Original Article

Spectrum of saline-Sono-Hysterosalpingographic findings in women with infertility in a tertiary hospital in Nigeria

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Abstract

Background: This study investigated the effectiveness of saline-sono- hysterosalphingography (S-SHSG) in diagnosing infertility causes among women in a tertiary hospital in Abuja, Nigeria. **Aims and Objectives:** To describes the various findings in the endometrial cavity and the fallopian tubes in women of reproductive age with infertility. **Materials and Methods:** Researchers enrolled 200 infertile women undergoing S-SHSG at a local hospital. Data on demographics, infertility history, and S-SHG findings were collected. **Results:** Nearly half the participants fell within the 30–39-year age range. Secondary infertility was more frequent than primary infertility. The average duration of infertility was 8.7 years. Over half the women (52.5%) exhibited abnormal S-SHSG results. Submucous myomas (19.5%), polyps (11.0%), and adhesions (13.5%) were the most frequently detected endometrial cavity abnormalities. Fallopian tubal patency assessment revealed, bilateral patency in 61.5% of the women, unilateral patency in 21.5%, and bilateral blockage in 16.0%. **Conclusion:** Overall, this research reinforces the use of S-SHSG as a safe and effective diagnostic method for investigating female infertility. The high prevalence of abnormalities underscores the importance of S-SHSG in infertility evaluations. The study acknowledges limitations such as occasional inability to fully assess the uterine cavity and a restricted evaluation of the cervix.

Keywords: Infertility, saline infusion sonohysterography (S-SHG), tubal patency

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INTRODUCTION

Infertility, a disease of the reproductive system, is defined as the failure to achieve a clinically proven pregnancy after 12 months or more of regular unprotected sexual intercourse.[1] Infertility can be classified generally into primary and secondary.[2]

Imaging tools used for the evaluation of infertility include hysterosalpingography (HSG), pelvic ultrasound, hysterographic ultrasound, and magnetic resonance imaging.[3]

"Instillation of saline, and potentially air bubbles or other echogenic contrast agents during sonography has been known by many names including sonohysterography, hysterosonography, transvaginal sonography (TVS) with fluid contrast augmentation, saline infusion sonography, and finally saline – sono – hysterography (S-SHG). When this procedure is performed with particular attention to the fallopian tubes, it is sometimes known as sonosalpingography."[4]

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There is a global rise in the incidence of infertility with increased demand for *in vitro* fertilization (IVF), thus increasing the request for S-SHSG. S-SHSG evaluation of women with infertility will help to identify those patients in whom hysteroscopy and surgical intervention is necessary before IVF, thus improving the outcome of IVF which is a modern solution to infertility.

It is high level of diagnostic accuracy has been documented.[5,6]

This study will provide a yardstick for the various patterns of presentation of the endometrial cavity in women with infertility in National Hospital, Abuja, and provide a collaborative platform for IVF treatment in the hospital, thus contributing to the management of patients with infertility.

MATERIALS AND METHODS

Study design and setting

This is a cross-sectional study that was carried out from October 2017 to April 2018 (over a period of 7 months) at National Hospital, Abuja, Nigeria. National Hospital Abuja is a 400-bed tertiary health institution in the central area of the federal capital city of Nigeria, having a diverse population of people from all local ethnic groups.

Study population

A total of 200 women of childbearing age within the range of (≥18–49 years) presenting to the gynecology clinic of National Hospital, Abuja with infertility, who were referred to the Radiology Department for Saline – Sonohysterosalpingography were recruited into the study after informed consent was obtained. A consecutive sampling method was used in recruiting the patients.

Inclusion and exclusion criteria

Women ≥18–49 years, with infertility who consented were included in the study. Those excluded include women referred for S-SHSG for reasons other than infertility, pregnant women, and women with an abnormal vaginal discharge.

Ethical approval

Approval of the ethical committee of National Hospital, Abuja was obtained before commencement of this study [Appendix I].

Sonographic technique

The procedure was performed on an outpatient basis, during the early proliferative phase (between days 6 and 10) of a menstrual cycle using the 10th day rule.[7] Patient preparation included counseling (at the booking point) and obtaining informed consent on the day of the examination. The patient's bio data was recorded before the commencement of the examination on a data sheet. Each patient was requested to change into a sterile surgical gown, draped, and examined in the lithotomy position. An assistant was also deployed. Each patient was given 10 mg of Buscopan, through the intramuscular route about 5 min before commencement of the procedure.

A strict aseptic technique was observed. A small amount of coupling gel was applied to the tip of the probe before applying the condom, to remove the air interface between the condom and the probe. A detailed preliminary TVS was performed before saline infusion to assess the position of the pelvic organs and rule out any preexisting pathologies. The size of the uterus was measured in three planes (L × AP × TR) using the electronic calipers [Figures 1 and 2]. The status of the endometrial plate, myometrium, ovaries, and pouch of Douglas was noted.

The bi-layer endometrial plate thickness was measured at the thickest fundal part in the sagittal plane.[8] Any free pelvic fluid seen on the preinfusion scan was quantified, recorded, and compared with the postinfusion volumes, with measurements taken in three dimensions using the common ellipsoid formula (L × W × H) 0.52 to obtain the volume. The probe was removed, and then the Cusco's speculum was placed into the vagina to visualize the cervix. The vagina and cervix were cleaned with chlorhexidine antiseptic solution. The anterior lip of the cervix was held with a vulsellum forcep's to stabilize the cervix, where necessary. An HSG/SHG catheter with a syringe prefilled with 20 mL of sterile normal saline was introduced through the cervix, taking care to evacuate air bubbles. With the catheter tip at the level of the internal cervical

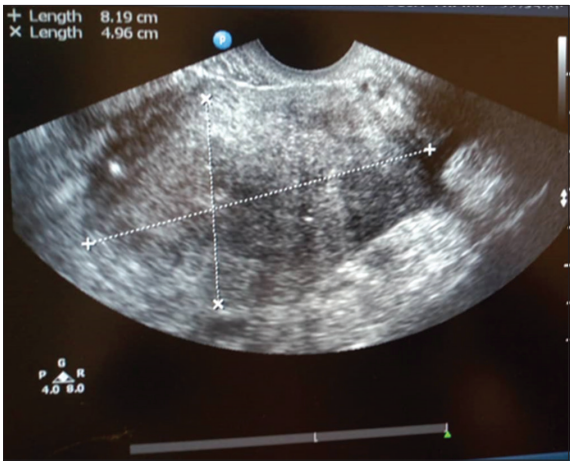

Figure 1: A Transvaginal ultrasound scan (USS) image showing the Uterus measured in length and Anterior – Posterior diameter

os, the catheter balloon was inflated with 1–2 mL of sterile normal saline. Once the catheter was fixed, the Cusco's speculum and vulsellum were removed, and the transvaginal probe was re-introduced into the vagina alongside with the catheter for further assessment. With the help of the assistant, saline at room temperature was injected through the catheter slowly. The amount of saline infused was variable, ranging from 20 to 40 mL depending on uterine distension and patient's tolerance. Scanning on B mode was done, with a sagittal sweep starting from one cornua to the other cornua, followed by an axial sweep from the fundus to the external os. Representative images were acquired in both longitudinal and transverse planes to assess the saline-distended uterine cavity for any abnormality.[5] The single-layer endometrial plate thickness was measured and recorded at the thickest point of the fundus anteriorly and posteriorly in the sagittal plane.[8] Passage of saline (fluid) through the fallopian tubes was also checked, and inferred by the presence of fluid in the adnexa around each ovary and its collection in the pelvis. Free fluid spilled around the ovary was demonstrable on the side of tubal patency. The increase in the volume of preexisting free fluid in the pouch of Douglas was inferred as the presence of at least a patent fallopian tube. The absence of spill in some of the patients may be as a result of tubal spasm, or an indicator of tubal blockage. At the end of the procedure, a quick scan was done to check for a persistent loculated fluid spill that will suggest hydrosalpinx. The catheter balloon was deflated, and the catheter and transducer were then removed. Each patient was cleaned up. Each procedure lasted for about 15–30 min.

Postprocedural care included an explanation of the imaging findings to the patient. They were told to expect leakage of fluid that may be blood-stained or have a similar color with the cleansing solution. Patients were also instructed to contact their managing gynecologist if they experienced persistent lower abdominal pain, unusual bleeding, or fever.

Figure 2: Showing a Transvaginal USS image of the Uterus in transverse plane, with the transverse diameter measured

Sample size estimation

The sample size is estimated using Fischer's formula below.[9]

$$n = Z^2pq/d^2$$

Where:

n = desired sample size

Z = standard normal deviation = 1.96 at 95% confidence interval

P = prevalence of infertility = 14.8% (0.148).[11]

$q = 1 - P = 0.855$ (proportion in the target population not having the particular characteristic)

d = degree of accuracy, usually set at 0.05

Therefore, $n = (1.96)^2 \times 0.148 \times 0.855/(0.05)^2 = 194.4$.

To make up for the possible error of attrition, the above figure was adjusted using an approximate response rate of 90%, making 200.

Data analysis

Data collected was entered on IBM SPSS version 20.0 (IBM® Chicago, USA, 2011) and analyzed. Chi – square tests and Fishers exact test were used where applicable. Results obtained were presented as p - values, odds ratio and simple percentages using tables and pie charts as appropriate. The P value was set at 0.05 (95% confidence interval).

RESULTS

This is a study comprising of 200 infertile women within the reproductive age group. Almost half of these women, 99 (49.5%) were within the age range of 30 – 39 years [Table 1]. Out of the 200 women examined, 70 women (35.5%) had primary infertility, with majority of them (42.4%) seen presenting within the age range of 30 – 39 years. [Table 1]. Majority of the women, 79(39.5%) were seen to present within 6 – 10 years of infertility, while

Table 1: Age distribution of subjects

Age	Primary, *n* (%)	Secondary, *n* (%)	Total
<20	1 (100.0)	0	1
20–29	7 (50.0)	7 (50.0)	14
30–39	42 (42.4)	57 (57.6)	99
40–49	20 (23.3)	66 (76.7)	86
Total	70 (35.0)	130 (65.0)	200

39 (19.5%) of the women were seen to present following 11 – 15 years of infertility. Also, amongst the risk factors for infertility, previous termination of pregnancy was highly reported, 77 (38.5%). Previous myomectomy was highly reported 46 (62.1%), and few of the subjects had ovarian surgeries in the past 1 (1,3%) [Table 2].

Some of the women had findings other than those in the endometrial cavity and fallopian tubes, seen either in isolation or in combination with the above-mentioned abnormal findings. These findings were either related to the myometrium, ovaries/adnexa, or both. These include intramural myomas, subserous myomas, and a complex left pelvic mass in one of the patients. Some of the patients had a combination of intramural and submucous myomas. The uterus of one of the patients was atrophic [Table 3].

Submucous myomas was the commonest endometrial cavity finding, seen in 39 (19.5%) of cases. Endometrial calcifications were seen in 8 (4.0%) of the cases [Table 4].

The assessment for tubal patency suggests bilateral tubal patency in 123 (61.5%) of the women examined, unilateral tubal patency in 43 (21.5 %), and bilateral tubal blockage in 32 (16.0%) of the women. In patients with unilateral tubal patency, right sided tubal patency was seen to be commoner accounting for 24 (12.0%) of the cases [Figure 3].

All the women within the age range of < 20 years and 20 – 29 years gave a history of regular menstrual cycles, similarly 86 and 66 women within the age range of 30 – 39 and 40 – 49 respectively had regular menstrual cycles. Menstrual abnormalities ranging from hypomenorrhoea, menorrhagia, and secondary amenorrhoea were observed in women within the age ranges of 30 – 39 years and 40 – 49 years [Figure 4].

The commonest occurring endometrial cavity finding was submucous myoma [Figures 5 and 6],seen in 39 (19.5%) of the women [Table 4]. Endometrial polyps [Figure 7], were seen in 22 (11.0%)of the women [Table 4]. Uterine synaechiae was observed in 1 (1.7%) of the women, [Table 3]. About 8 (4.0%) of the women were found to have endometrial calcifications [Table 4, and Figure 8].

DISCUSSION

The index study aimed at demonstrating the value of S-SHSG as a diagnostic tool in the investigation of women with infertility. The age distribution showed an early presentation of the women to an infertility clinic, with about 50% of the subjects seen within the age range of 30–39 years. This may be due to the onset of a decline in fertility that begins at the age of 35 years.[10] Secondary infertility was the most common form of infertility observed in this study, accounting for 130 (65.5%) of the cases. This finding is similar to that of studies on the spectrum of saline infusion sonhysterographic findings conducted in the Southeast part of Nigeria,[11] and another one carried out in Southwestern Nigeria.[12] Another similar study carried out in Karnataka, Southwestern India,[5] revealed primary infertility to be more common. This may be due to sociocultural variation, with the latter study being an Asian-based study. The higher prevalence of secondary

Table 2: Duration of infertility and risk factors for infertility

	Frequency (%)
Duration of infertility	
≤5	60 (30.0)
6–10	79 (39.5)
11–15	39 (19.5)
>15	22 (11.0)
Risk factors for infertility	
Diabetes	6 (3)
Hypertension	24 (12)
Thyroid disease	1 (0.5)
Galactorrhea	45 (22.5)
Previous termination of pregnancy	77 (38.5)
Previous spontaneous abortion	54 (27)
Past surgeries	74 (37)
Proportion of type of previous surgeries	
Right salpingectomy	5 (6.7)
Right ovarian cystectomy	3 (4.0)
Myomectomy	46 (62.1)
Laparoscopy	1 (1.3)
Hysteroscopy	1 (1.3)
Cesarean section	7 (9.4)
Bilateral salpingo-oophorectomy	1 (1.3)
Bilateral_ovarian_cystectomy	1 (1.3)
Appendicectomy	12 (16.2)
Thyroidectomy	1 (1.3)
Total	78 (104.9)

Table 3: Nonendometrial cavity-related findings

Outside endometrial cavity	Frequency (%)
Complex left pelvic mass	1 (1.7)
Intramural myomas	10 (17.2)
Mildly atrophic uterus	1 (1.7)
Multiple intramural and subserous myomas	8 (13.7)
Multiple intramural myomas	36 (61.0)
Subserous myoma	1 (1.7)
Uterine synechiae	1 (1.7)
Total	58 (98.7)

Table 4: Distribution of endometrial cavity findings on saline infusion sonohysterosalphingography

Frequency of findings on S-SHSG	Frequency (%)
Adhesions	27 (13.5)
Polyps	22 (11.0)
Submucous myomas	39 (19.5)
Endometrial calcifications	8 (4.0)
Abnormal endometrial plate thickness on S-SHSG	11 (5.5)
Asherman syndrome	1 (0.5)
Total	108 (54.0)

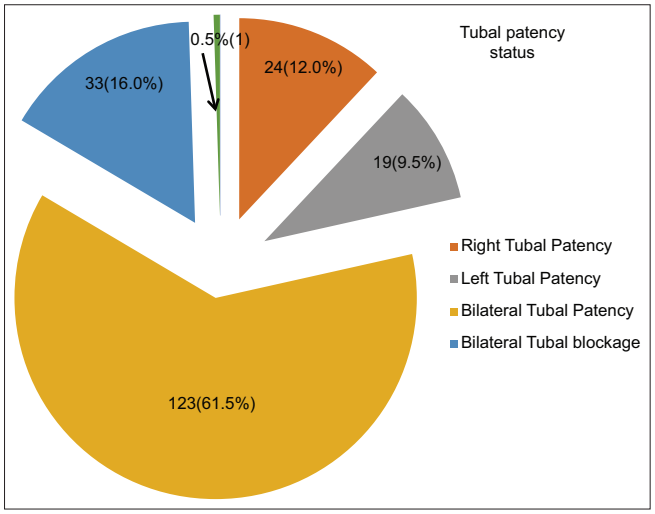

Figure 3: Pie chart showing tubal patency status

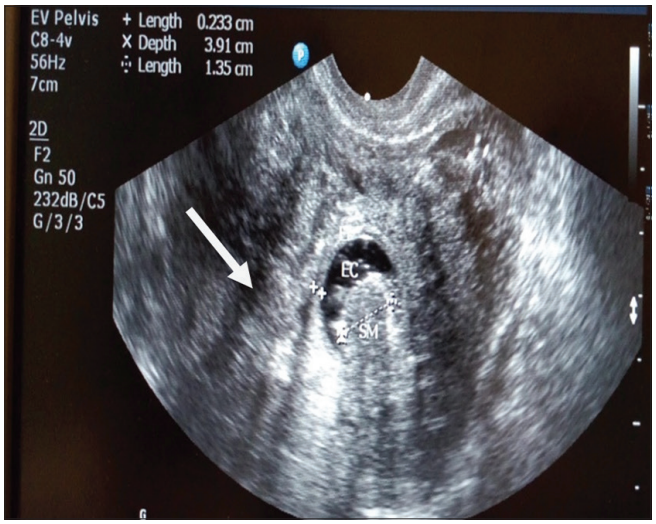

Figure 5: A transverse view of a Transvaginal USS image obtained during S-SHSG. A well – defined oval isoechoic mass is seen posteriorly with the echogenic endometrial plate draping over it anteriorly – suggestive of a submucuous myoma. Marked narrowing in the caliber of the endometrial cavity is also seen. EC = Endometrial cavity; SM = Submucuous myoma

infertility is presumably due to the high burden of infection in this environment, thus leading to tubal blockage.[13]

The mean duration of infertility was 8.7 ± 5.1 years. The majority of the women presented within 6–10 years of infertility. Similarly, the findings of a study conducted in the southwestern part of Nigeria.[12] The relatively early presentation of patients in the index study may be attributed to increased awareness of assisted conception techniques.

Only about one-fourth of the women (26.0%) had normal body mass index, with the majority of the patients seen to be overweight accounting for 53.5% of the cases. Women who had secondary amenorrhea were seen in the age ranges

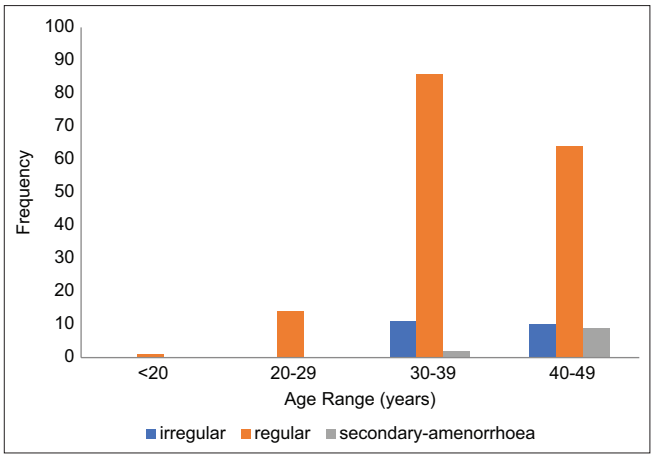

Figure 4: Menstrual history by age

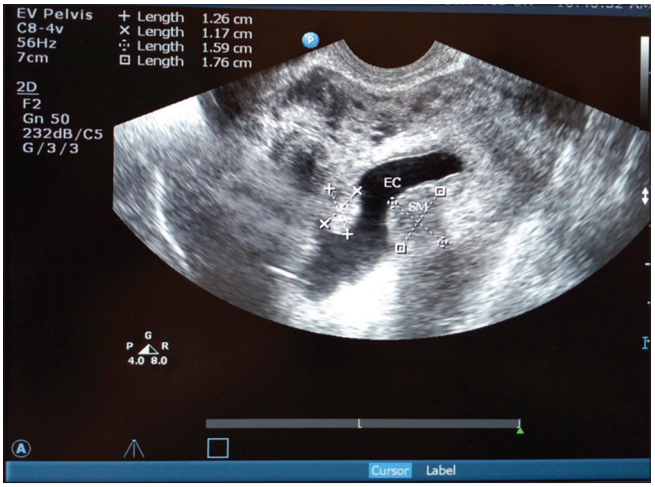

Figure 6: Transvaginal USS image in longitudinal via obtained during S-SHSG, showing a submucous myoma in the posterior endometrial wall and a sessile endometrial polyp in the anterior endometrial wall, all causing narrowing of the endometrial cavity. EC = Endometrial cavity. SM = Submucous myoma. P = Polyp

of 30–39 years and 40–49 years. This may be attributed to a decline in ovarian functions, with possible premature ovarian failure occurring in some of the women at the age range of 30–39 years.

This study has shown S-SHSG to be a useful multipurpose screening tool for the assessment of not only the endometrial cavity, uterine musculature, cervix, and ovaries but also the fallopian tubes. S-SHSG is a safe, less invasive, better tolerated, reliable, and readily available method of assessing the female genital tract.[12,14] The most common cause of female infertility is tubal occlusion;[15,16] thus, assessment of tubal patency is the most common and most practicable method of evaluating tubal function.[17]

This study shows that abnormal S-SHSG findings were more common than normal findings, accounting for

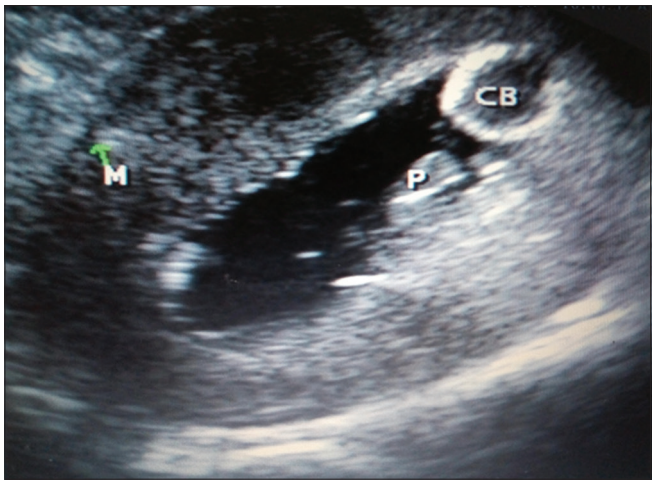

Figure 7: Transvaginal USS image in longitudinal view obtained during S – SHSG, showing a myoma and endometrial polyp attached to the posterior wall via a stalk. CB = catheter balloon. P = polyp. M = Intramural myoma

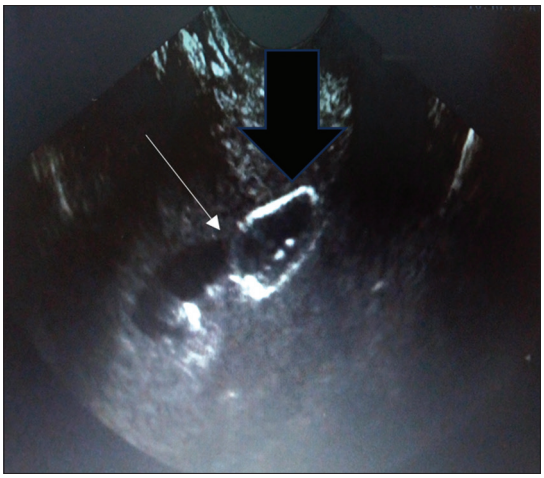

Figure 8: A Transvaginal USS image in longitudinal view obtained during S-SHSG, showing endometrial calcifications involving both walls (arrow), with associated posterior acoustic shadowing. An adhesion band is also seen (small white arrow head)

105 (52.5%) of the total number of cases, whereas the latter accounted for 95 (47.5%) of the cases. This is in contrast with the findings of some earlier Nigerian researches.[11,12,17] The aforementioned studies all showed a higher incidence of normal findings on S-SHSG. The high incidence of abnormal findings in the index study may be attributed to the center of the index study being a major National referral center for infertile women being worked up for IVF, also increased awareness. Furthermore, the smaller sample sizes in similar studies[11,17] may be a contributing factor.

The true prevalence of intrauterine lesions in infertile women is not known, with some studies reporting an incidence of about 16%–24%.[18] The most common endometrial cavity finding in the index study was seen to be submucous myoma. This finding is similar to that of a study by Onah *et al*.,[11] and Obajimi and Ogunkinle,[12] on saline sonohysterographic findings in infertile women. In some other studies, endometrial polyps were also found to be the most common finding.[5,19] The occurrence of congenital uterine anomalies was reported in some earlier studies,[5,11,12,19] with a high prevalence rate reported in the later study. The variations in the spectrum of findings are presumably due to variations in the geographical location of studies and thus composition of the population of the study. Furthermore, the higher sample size of 600 infertile women in the study by Ilan *et al*.[20] could be responsible for the variation in findings when compared with the index study. The second and third most frequently occurring findings, following submucous myomas were intrauterine adhesions and endometrial polyps, which is also in keeping with a study conducted earlier in southwestern part of Nigeria.[12] The variation in the endometrial cavity findings may be attributed to the variation in the geographical location of the center of studies; thus, their varied sociocultural distributions. Similarly, one case of uterine synechiae was reported in this study, and these conform with the reports of a study done in Asia.[5] There was a report of slightly higher prevalence of severe intrauterine adhesions in another study.[11] Furthermore, some studies did not attempt to report fallopian tubal status.[11,12] An earlier study done in Osun, South-Western Nigeria, using the transabdominal route of ultrasound scan, compared the accuracy, and also the specificity of saline-infusion sonography technique with that of the HSG, in the differentiation of submucous myoma from endometrial polyps. S-SHSG was confirmed to be a reliable method for the differentiation, with HSG having a limited capability to do so. Some of the women examined had multiple/combined lesions, as reported in another study.[6] The occurrence of combined lesions was not reported in some studies,[11,12] presumably because there was none.

The index study also demonstrated a similar pattern of tubal passage to that of the study done in Asia and another in Nigeria, respectively,[5,19] with the finding of bilateral tubal patency predominating in all these studies. The patterns of fallopian tube findings were demonstrated in the index study, with bilateral tubal patency seen to be more common than unilateral tubal patency and bilateral tubal blockage. These findings are similar to the pattern of tubal patency of research conducted in western India.[18] The occurrence of left tubal patency was reported to be a more common form of unilateral tubal patency. In the index study, unilateral tubal patency was reported in 43 (21.5%), and bilateral tubal blockage was seen in 33 (16.0%) of the women. The high

number of women with bilateral tubal blockage may be due to tubal spasms in them.[5] However, Buscopan injection was given to minimize tubal spasm.

Other findings unrelated to the endometrial cavity and fallopian tubes were observed. These include intramural myomas, subserous myomas, polycystic ovaries, and complex left adnexal mass, with some patients having more than one of the findings. Similar findings were reported in another study.[11] No case of adenomyosis was reported in the index study.

Study limitations

Lack of uterine distensibility in patients with Asheman's syndrome, thus the evaluation of the endometrial cavity and fallopian tubes becomes impossible. Inability to adequately evaluate the cervical canal. No attempts to use of agitated saline for infusion, which may have aided the visualization of the fallopian tubes.

CONCLUSION

This study has further emphasized the significance of S-SHSG as a useful tool for the evaluation of women with infertility. The study described not only the various findings in the endometrial cavity but also the state of the fallopian tubes in women with infertility in a Nigerian tertiary hospital. Routine use of S-SHSG as a screening tool for infertility will influence decision-making and thus improve the outcome of fertility treatment.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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