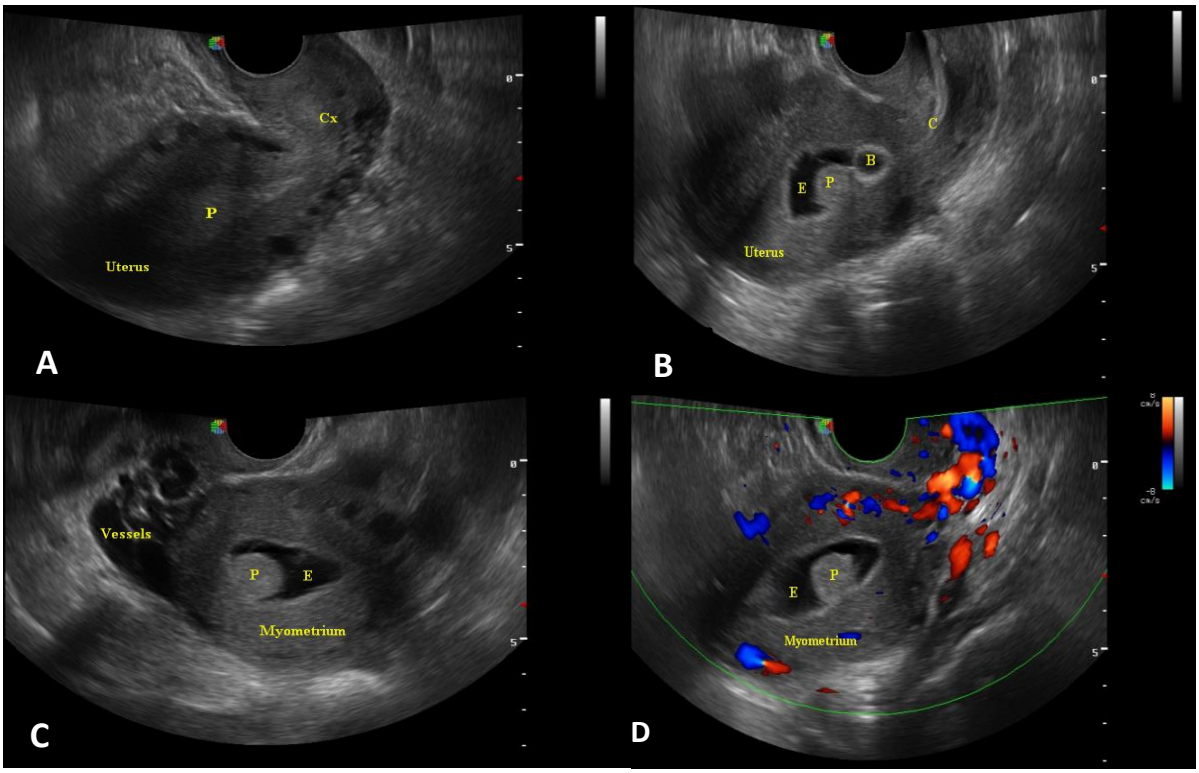


FIGURE 5:- Endometrial polyp: a 33 year old lady with primary infertility, sagittal and axial transvaginal ultrasound showing small posteriorly located intracavitary echogenic well defined pediculated polypoid lesion. Myometrial-endometrial interface is well outline suggesting endometrial nature of the lesion. 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 as well as the other portion of the endometrium with normal thickness **(B-D)**, [P=polyp, Cx=cervix, E=endometrial cavity filled with saline, B=balloon, C=catheter]. **Tikur Anbessa Hospital, 2019G.C.**

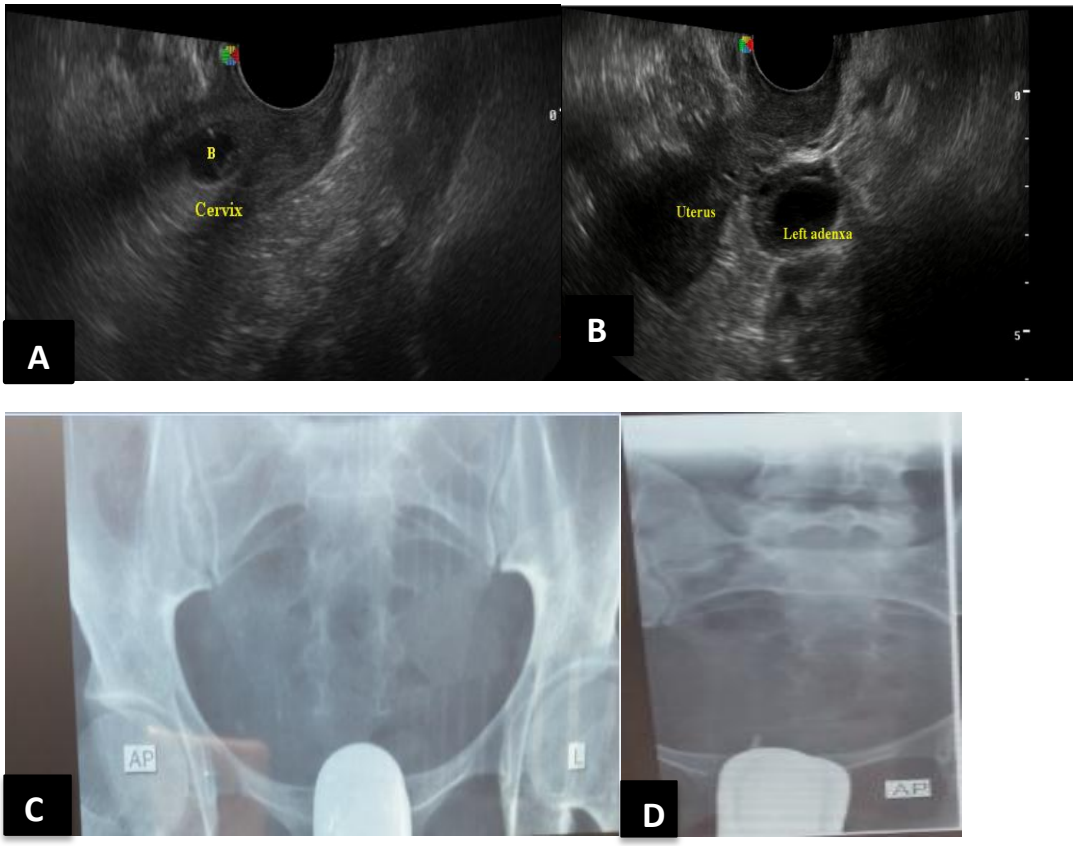


FIGURE 6 Asherman syndrome/cervical stenosis: - A 27 year lady who presented with secondary infertility and amenorrhea of 2years duration after she delivered her first child through cesarean section**. (A),** axial TVS the balloon is placed within the endocervix but the balloon was repeatedly dislodged upon saline infusion and back flow of saline into vaginal forncis noted. The uterus is elongated with distorted contour and endometrial strip is not well outlined as well as any saline seen within the endometrial cavity, **(B).** On conventional HSG, (**C-D)**, only the distal third portion of the cervix partially opacifed otherwise most portion of cervix, uterus and fallopian tubes were not opacifed despite repeated attempts. **Tikur Anbessa Hospital, 2019.**

CHAPTER SIX: DISCUSSION.

Out of the 50 patients majority of them were within the age range of 35-40 years (38%) and most of them(68%) had secondary infertility which is in accordance with but slightly higher than a report done by Program for Appropriate Technology in Health which showed 52% of Sub Saharan countries women with infertility had secondary infertility[14].

In our research out of 50 patient had 10(20%) myomatous uterus , 2(4%) chronic endometritis, 1(2%)submucos myoma and 1(2%) endometrial polyp which is consistent with a research done in Turkey which showed SISHSG has the upper hand in detecting uterine cavity lesions and intramural lesion as compared to conventional HSG and TVS [9].

Among those patient who underwent SISHSG the majority of them 18(36%) had normal study which is similar with study done in Ahvaz, Iran [18].

In this study SISHSG had 100% sensitivity, specificity and predictive value in diagnosing, normal and Asherman syndrome/cervical stenosis as compared to conventional HSG which similar with research done in Nigeria comparing trans abdominal saline contrast sonohysterography with conventional HSG , however, regarding bilateral tubal blockage SISHSG diagnosis, it had 50 % sensitivity, and 90% specificity which was low as compared to the Nigerian research which had 100% sensitivity and specificity [11].

In our study unilateral tubal blockage had sensitivity of 33% which is low and similar with a research done in Nigeria and Turkey [9, 11]. Two cases of chronic endometritis diagnosed with SISHSG were consistent with conventional HSG.

All the patients complained of pain during SISHSG; ranging from mild 40 (80%) patients; moderate in 9 (9%) patients and severe in one patients (2%) which is similar with a research done in India [8], however in this study no single patient had complained of nausea, vomiting or vaginal bleeding during or after the procedure which is in contrary to a similar procedure done in USA in which few patients had the above complaints [12].

Conclusion:

SISHSG is cheap, easy to do, safe procedure and has high sensitivity and specificity in detecting uterine cavity abnormality, we advocate its use as a first step of investigation modality in evaluation of infertility.

Limitations

- Our study is, as to our knowledge, it is the only study that showed the role SISHSG in the evaluation of infertility in Ethiopia and the whole of East Africa as result it was difficult to compare it with other loco-regional pervious research.
- HSG, which was taken as our gold standard reference, done at different institution, by different professional namely by radiologist and gynaecologist, by different modalities namely fluoroscopy and X-ray, on different day with SISHSG as well as for some patient we received only the report of the procedure and for other patient only static image which has affected our conclusion.
- Those patients who had both SISHG and conventional HSG were few in number which likely affected our conclusion and generalization regarding sensitivity, specificity, PPV and NPV.

Recommendations

For services and policy:

- In the study period in Tikur Anbessa Hospital, conventional HSG was not available for the patient, we recommended radiology department of Addis Ababa university to make SISHSG as routine service to be given for clients if possible in combination with conventional HSG.

For research

- Further prospective study should be done by radiology department in association with Gyn and Obs department with large sample size patient who will undergo both SISHSG and conventional HSG as it would give more accuracy in specificity and sensitivity of the procedure.

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7. ANNEX QUESTIONNAIRE

Part I preprocedure

No	Questions and filters	Response
1	Personal information	1. Name 2. Age 3. Medical record number 4. Any allergy?
2	Last normal menstrual period(LNMP)	
3	Have you ever been pregnant before(primary or secondary infertility)	**1. Yes** **2. No**
3	Pre procedure abdominal US scan	**1 fluid in pouch of Douglas** **A. No** **B. Yes** **2 any lesion (specify)**

Part II during the procedure

No	Questions and filters	Response
1.	Endometrial cavity Distensibility	1. yes 2. no

2	Subendometrial/Myometrial mass	1.yes 2.no
4	If the answer is yes for no4	1. Focal 2. Ill defined 3. Isoechoic 4. Hypoechoic 5. Echogenic
6	Congenital uterine cavity abnormality	1. No 2. Yes (specify)
7	Intracavitary Lesions	1. Absent 2. Linear band 3. Mass 4. Other _____
8	Linear band	1. Single 2. Multiple 3. Bridging 4. Non- bridging 5. Mobile 6. Non mobile 7. Difficult to assess 8. Thickness _____mm 9. Location 10. Other _____
9	Both fallopian tube, any lesion	1. No 2. Yes , specify _____

10	Fluid in pouch of Douglas	1. Yes 2. No	

Part III. Post procedure

16	Pain	1. no 2. yes A mild B. moderate C. severe	
17	Nausea	1. no 2. yes	
18	Vaginal bleeding	1. no 2. yes	
19	Other (specify)		

Final diagnosis:

1. Normal
2. Adhesion
3. Submucosal myoma
4. Tubal blockage
5. Congenital uterine abnormality (specify)
6. Other