

Pattern of hysterosalpingographic findings among women with infertility in Ahmadu Bello University Teaching Hospital, Zaria, Nigeria

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Abstract

Hysterosalpingography (HSG) is a radiological procedure that is routinely done for female fertility workup in most clinical settings. Hysterosalpingography (HSG) is primarily done to assess tubal patency, but it can detect cervical, uterine, and peritoneal diseases. As such, it remains a valuable tool in the evaluation of female infertility in our environment, where the high prevalence of infertility has been largely attributed to tubo-peritoneal factors. It was a retrospective cross-sectional descriptive study. A total of 215 HSG reports of women with infertility at the Department of Radiology, Ahmadu Bello University Teaching Hospital, Zaria,

Nigeria, were reviewed retrospectively. Data on sociodemographic profile, reproductive profile, infertility profile, and HSG reports were obtained from the case records and archives of the Department of Radiology on a proforma. The obtained data was analyzed using SPSS version 20. Most of the clients were within the age range of 35 to 44 years. Secondary infertility accounted for 58.6% of cases of infertility. Abnormal HSG was reported in 70.2% of cases. Tubo-peritoneal pathology was the most common abnormality, detected in 46% of cases. Uterine and cervical pathologies were seen in 38.1 and 15.3% of cases, respectively. A total of 116 (53.9%) of the cases had a combination of abnormalities. Abnormal HSG was significantly associated with secondary infertility and a history of induced abortion ($p=0.006$ and <0.001 , respectively). Tubo-peritoneal pathologies are still a common cause of infertility in our environment. HSG remains a valid tool for female infertility workup.

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Introduction

Hysterosalpingography (HSG) is a radiological procedure that detects pathology of the female genital tract and peritoneum. It is routinely done for female fertility workup in most clinical settings. According to the World Health Organization (WHO) 1990-2021 infertility prevalence estimates, one in six people have experienced infertility at some stage in their lives, globally with an estimated lifetime prevalence of 17.5% and period prevalence of 12.6%.¹ High prevalence of infertility has been reported in Sub-Saharan Africa, which has been largely attributed to tubo-peritoneal pathologies.²

HSG is primarily done to assess tubal patency, but it can detect cervical, uterine, and peritoneal diseases.³ As such, it remains a valuable tool in the evaluation of female infertility. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of HSG in detecting female genital tract abnormalities vary with location or type of abnormality. The sensitivity and specificity of HSG in detecting uterine abnormalities range from 38.78% to 98% and 15 to 80%, respectively, with a positive predictive value of 67.86%, negative predictive value of 52.38%, and accuracy of 57.14% in comparison to those of hysteroscopy.^{3,4} HSG is said to have a sensitivity of 63%, specificity of 89.3%, positive predictive value of 92%, negative predictive value of 55%, and accuracy rate of 72%, respectively, in detecting tubo-peritoneal disease when compared to laparoscopy.⁵ Overall, the accuracy of HSG in detecting tubal, uterine cavity, and peritoneal abnormalities has been reported to be 95.5%, 95%, and 89%, respectively.⁶

Even though other procedures like Hysterosalpingography Contrast Sonography (HyCoSy), laparoscopy, and hysteroscopy have been reported to have higher sensitivity for detecting uterine and tubo-peritoneal diseases,^{3,5,6} HSG still remains a valid option for evaluating the female genital tract in clients with infertility. This is due to its availability, cost, and ability to outline the whole genital tract in a single procedure. HyCoSy has high sensitivity and

specificity for uterine but not tubal disease,³ laparoscopy and hysteroscopy have a higher sensitivity and specificity in detecting tubo-peritoneal and intrauterine abnormalities, respectively,^{7,8} but HSG alone can detect both intrauterine and tubo-peritoneal abnormalities as a standalone procedure. Also, laparoscopy and hysteroscopy are not readily available in most clinical settings in our environment, where tubo-peritoneal and intrauterine abnormalities are among the leading causes of infertility. This makes HSG a first-line investigation in evaluating female factor infertility in our environment.

This paper reviewed the pattern of hysterosalpingographic findings among women being investigated for infertility at Ahmadu Bello University Teaching Hospital Zaria. It determined the percentage of abnormal hysterosalpingograms, the prevalence of tubo-peritoneal, uterine, and cervical abnormalities, and characterized the abnormalities. The association between sociodemographic, reproductive, and infertility profiles and abnormal results was also explored.

Materials and Methods

The study was conducted at Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. It was a cross-sectional descriptive study. Random selection of retrospective data of HSG was done where the archives of the HSG records from January to December 2013 were pulled out by the staff of the Department of Radiology Ahmadu Bello University Teaching Hospital, Zaria, until when the sample size was achieved. The case files of the cases were retrieved. The sample size was determined using Fisher's formula. Power of 95% was used. Prevalence of tubal factor infertility in sub-Saharan Africa was used, which is 85%. The data was analyzed using SPSS 15.0. Fisher's formula, $n = Z_{\alpha}^2 pq / d^2$

N = minimum sample size

Z_{α} = standard normal deviation for normal distribution and is taken as 95% Confidence Interval (CI) = 1.96 from z table

p = proportion or prevalence of the item in question; the prevalence of tubal factor infertility in sub-Saharan Africa was used, which is 0.85⁹

$q = 1 - p$, i.e. $1 - 0.85 = 0.15$

$d = 0.05$, i.e. 5% CI/degree of precision

$n = 1.962 \times 0.85 \times 0.15$

0.052

$n = 195$

attrition rate of 10% = 19.5

The sample size was rounded up to 215 when an attrition rate of 10% was added.

Inclusion criteria

The study included all HSG done as part of an investigation for infertility with complete documentation and whose case files were found.

Exclusion criteria

All HSG done for other indications apart from infertility, those with incomplete documentation and those that were not managed at Ahmadu Bello University Teaching Hospital were excluded from the study.

Results

The majority of the clients were within the age range of 25-35 years and 35-44 years (40.4% and 44.1%, respectively). Only 0.47% and 14.9% of the clients were within the 15-25 years and 45-54 years age ranges, respectively. The result of HSG differed significantly ($p = 0.003$) between the different age groups (Table 1). A total of 55.5% of clients had secondary infertility. Among clients with secondary infertility, 80% had an abnormal HSG, while only 20% of the clients with primary infertility had abnormal HSG results. Among the clients with primary infertility, 61% had abnormal results, while only 38.9% had normal HSG results. The difference between the type of infertility and HSG result was statistically significant ($p = 0.006$) (Table 1). The mean duration of infertility was 5.6 (SEM 0.67) and 5.5 (SEM 0.36) among the clients with normal and abnormal HSG, and the difference was not statistically significant ($p = 0.185$) (Table 1). A history of induced termination was seen in 19.5%. Out of these clients that had induced termination of pregnancy, 95.2% had an abnormal HSG result, with only 4.8% of them having a normal HSG result. The difference was statistically significant ($p < 0.001$) (Table 1). No significant difference was observed in the HSG result of clients with regards to their menstrual pattern, previous deliveries, and previous spontaneous abortions ($p = 0.075$, 0.725, and 0.509, respectively) (Table 1).

Abnormal HSG was reported in 70.2% of clients. Tubo-peritoneal pathology was the most common abnormality, detected in 46% of clients. Uterine and cervical pathologies were seen in 38.1 and 15.3% of clients, respectively. A total of 116 (53.9%) of clients had a combination of abnormalities (Tables 2 and 3).

Discussion

The majority of the clients were within the age range of 25-35 years and 35-44 years (40.4% and 44.1%, respectively). Only 0.47% and 14.9% of the clients were within the 15,25 years and 45,54 years age ranges, respectively (Table 1). A similar finding has been documented in the literature.¹⁰ Thus, the majority of our clients were in their most fertile years. Only one client was within the 15-24 years age range, and she had a normal HSG result. Among the 14.9% of clients that were within the 45-55 years age range, 96.9% had an abnormal HSG result, with only 3.1% having normal HSG. Abnormal HSG was seen in 66.6% and 68.4% of clients within the age range of 25-35 years and 35-44 years, respectively. The difference in HSG results between the different age ranges was statistically significant ($p = 0.003$) (Table 1). Over a quarter (28.5%) of the clients had previous deliveries (Table 1). This may reflect the fact that despite the fact that some women have had previous deliveries, they are still desirous of having more children. This is likely due to the fact that children are highly valued for sociocultural and economic reasons, and childlessness often leads to psychological, social, and economic burdens in our environment.¹¹

Most of our clients (55.5%) presented with secondary infertility (Table 1). This pattern is predominant worldwide.^{12,13} Similar studies have also reported secondary infertility to be predominant among clients. Secondary infertility was reported among 52.2% of clients in Maiduguri,¹⁴ 54.9% of clients in Sokoto,¹⁵ 75.6% of clients in Delta,¹⁶ and 76.5% of clients in Nnewi¹⁷ in similar studies. However, some studies have reported a lower prevalence of secondary infertility of 43.9%¹⁸ and 49.2%¹⁹. Among the 55.5% of clients with secondary infertility, 80% had an abnormal HSG, while

20% of them had a normal HSG. Among the clients with primary infertility, 61% had abnormal results, while 38.9% had normal HSG results. This shows that secondary infertility was more associated with abnormal HSG findings, and this association was statistically significant ($p=0.006$) (Table 1). This reflects the pattern of infertility seen in Sub-Saharan Africa, including unsafe abortions and puerperal infections.² Even though most of our clients (55.5%) had secondary infertility, the majority of them have not had deliveries. This reflects pregnancy losses like spontaneous abortions, induced abortions, and ectopic pregnancies, which were seen in 22.7%, 19.5% and 2.3% of the clients, respectively. A similar finding was reported from Nnewi,¹⁷ where induced termination of pregnancy and spontaneous miscarriage were seen in 22.4% and 25.1% of the study participants.

The majority of the clients had normal menstrual patterns (Table 1). This is not surprising because not all cases of infertility present with menstrual abnormality. Menorrhagia was the most common form of menstrual abnormality found. Menorrhagia is one of the common symptoms of uterine fibroids, and uterine findings suggestive of fibroid was the most common (21.4%) uterine abnormality seen in our clients. Hypomenorrhoea was seen in 7.4%, and amenorrhoea was seen in 0.9% of our clients. They are associated with uterine adhesions, which were seen in 13.5% of our clients.

A significant proportion of our clients (70.2%) had an abnormal HSG result (Table 2). This is in keeping with many studies done in this country, which found abnormality rates as high as 85.8%.²⁰ However, few other studies reported a different pattern. In a study

from Switzerland,³ only 21% of HSG done for infertility were pathologic. In another study from Kano North Western, Nigeria,¹⁹ reported abnormal HSG in only 37.6% of the study population. However, only 29.7% of the HSG reviewed in the study were done as part of infertility work, and up to 42% of the reviewed HSG had no valid indication. This may account for the low rate of abnormality reported.

Tubal abnormalities were seen in 38.1% of our clients, while tubo-peritoneal abnormalities were seen in 46% of clients (Table 3). Tubal abnormalities remain the most common abnormalities reported in HSG reviews, with prevalence rates ranging between 33.0% to 72.1%.^{3,13,15-21} Even studies that reported low abnormality rates in their HSG reviews had tubal abnormality as the most common abnormality detected.^{3,19} This buttresses the role of tubo-peritoneal disease in the etiology of female factor infertility, especially in our environment. Tubal occlusion was seen in 79.3% of cases of tubal pathology, while hydrosalpinges were seen in 19.5% of cases. The tubes were not outlined in 1.9% of cases, which reflected salpingectomy for ectopic pregnancy. Many other studies also reported a similar pattern.^{15,17,19} Left tubal occlusion was seen in 79.3% of cases, and right tubal occlusion was seen in 77.2% of cases, while 19.5% of hydrosalpinges were noted on the left tube and 21.7% on the right tube. Bilateral tubal pathology was seen in 71% of cases of tubal pathology. Other studies have also documented a higher incidence of left tubal occlusion.^{17,19,21} However, the preponderance of the right tubal block has also been documented in the literature.¹⁶ Higher rates of bilateral tubal disease

Table 1. Baseline demography and reproductive profile of clients and their association with HSG result. A p value <0.05 is considered statistically significant.

	Normal	Abnormal	Frequency (%)	p value of χ^2 Test
Age in years (n=215)				
15-24	1	0	1 (0.47%)	0.003
25-34	29	58	87 (40.4%)	
35-44	30	65	95 (44.1%)	
45-54	1	31	32 (14.9%)	
Duration of infertility in years				
Mean	5.6	5.5	T Test	0.185
Type of infertility (n=215)				
Primary	37	58	95(44.2%)	0.006
Secondary	24	96	120(55.5%)	
Menstrual pattern (n=215)				
Normal	48	113	161(74.9%)	0.075
Irregular	1	1	2(0.9%)	
Hypomenorrhoea	3	13	16(7.4%)	
Polymenorrhoea	1	0	1(0.5%)	
Oligomenorrhoea	4	4	8(3.7%)	
Amenorrhoea	4	3	7(3.3%)	
Menorrhagia	2	18	20(9.3%)	
Previous deliveries (n=215)				
0	43	111	154(71.5%)	0.723
1-4	18	42	60(28.0%)	
≥ 5	0	1	1(0.5%)	
Previous miscarriages (n=215)				
0	50	116	166(77.2%)	0.509
1-4	11	38	49(22.7%)	
Previous induced abortions (n=215)				
0	59	117	173(80.4%)	<0.001
1-4	2	42	42(19.5%)	

as opposed to unilateral tubal disease are also well documented.^{13,15,17,19,22,23} Proximal tubal occlusion was seen more commonly on the right tube (53.5%), while distal occlusion was more common on the left tube (55.4%). Distal occlusion was seen in 3.1% and 2.8% of the left and right tubes, respectively. The majority of our clients had a free spill of contrast. A loculated spill was noticed in 14% of clients on the right side, while 15.3% had a loculated spill on the left side. This suggests pelvic adhesions. The high incidence of tubal abnormalities seen reflects the high incidence of unprotected sexual intercourse with infected partners at a very young age, postpartum pelvic infection, and illegal unsafe abortions commonly seen in our environment.^{2,24}

Uterine abnormalities were seen in 38.1% of our clients. It is second to tubal abnormalities in this study and many other similar studies worldwide.^{3,16,19,23} Acquired uterine abnormalities are the predominant uterine abnormalities reported. It accounted for 96% of uterine abnormalities in this study (Figure 1). Uterine synechiae accounted for 45.1% of uterine abnormalities, which suggests previous intrauterine infections. Enlarged uterine cavity and filling defects in keeping with uterine fibroids were seen in 38% and 7% of cases, respectively. The bicornuate uterus was the only congenital uterine anomaly seen in 4% of cases (Figure 1). A study from

Sokoto¹⁵ reported 25.5% of cases of uterine abnormality from a review of HSG, with the majority of the cases being acquired abnormalities. Also, acquired uterine abnormalities have been reported as the most common (41.95%) abnormality detected in HSG review by some authors.²⁰

Cervical abnormalities accounted for 15.3% of the abnormalities detected in this work (Table 2). This is almost similar to the report of 13.5% by Danfulani *et al.*¹⁵ and 11.9% by Udobi *et al.*¹⁸ Cervical adhesions were the most common (43%) cervical lesions seen. Other lesions seen included irregular (24%), elongated (21%), tortuous (3.0%), narrowed (3%), out-pouched (3.0%), and deviated (3.0%) cervixes (Figure 2). Similar findings have also been reported by other authors.¹⁸

A combination of abnormalities was noted in 53.9% of cases in this study (Table 2). Tubo-peritoneal abnormalities were seen in 46% of cases, uterus and tubal in 31.6%, uterus and cervical in 15.3%, and uterus, tubal and cervical in 7% of cases. A combination of abnormalities has been documented in the literature.¹⁸ The ability of the HSG to detect a combination of abnormalities gives it an advantage over other investigations for detecting female genital tract abnormalities in women with infertility.³

Table 2. Hysterosalpingographic findings.

Result	Frequency (%)
Normal	64 (29.8%)
Abnormal	151 (70.2%)
Total	215 (100%)
Site of abnormality	
Cervical	33 (15.3%)
Uterine	82 (38.1%)
Tuboperitoneal	100 (46.5%)
Combination	116 (53.9%)
Type of combined abnormality	
Uterine+tuboperitoneal	68 (31.6%)
Uterine+cervical	33 (15.3%)
Uterine+tuboperitoneal+cervical	15 (7.0%)

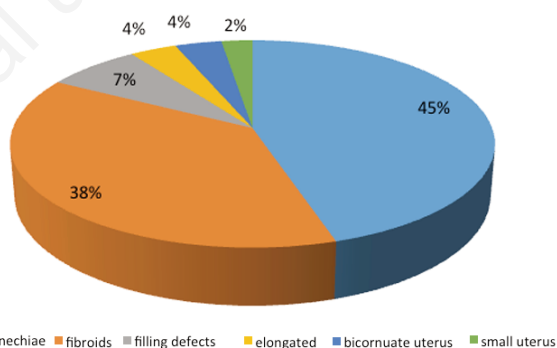


Figure 1. Pattern of uterine abnormalities.

Table 3. Tuboperitoneal findings.

	Left tube	Right tube
Tube		
Normal	133 (61.9%)	123 (57.2%)
Tubal pathology	82 (38.1%)	92 (42.8%)
Bilateral pathology	71 (33%)	71 (33%)
Not outlined/Ectopic	1 (1.2%)	1 (1.1%)
Type of tubal pathology		
Occlusion	65 (79.3%)	71 (77.2%)
Hydrosalpinx	16 (19.5%)	20 (21.7%)
Total	82 (100%)	92 (100%)
Site of tubal occlusion		
Proximal	27 (41.5%)	38 (53.5%)
Distal	36 (55.4%)	31 (43.7%)
Mid segment	2 (3.1%)	3 (2.8%)
Peritoneal spill		
Free spill	141 (65.6%)	136 (63.3%)
Loculated spill	33 (15.3%)	30 (14.0%)
No spill	41 (19.1%)	49 (22.8%)

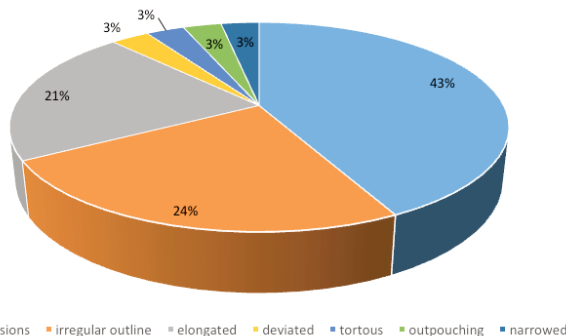


Figure 2. Pattern of cervical abnormalities.

Conclusions

HSG is an important tool for diagnosing tubal infertility. It can also detect cervical, uterine, and peritoneal abnormalities, as was seen in this study. Tubal factor was the commonest abnormality in 46.0% of clients, uterine abnormalities were seen in 38.7% of the clients, and cervical abnormalities were seen in 15.3 of our clients. A total of 53.9% of the clients had a combination of abnormalities. Abnormal HSG finding was associated with secondary infertility and a history of induced abortions.

Limitations

The major drawback of this study is the fact that it is a retrospective study. Also, the results of further evaluation of clients, such as a laparoscopy to confirm tubo-peritoneal disease, were not reviewed.

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