

Comparative Study of Saline Infusion Sonography and Hysterosalpingography in Women Undergoing Infertility Evaluation

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Abstract

Original Research Article

Background: Uterine cavity abnormalities and tubal pathology are important causes of female infertility. Saline infusion sonography (SIS) and hysterosalpingography (HSG) are commonly used to evaluate these factors, although their diagnostic findings may differ. **Methods:** This comparative cross-sectional study was conducted among 110 women undergoing infertility evaluation. Participants were selected using purposive sampling. All women underwent SIS and HSG and findings related to uterine cavity abnormalities and fallopian tube patency were compared. Data were analyzed using SPSS version 25.0. **Results:** Primary infertility was present in 60.9% of participants and infertility lasting more than five years was observed in 40.9%. SIS detected more endometrial polyps (14.5% vs. 6.4%) and submucosal fibroids (10.0% vs. 7.3%) than HSG. In contrast, intrauterine adhesions were identified more frequently by HSG (11.8% vs. 8.2%). Bilateral tubal patency was observed in 61.8% by SIS and 64.5% by HSG. Tubal abnormalities were detected in 29.1% and 33.6% by SIS and HSG, respectively. SIS identified uterine cavity abnormalities more frequently than HSG (35.5% vs. 26.4%), while HSG showed a slightly higher detection of tubal abnormalities; however, these differences were not statistically significant. **Conclusion:** SIS was more effective in detecting focal uterine cavity abnormalities, whereas HSG showed a slight advantage in evaluating tubal pathology. Both modalities provide complementary information and may improve the overall assessment of women undergoing infertility evaluation.

Keywords: Infertility; Saline infusion sonography; Hysterosalpingography; Uterine cavity; Tubal patency.

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INTRODUCTION

Infertility is a significant reproductive health problem that affects individuals and couples worldwide and may result from abnormalities involving the female reproductive tract, male factors, or a combination of both [1]. Among female factors, abnormalities of the uterine cavity and fallopian tubes play an important role in impaired fertility by interfering with sperm transport, fertilization, embryo implantation, or normal maintenance of early pregnancy [2]. Accurate evaluation of these anatomical factors is therefore an essential component of infertility assessment [3].

The uterine cavity may be affected by structural abnormalities such as endometrial polyps, submucosal fibroids, intrauterine adhesions, congenital uterine anomalies and other endometrial lesions [4]. These abnormalities can reduce reproductive potential and may be associated with implantation failure, recurrent pregnancy loss, or unsuccessful fertility treatment [5]. Similarly, tubal factors, including unilateral or bilateral tubal obstruction and hydrosalpinx, are important causes

of female infertility. Identification of these conditions can assist clinicians in determining appropriate management and selecting suitable fertility treatment [6].

Transvaginal ultrasonography is commonly used as an initial imaging modality because it is readily available and noninvasive; however, its ability to delineate certain intracavitary lesions may be limited [7]. Saline infusion sonography improves visualization of the endometrial cavity by introducing sterile saline into the uterus, allowing clearer identification of intracavitary abnormalities and better differentiation between focal and diffuse lesions [8]. The procedure may also provide information regarding tubal patency when appropriate techniques are applied [9].

Hysterosalpingography has traditionally been an important investigation for evaluating the morphology of the uterine cavity and the patency of the fallopian tubes [10]. By introducing radiographic contrast material into the uterine cavity and fallopian tubes, it can demonstrate tubal obstruction and provide information regarding the site and extent of blockage [11]. However,

hysterosalpingography involves radiation exposure, may cause discomfort and has limitations in accurately characterizing some intrauterine lesions [12].

Both saline infusion sonography and hysterosalpingography provide valuable but potentially different diagnostic information during infertility evaluation. A comparative assessment of these modalities is important to determine their relative ability to identify uterine cavity abnormalities and tubal pathology. Understanding the diagnostic performance and areas of agreement or discrepancy between these investigations may help optimize the evaluation of women with infertility and support appropriate clinical decision-making.

METHODOLOGY & MATERIALS

This comparative cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Dhaka Medical College Hospital, from January 2026 to June 2026 over a period of six months. A total of 110 women undergoing evaluation for infertility were included in the study using purposive sampling. Women of reproductive age presenting with primary or secondary infertility and requiring assessment of the uterine cavity and fallopian tube patency were enrolled after obtaining informed written consent. Women with active pelvic infection, acute pelvic

inflammatory disease, ongoing pregnancy, active genital tract bleeding, known allergy or contraindication to contrast media, severe medical illness, or those unwilling to participate were excluded from the study. Relevant socio-demographic and clinical information, including age, type and duration of infertility, menstrual history and previous pelvic or reproductive history, was collected using a predesigned structured data collection sheet. All participants underwent saline infusion sonography and hysterosalpingography according to standard clinical procedures. Findings related to the uterine cavity, including endometrial polyps, submucosal fibroids, intrauterine adhesions, congenital uterine abnormalities and other structural abnormalities, were recorded. Fallopian tube patency and abnormalities, including unilateral or bilateral tubal blockage and hydrosalpinx, were also assessed and compared between the two diagnostic modalities. Data were checked for completeness and analyzed using Statistical Package for the Social Sciences (SPSS) version 25.0. Descriptive statistics were expressed as frequency, percentage, mean and standard deviation as appropriate. Comparative analysis between saline infusion sonography and hysterosalpingography findings was performed using appropriate statistical tests and a p value of less than 0.05 was considered statistically significant.

RESULTS

Table I: Socio-demographic and Clinical Characteristics of the Study Participants (n=110)

Variables	n	%
Age group (years)		
<25	17	15.5
25–29	31	28.2
30–34	29	26.4
35–39	21	19.1
≥40	12	10.9
Type of infertility		
Primary infertility	67	60.9
Secondary infertility	43	39.1
Duration of infertility (years)		
<3	26	23.6
3–5	39	35.5
>5	45	40.9
Menstrual pattern		
Regular	71	64.5
Irregular	39	35.5
Previous pelvic infection		
Present	23	20.9
Absent	87	79.1

Table I presents the socio-demographic and clinical characteristics of the 110 study participants. The mean age of the participants was distributed across reproductive years, with the largest proportion belonging to the 25–29 years age group (28.2%), followed closely by the 30–34 years group (26.4%), while 10.9% were aged 40 years or older. Regarding the type of infertility,

primary infertility was more prevalent, affecting 67 women (60.9%), whereas secondary infertility was observed in 43 participants (39.1%). The duration of infertility varied, with the majority of women having infertility lasting more than five years (40.9%), followed by those with a duration of 3–5 years (35.5%) and less than three years (23.6%). In terms of menstrual pattern,

regular cycles were reported by 71 women (64.5%), while 39 participants (35.5%) had irregular menstrual cycles. A history of previous pelvic infection was noted

in 23 women (20.9%), whereas the remaining 87 participants (79.1%) had no such history.

Table II: Uterine Cavity Findings Detected by Saline Infusion Sonography and Hysterosalpingography (n=110)

Uterine cavity findings	Saline Infusion Sonography n	%	Hysterosalpingography n	%
Normal uterine cavity	62	56.4	71	64.5
Endometrial polyp	16	14.5	7	6.4
Submucosal fibroid	11	10	8	7.3
Intrauterine adhesions	9	8.2	13	11.8
Uterine septum/congenital anomaly	7	6.4	8	7.3
Other cavity abnormality	5	4.5	3	2.7

Table II compares the uterine cavity findings detected by Saline Infusion Sonography (SIS) and Hysterosalpingography (HSG) among the 110 study participants. A normal uterine cavity was observed more frequently on HSG in 71 women (64.5%) compared to 62 women (56.4%) on SIS. SIS demonstrated a notably higher detection rate for endometrial polyps, identifying 16 cases (14.5%) compared to only 7 cases (6.4%) detected by HSG. Submucosal fibroids were also more

commonly identified by SIS, with 11 cases (10.0%) versus 8 cases (7.3%) on HSG. However, intrauterine adhesions were detected more frequently by HSG, with 13 cases (11.8%) compared to 9 cases (8.2%) on SIS. Uterine septum or congenital anomalies were identified in 7 cases (6.4%) by SIS and 8 cases (7.3%) by HSG, while other cavity abnormalities were noted in 5 cases (4.5%) and 3 cases (2.7%), respectively.

Table III: Fallopian Tube Findings on Saline Infusion Sonography and Hysterosalpingography (n=110)

Tubal findings	Saline Infusion Sonography n	%	Hysterosalpingography n	%
Bilateral tubal patency	68	61.8	71	64.5
Unilateral tubal blockage	19	17.3	18	16.4
Bilateral tubal blockage	13	11.8	14	12.7
Suspected hydrosalpinx	6	5.5	5	4.5
Inconclusive result	4	3.6	2	1.8

Table III presents the fallopian tube findings detected by Saline Infusion Sonography (SIS) and Hysterosalpingography (HSG) among the 110 participants. Bilateral tubal patency was observed in 68 women (61.8%) on SIS and 71 women (64.5%) on HSG, indicating a slightly higher patency rate with HSG. Unilateral tubal blockage was identified in 19 cases

(17.3%) by SIS and 18 cases (16.4%) by HSG, while bilateral tubal blockage was noted in 13 cases (11.8%) and 14 cases (12.7%), respectively. Suspected hydrosalpinx was reported in 6 cases (5.5%) on SIS compared to 5 cases (4.5%) on HSG. Inconclusive results were more frequent with SIS, occurring in 4 women (3.6%) versus only 2 women (1.8%) on HSG.

Table IV: Comparison of Overall Diagnostic Findings between Saline Infusion Sonography and Hysterosalpingography (n=110)

Diagnostic parameter	Saline Infusion Sonography n	%	Hysterosalpingography n	%	p value
Normal findings	51	46.4	58	52.7	0.348
Uterine cavity abnormality detected	39	35.5	29	26.4	0.143
Tubal abnormality detected	32	29.1	37	33.6	0.463
Both uterine and tubal abnormalities	12	10.9	14	12.7	0.668
Additional abnormality detected by either modality	8	7.3	3	2.7	0.121

Table IV compares the overall diagnostic findings between Saline Infusion Sonography (SIS) and Hysterosalpingography (HSG) among the 110 study participants. Normal findings were observed in 51 women (46.4%) on SIS and 58 women (52.7%) on HSG, with no statistically significant difference ($p=0.348$). Uterine cavity abnormalities were detected more frequently by SIS, identified in 39 cases (35.5%) compared to 29 cases (26.4%) on HSG, although this difference did not reach statistical significance

($p=0.143$). Conversely, tubal abnormalities were more commonly detected by HSG, with 37 cases (33.6%) versus 32 cases (29.1%) on SIS ($p=0.463$). Both uterine and tubal abnormalities were identified in 12 women (10.9%) on SIS and 14 women (12.7%) on HSG ($p=0.668$). Additional abnormalities detected exclusively by either modality were noted in 8 cases (7.3%) on SIS compared to 3 cases (2.7%) on HSG ($p=0.121$).

DISCUSSION

The present study compared the findings of Saline Infusion Sonography (SIS) and Hysterosalpingography (HSG) among 110 women undergoing infertility evaluation, with particular emphasis on uterine cavity abnormalities and fallopian tube patency. Most participants were within the active reproductive age range, with the largest group aged 25–29 years (28.2%), followed by those aged 30–34 years (26.4%). Primary infertility was more common than secondary infertility, affecting 60.9% of the participants, while infertility lasting more than five years was observed in 40.9%. These findings indicate that a substantial proportion of women underwent detailed anatomical evaluation after a prolonged duration of infertility.

In the present study, SIS demonstrated greater detection of certain intrauterine abnormalities compared with HSG. Endometrial polyps were identified in 14.5% of women by SIS compared with 6.4% by HSG, while submucosal fibroids were detected in 10.0% and 7.3%, respectively. These findings support the observations of Elkady *et al.*, who emphasized the usefulness of saline infusion sonography for detailed evaluation of the uterine cavity and identification of intracavitary abnormalities [13]. Similarly, El-Omda *et al.*, reported that saline infusion sonohysterography provided valuable information regarding uterine cavity pathology in infertile women [14]. The improved visualization provided by distension of the uterine cavity may explain the higher detection of focal lesions such as polyps and submucosal fibroids in the present study.

Our findings are also consistent with Nabil El-Sayed Ali *et al.*, who demonstrated an important role of sonohysterography in the assessment of uterine abnormalities among women evaluated for infertility [15]. Malik *et al.*, and Yigeremu *et al.*, similarly reported that saline infusion sonography is useful for identifying structural uterine abnormalities in women with subfertility or infertility [16,17]. In the present study, SIS detected uterine cavity abnormalities in 35.5% of participants compared with 26.4% by HSG. Although the difference was not statistically significant ($p=0.143$), the numerical difference suggests that SIS may provide an advantage in detecting subtle intracavitary lesions.

Intrauterine adhesions were detected more frequently by HSG in the present study, with findings in 11.8% compared with 8.2% on SIS. Likewise, uterine septum or other congenital anomalies were identified in similar proportions by both methods. These results suggest that HSG remains useful for demonstrating abnormalities affecting the contour and configuration of the uterine cavity. CANDAY *et al.*, highlighted the continuing importance of HSG in infertility evaluation because of its ability to assess both the uterine cavity and fallopian tubes [18]. The complementary role of the two

investigations may therefore be more clinically relevant than considering either modality as universally superior.

Regarding tubal assessment, bilateral tubal patency was demonstrated in 61.8% of women by SIS and 64.5% by HSG. Unilateral tubal blockage was identified in 17.3% and 16.4%, respectively, whereas bilateral blockage was found in 11.8% by SIS and 12.7% by HSG. The close agreement between the two modalities is consistent with the findings of Chalumuri and Nimmakayala, who compared saline-based sonographic assessment with conventional HSG for evaluating tubal patency and demonstrated the potential of sonographic techniques as alternatives in infertility assessment [19]. Sultana and Naznin also described saline hysterosalpingographic techniques as a less invasive approach for assessing tubal patency [20].

The slightly higher detection of tubal abnormalities by HSG in our study, observed in 33.6% compared with 29.1% by SIS, was not statistically significant ($p=0.463$). This finding is supported by Kumar *et al.*, who reviewed the current status of saline infusion sonohysterosalpingography and emphasized its usefulness in evaluating both uterine and tubal factors while recognizing technical and diagnostic limitations [21]. Satiraju and Katakdhond and SANGWAN *et al.*, similarly demonstrated the value of saline-based sonographic methods, including Doppler techniques, in the evaluation of tubal patency [22,23].

HSG showed fewer inconclusive results in the present study, occurring in only 1.8% compared with 3.6% with SIS. This may reflect the established role of contrast visualization in defining the passage of material through the fallopian tubes. Igbo-dike *et al.*, also emphasized the diagnostic value of HSG as an initial investigation in women with utero-tubal infertility, although confirmatory procedures may sometimes be necessary because imaging findings do not always correspond completely with definitive diagnostic assessment [24]. Similarly, Oyedepo *et al.*, reported diverse diagnostic patterns on HSG among women with infertility, supporting its continued relevance in the evaluation of tubal pathology [25].

Limitations of the study

This study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. In addition, hysteroscopy or laparoscopy was not used as a reference standard to confirm all uterine and tubal abnormalities detected by SIS and HSG.

CONCLUSION

Both SIS and HSG were valuable in the evaluation of female infertility. SIS showed better detection of uterine cavity abnormalities, particularly focal intracavitary lesions, whereas HSG demonstrated a

slight advantage in assessing tubal patency and tubal abnormalities. The complementary use of both modalities may therefore provide a more comprehensive assessment of women undergoing infertility evaluation.

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Conflicts of interest

There are no conflicts of interest.

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