



The Journal of Anatomical Sciences  
Email: [journalofanatomicalsciences@gmail.com](mailto:journalofanatomicalsciences@gmail.com)

J. Anat Sci 17(1) Mar

Revised: February 28<sup>th</sup>, 2026

Accepted: March 3<sup>rd</sup>, 2026

## Hysterosalpingogram Outcomes in Women with Infertility attending the Gynecological clinic of a public tertiary health institution in North Central Nigeria: A 3-year retrospective review

Sadiya M Gwadabe<sup>1\*</sup>, Muslimah A Musa<sup>2</sup>, Latifat T Aremu<sup>2</sup>, Hadijat O Raji<sup>1</sup>, Olanrewaju S Jimoh<sup>3</sup>, Idris O Quadri<sup>4</sup>, AbdulRaheem B Abdulrasheed<sup>2</sup>, Joseph J Ocheni<sup>2</sup>, Safiya Zahradeen<sup>5</sup>, Hauwa H Mohammed<sup>6</sup>, Ridwan O Sulayman<sup>7</sup>

<sup>1</sup>Dept of Obst and Gyne, University of Ilorin/ University of Ilorin Teaching Hospital; <sup>2</sup> Dept of Radiology, University of Ilorin Teaching Hospital, Ilorin; <sup>3</sup>Dept of Obst and Gyne, Federal Medical Centre, Abeokuta; <sup>4</sup>Federal Teaching Hospital, Ido Ekiti/Afe Babalola University, Ado Ekiti; <sup>5</sup>Dept of Obst and Gyne, Muhammad Abdullahi Wase Teaching Hospital, Kano; <sup>6</sup>Dept of Physiotherapy, University of Ilorin, Ilorin; <sup>7</sup>Crescent Gold Crown Hospital, Ilorin, Nigeria.

\*Corresponding Author: Email: [gwadabe.sm@unilorin.edu.ng](mailto:gwadabe.sm@unilorin.edu.ng); Tel: +2347069448106. ORCID: 0000-0003-0979-7338

### ABSTRACT

There is a growing global trend in infertility, with the majority of the burden in sub-Saharan Africa. Structural damage to the reproductive tract from infection and complications from unsafe procedures has been implicated. Hysterosalpingography is readily available and relatively affordable for assessing the degree of obstruction in these structures, and it remains a dependable tool despite the advent of more advanced radiological tests. The study aimed to evaluate the outcomes of hysterosalpingograms in women with infertility by assessing the structural abnormality of the uterus, fallopian tubes, and the cervix at a public health institution in North Central Nigeria. A retrospective cross-sectional study evaluating the outcomes of hysterosalpingography (HSG) among infertile women attending the gynecological clinic of the University of Ilorin Teaching Hospital (UITH) over 3 years, from January 2022 to December 2024. Relevant data were collected from available records, coded, and analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0, and the results were presented in frequency tables. During the period, 102 records of infertile women who underwent HSG were reviewed, with ages ranging from 21 to 45 years. The majority of women were married and nulliparous. About 52% had undergone previous surgery/procedures, and secondary infertility was more common than primary. Uterine fibroids (31.4%) were the most common finding on HSG; 27.5% had some form of tubal blockage, and 25.5% had pelvic adhesions. Hysterosalpingogram is a valuable diagnostic tool in infertility work-up, helping to identify possible etiologies and guide clinical decisions.

**Keywords:** infertility, hysterosalpingography, tubal obstruction

### INTRODUCTION

Infertility is a major global health concern, regarded as a major source of stigma and often a significant cause of divorce in African society.<sup>1,2,3</sup> It is defined as a couple's failure to achieve conception after one year or more of regular unprotected sexual intercourse.<sup>4,5</sup> Globally, approximately 15% of couples experience infertility at one point or another in their lifetime, with prevalences in the US and UK estimated as 10% and 6%, respectively.<sup>6,7</sup> Infertility can be primary if the woman has never conceived, and secondary is failure to get pregnant after a previous pregnancy, which may or may not have resulted in a live birth.<sup>6</sup>

The prevalence in Africa, especially in Sub-Saharan Africa, appears to be relatively high, ranging from 20% to 60% of cases.<sup>8</sup> This high rate is thought to be a result of complications from unsafe abortion, high rates of sexually transmitted diseases, and puerperal pelvic infections.<sup>9</sup> Studies in Nigeria estimated the infertility rate as high as 45%, presumably from structural and hormonal disorders such as tubal, uterine, cervical, and ovulatory factors, with tubal factor alone accounting for approximately 40%.<sup>10,11</sup>

Fallopian tubes and the endometrial cavity are pertinent to normal human fertility, as they provide a conduit for fertilization, transport the fertilized ovum, and facilitate its eventual implantation into the receptive endometrium.

Also, the fallopian tubes are specifically prone to infections and damage from surgical procedures, which impair the endosalpinx and the delicate fimbriae. Assessment of the fallopian tubes is an integral part of the fertility work-up for women.<sup>12</sup>

The structural findings in the female reproductive system are best assessed by hysterosalpingography (HSG), which remains a valuable screening tool. It is a minimally invasive, cost-effective, readily available, simple, and generally safe procedure. It has a specificity of 83% and a sensitivity of 65% in detecting tubal blockage.<sup>12</sup> According to the American Society for Reproductive Medicine (ASRM), HSG is the first-line test for evaluating tubal patency.<sup>8</sup>

Other imaging modalities include transvaginal ultrasound scan (TVS), Sono-hysterosalpingogram Magnetic resonance imaging (MRI scan), and hysteroscopy. The TVS is readily available, highly sensitive, and accurate, but with some limitations in assessing tubal pathologies. MRI is also highly sensitive, especially for evaluating congenital Müllerian duct anomalies; however, it has a limited role in assessing tubal abnormalities. Hysteroscopy is another invaluable complementary tool, even though it appears expensive and not readily available in sub-Saharan Africa. Therefore, HSG remains a very important diagnostic test for uterine and tubal abnormalities in the evaluation of couples with infertility and subfertility in low and middle-income countries, where the burden of childlessness is enormous and with limited access to advanced reproductive techniques due to their affordability and socio-cultural as well as religious beliefs.<sup>13</sup>

This is a retrospective study, and the aim is to evaluate the outcome of HSG in women with infertility by assessing the structural abnormality of the uterus, fallopian tubes, and cervix. This, in turn, helps provide valuable data in improving the quality of health care delivery and informs evidence-based practice in the management of infertility in our setting.

## **MATERIALS AND METHODS**

This was a retrospective cross-sectional study evaluating the outcomes of hysterosalpingography (HSG) among infertile women attending the gynecological clinic of the University of Ilorin Teaching Hospital (UITH) over a 3-year period, from January 2022 to

December 2024. The University of Ilorin Teaching Hospital is a public tertiary referral hospital with a gynecological clinic where specialist consultants manage infertility cases.

### ***Study population***

The study included women aged 18 to 45 years presenting with either primary or secondary infertility. Patients with complete medical records, including detailed HSG results, were included in this study. In contrast, women with prior surgical interventions affecting the reproductive tract, such as bilateral tubal ligation or hysterectomy, were excluded. Additionally, HSG performed for non-fertility-related indications was not included.

### ***Hysterosalpingography procedure***

Hysterosalpingography was performed during the proliferative phase of the menstrual cycle (days 6-12) using a water-soluble contrast medium. Following written consent, the patients were given parenteral analgesia and a spasmolytic agent to minimize the discomfort and cramps associated with the procedure. A sterile bi-valve speculum was introduced to expose the cervix. The anterior lip of the cervix was grasped with a vulsellum forceps, then pulled outward to align the uterus for easier flow of the contrast and better results. Under fluoroscopic guidance, the medium was introduced into the uterine cavity to assess uterine contours, fallopian tube patency, and peritoneal spillage. The results were categorized into three broad groups: normal uterine cavity with bilateral tubal patency; uterine anomalies, including structural abnormalities such as fibroids or congenital malformations; and tubal abnormalities, including unilateral or bilateral tubal blockage and hydrosalpinx.

All procedures adhered to standard clinical protocols and were interpreted by experienced radiologists. Abnormalities were confirmed by consensus review to minimize interobserver variability.

### ***Data collection***

Patient data were obtained from hospital records, including sociodemographic characteristics, clinical histories, and HSG findings. Key variables extracted included age, duration of infertility, type of infertility (primary or secondary), previous diagnosis of pelvic inflammatory disease (PID), or prior surgical interventions. HSG findings were documented

under predefined categories, focusing on uterine abnormalities, tubal blockages, and peritoneal spillage. To ensure consistency and accuracy, data were independently verified by researchers.

**Data analysis**

Collected data were coded and analyzed with the statistical package for social sciences (SPSS), IBM version 27.0 (Armonk, NY). Descriptive statistics were used to summarize patients’ socio-demographic characteristics, clinical parameters, and HSG findings. The results were presented in frequency tables.

**Ethical consideration**

Ethical approval was sought from the ethical review committee of the University of Ilorin Teaching Hospital. Patient confidentiality was maintained through data anonymization, and records were securely stored to prevent unauthorized access, ensuring compliance with international research standards. The retrieved data were used solely for research.

**RESULTS**

A total of 102 HSG reports and medical records were reviewed between January 2022 and December 2024. The age range in this study was 21 to 45 years, with the highest percentage (28.4%) between 36 and 40 years, and the lowest

(12.7%) between 41 and 45 years. Most of them were married (94.1%) and from the Yoruba tribe (84.3%), while a quarter of them (74.5%) were Muslims. About half of them (47.1%) were educated to the tertiary level (Table 1).

Majority of participants (67.6%) were nulliparous, with 20.6% primiparous. Among those with previous pregnancy losses, (38.2%) were spontaneous, and (26.5%) terminated their pregnancies voluntarily. About half of these women (52%) have had previous surgery or procedures; the majority were D & C (51%) and MVA (39.6%). Most (79.4%) of the patients have no child alive. (Table 2)

Majority (73.5%) had secondary infertility, while only 26.5% had primary infertility. About 55.9% of them had infertility for less than 4 years. The majority (73.5%) had no prior history of PID. In comparison, uterine (20.6%), tubal (17.6%), and male (14.7%) factors were the most commonly suspected causes of infertility on HSG in our patients (Table 3). Uterine fibroid (31.4%) was the most common uterine factor, while tubal blockage accounted for 27.5% of tubal factors. Only 12.7% had bilateral tubal blockage compared to 7.8% who had a left blocked tube and 6.9% on the right side; and 25.5% of the patients had pelvic adhesions (Table 4).

**Table 1:** Socio-demographic characteristics of infertile women

Variable	Frequency	Percentage (%)
<b>Age</b>		
21-25	17	16.7
26-30	18	17.6
31-35	25	24.5
36-40	29	28.4
41-45	13	12.7
<b>Marital status</b>		
Single	2	2.0
Married	96	94.1
Divorced	4	3.9
<b>Occupation</b>		
Primary	10	9.8
Secondary	39	38.2
Tertiary	48	47.1
Others	5	4.9
<b>Ethnicity</b>		
Yoruba	86	84.3
Igbo	7	6.9
Hausa	3	2.9
Others	6	5.9
<b>Religion</b>		
Islam	76	74.5
Christianity	26	25.5
Others	0	0.0

**Table 2:** Gynecological and reproductive parameters of infertile women

Variable	Frequency	Percentage (%)
<b>Parity</b>		
0	69	67.6
1	21	20.6
2	8	7.8
3	1	1.0
4	3	2.9
<b>No of living Children</b>		
0	81	79.4
1	16	15.7
2	2	2.0
4	1	1.0
5	2	2.0
<b>Regularity of menstrual cycle</b>		
Irregular	41	40.2
Regular	61	59.8
<b>Pregnancy loss</b>		
Spontaneous Miscarriage	36	38.2
Voluntary termination of pregnancy	27	26.5
No pregnancy loss	36	35.3
<b>Previous procedure</b>		
Yes	53	52.0
No	49	48.0
<b>Type of surgery/procedure n=53</b>		
Exploratory	1	1.9
D&C	27	51.0
MVA	21	39.6
Abdominal myomectomy	2	3.8
Adhesiolysis + IUC	2	3.8

**Table 3:** Types, duration, and causes of infertility in women

Variable	Frequency	Percentage (%)
<b>Type of infertility</b>		
Primary	27	26.5
Secondary	75	73.5
<b>Duration of infertility in years</b>		
≤4	57	55.9
≥5	45	44.1
<b>Previous history to suggest PID</b>		
Yes	27	26.5
No	75	73.5
<b>Suspected cause of infertility</b>		
Tubal factor (obstruction)	18	17.6
Anovulation	23	
Unexplained	3	2.9
Male factor	15	14.7
Uterine factor	21	20.6
Others	22	21.6

**Table 4:** HSG findings of women with infertility

Variable	Frequency	Percentage (%)
<b>Tubal blockage</b>		
Right	7	6.9
Left	8	7.8
Both	13	12.7
No	74	72.5
<b>Hydrosalpinx</b>		
Right	5	4.9
Left	3	2.9
Both	1	1.0
No	93	91.2
<b>Uterine fibroid</b>		
Yes	32	31.4
No	70	68.7
<b>Uterine synechia</b>		
Yes	14	13.7
No	88	86.3
<b>Congenital anomaly</b>		
Yes	0	0.0
No	102	100.0
<b>Cervical appearance</b>		
Normal	89	87.3
Irregular	4	3.9
Stenosis	9	8.8
<b>Pelvic adhesion</b>		
Yes	26	25.5
No	76	74.5

## DISCUSSION

This study analyzed the hysterosalpingography outcomes of 102 women with infertility attending the gynecological clinic at the UITH between January 2022 and December 2024. Most participants were aged 36–40 years, with nearly 94% being married. This age distribution is consistent with findings from other regions in Nigeria.<sup>14,15,16</sup> The lowest representation was observed in the 41–45-year age group, similar to reports from Lagos and Zaria.<sup>14,17</sup> These findings highlight that infertility affects women across the reproductive age spectrum. The high proportion (79.4%) of married women without a living child underscores the significant social, psychological, and marital consequences of infertility in this setting, where childbearing remains central to marital stability and social status.<sup>14,18</sup>

The predominance of secondary infertility (73.5%) in this study is consistent with earlier Nigerian and African reports, where secondary infertility often exceeds primary infertility due to the high prevalence of preventable reproductive tract infections such as post-abortal sepsis, puerperal sepsis, and sexually transmitted diseases.<sup>6,19,20,21</sup> In Abakaliki, South-Eastern Nigeria, Nwankwo *et al.* reported secondary

infertility in 65% of women undergoing HSG, emphasizing the role of prior reproductive events and their complications.<sup>20</sup> Similar patterns have been documented across Nigeria and sub-Saharan Africa, where unsafe abortion practices, poorly managed pelvic infections, and limited access to quality obstetric care are common contributors.<sup>6,14,17</sup> These contextual factors likely explain the high proportion of secondary infertility in our cohort, especially given the substantial proportion of women with previous dilatation and curettage (51%) or manual vacuum aspiration (39.6%) in their surgical histories.

Most women demonstrated bilaterally patent fallopian tubes, while 12.7 % had bilateral tubal blockage and 25.5% had pelvic adhesions. The prevalence of tubal obstruction is comparable to findings from several Nigerian HSG series, where tubal abnormalities have been reported in approximately 22–45% of infertile women. For example, Okafor *et al.*<sup>16</sup> in Nnewi found tubal pathologies in 43.5% of women, with bilateral tubal occlusion in 18.7%, while Adedigba *et al.*<sup>17</sup> in Lagos reported tubal pathologies as the predominant abnormality in about one-third of patients.<sup>16,17</sup> Studies from other African settings, including Uganda and Sudan, similarly highlight tubal blockage as the commonest structural cause of female infertility.<sup>19,24</sup>

In our cohort, the prevalence of bilateral tubal blockage (12.7%) is slightly lower than some of these reports, which may reflect differences in population risk profiles, prior antibiotic use, referral patterns, or technical and interpretive variations in HSG.

Hydrosalpinx was identified in 8.8% of participants, a frequency consistent with reports ranging from 4% to 14% in similar studies.<sup>15,20,23</sup> In a large Nigerian series, hydrosalpinx was reported as an increasingly recognized contributor to tubal factor infertility, often linked to longstanding pelvic infections and adhesions.<sup>11,14</sup> The relatively modest prevalence in this cohort may reflect earlier presentation before advanced tubal damage, under-recognition of subtle radiologic features, or prior treatment of pelvic infections. Nevertheless, hydrosalpinx remains clinically significant due to its adverse effects on natural conception and assisted reproductive technology outcomes, warranting careful evaluation and appropriate management.<sup>16,17,23,25</sup>

Uterine fibroids were the most common uterine abnormality detected, occurring in 31.4% of women. This finding is consistent with emerging local data showing fibroids as increasingly prominent HSG findings among infertile women, in some cases surpassing tubal pathologies.<sup>15</sup> A five-year review from Lagos State University Teaching Hospital similarly reported fibroids as the most frequent abnormality on HSG.<sup>15</sup> While fibroids are highly prevalent in women of African descent, their contribution to infertility depends on size, location, and distortion of the uterine cavity; thus, their frequent detection in this study population underscores the importance of integrating transvaginal ultrasound and, where appropriate, hysteroscopy or MRI for more precise characterization and targeted management.<sup>26</sup>

Uterine synechiae were identified in 13.7% of participants, while pelvic adhesions were present in approximately one quarter of the cohort. These findings are clinically plausible given the high rate of prior intrauterine procedures observed in this population. Intrauterine and pelvic adhesions have been widely linked to repeated uterine instrumentation and post-abortal or postpartum infections in African settings.<sup>14,17,20</sup>

## CONCLUSION

This study highlighted the significance of using a contrast-based radiological evaluation to test for structural abnormalities of the reproductive tract in women with infertility, further buttressing the fact that HSG is still relevant in modern clinical practice despite the development of newer diagnostic tools from technological advancement.

## Conflict of interest

The authors declared no conflict of interest in the conduct of this study.

## Funding and sponsorship

The authors received no funding for this work

**Authors' contribution:** Research conception and design was carried out by SMG, MAM and HOR, Data acquisition and collection was carried out by SMG, MAM and ROS, Analysis was done by SZ and HAM, Data interpretation was done by SMG and MAM. Drafting of Manuscript was done by LTO, IOO, ABO, JJO and OJS and Revising of the Manuscript was done by SMG and OSJ.

**ORCID:** SMG: 0000-0003-0979-7338; MAM: 0009-0006-3824-4977; LTA: 0000-0002-0477-7859; HOR: 0000-0003-4859-5405; OSJ: 0000-0002-1016-8355; IOQ: 0000-0001-5990-6841; ABA: 0009-0001-5141-4209; JJO: 0009-0002-2518-8583; SZ: 0009-0009-6046-461X; HHM: 0000-0003-3870-1585; ROS: 0000-0002-9350-1642.

## REFERENCES

1. Practice Committee of the American Society for Reproductive Medicine. Diagnostic evaluation of the infertile female: a committee opinion. *Fertil Steril.* 2012;98(2):302-7.
2. Úbeda B, Paraira M, Alert E, Abuin RA. Hysterosalpingography: spectrum of normal variants and non-pathologic findings. *Am J Roentgenol.* 2001;177(1):131-5.
3. Steinkeler JA, Woodfield CA, Lazarus E, Hillstrom MM. Female infertility: a systematic approach to radiologic imaging and diagnosis. *Radiographics.* 2009;29(5):1353-70.
4. Infertility: <https://www.who.int/news-room/fact-sheets/detail/infertility> [assessed on 29th of January 2025].
5. Onwuchekwa CR, Oriji VK. Hysterosalpingographic (HSG) Pattern of Infertility in Women of Reproductive Age. *J Hum Reprod Sci.* 2017; 10:178–184.
6. Panti A, Sununu Y. The profile of infertility in a teaching Hospital in Northwest Nigeria. *Sahel Med J.*2014; 17:7-11
7. Okonofua FE. Infertility in Sub-Saharan Africa. In: Okonofua FE (Ed). *Contemporary Obstetrics and Gynaecology for Developing Countries.* Benin City, Nigeria, Women's Health and Action Research Centre. 2003:128-56.
8. Ogunniyi SO, Makinde OO, Dare FO. Abortion related deaths in Ile-Ife, Nigeria. *Afr J Med Med Sci.* 1999; 19:271–4
9. Idrisa A, Kwawukume EY, Emuveyan EE. Infertility. In: Kwawukume EY, Emuveyan EE (Ed). *Comprehensive Gynecology in the*

- Tropics. Accra, Graphics Packaging 2005:333–43.
10. Adetoro OO, Ebomoyi EW. Prevalence of infertility in a rural Nigerian community. *Afr J Med Med Sci.* 1991; 20:23–7.
  11. Reis MM, Soares SR, Cancado ML, Camargos AF. Hysterosalpingo-contrast Sonography (Hycosy) with SH U 454 (Echorist) for the assessment of tubal patency. *Hum Reprod.* 1998; 13:3049–52.
  12. Khalaf Y. ABC of subfertility tubal subfertility. *Br Med J.* 2003; 327:610–3.
  13. Jimoh OS, Ahmed AK, Jimoh-Abdulghaffaar HO, Adeniyi MA, Egua AI, Animashaun OA, *et al.* Assisted reproductive technology: The perspectives of religious leaders in Ogun State, South-Western Nigeria. *AJRGE.* 2022;7(1):27-36.
  14. Yahya A, Adesiyun A. Pattern of hysterosalpingographic findings among women with infertility in Ahmadu Bello University Teaching Hospital, Zaria, Nigeria. *Ann Afr Med Res.* 2024;7(1).
  15. Jamiu I, Christopher O, Jovita D, Henry O, Andrew I. A Five-Year Review of Hysterosalpingographic Findings at Lagos State University Teaching Hospital, Nigeria. *Rwanda J Med. Health Sci.* 2022; 5:55-61.
  16. Okafor CO, Okafor CI, Okpala OC, Umeh E. The pattern of hysterosalpingographic findings in women being investigated for infertility in Nnewi, Nigeria. *Niger J Clin Pract.* 2010; 13:264-7.
  17. Adedigba JA, Idowu BM, Hermans SP, Ibitoye BO, Fawole OA. The relationship between hysterosalpingography findings and female infertility in a Nigerian population. *Pol J Radiol.* 2020;85:188-95.
  18. Ajayi AB, Afolabi BM, Ajayi BD, Oyetunji IO, Biobaku OR, Atiba A, *et al.* Pyospermia in Men Seeking Assisted Reproduction Technology. *Open J Urol.* 2018; 8:93-107.
  19. Kiguli- Malwadde E, Byanyima RK. Structural findings at hysterosalpingography in patients with infertility in two private clinics in Kampala, Uganda. *Afr Health Sci.* 2004; 4:178-81.
  20. Ibekwe PC, Udensi AM, Imo AO. Hysterosalpingographic findings in patients with infertility in Southeastern Nigeria. *Niger J Med.* 2010;19(2):165-7.
  21. Onwuchekwa C, Oriji V. Hysterosalpingographic (HSG) pattern of infertility in women of reproductive age. *J Human Reprod Sci.* 2017; 10(3):178-84.
  22. Anyiom OP, Ugbaka AC, Ahameufuna NW, Kanu UV, Chelsy O, Efeosa IP. Evaluating the prevalence of tubal patency with age in women investigating for infertility using hysterosalpingography in Calabar, Nigeria. *World J Bio Pharm Health Sci.* 2024; 19:159-65.
  23. Oriji PC, Kiridi K, Allagoa D, Omietimi J, Orisabinone IB, Makinde OI, *et al.* Pattern of tubal pathology in infertile women undergoing hysterosalpingography at the Federal Medical Centre, Yenagoa, Bayelsa State, Nigeria. *Yen Med J.* 2020;2(1).
  24. Kamal E, Elzaki M. Hysterosalpingography findings in Infertile Sudanese women: A cross-sectional study on tube blockage. *Pan Afr Med J.* 2024;48(1).
  25. Utoo BT, Mohammad H. Tubal Abnormalities on Hysterosalpingography and Select Risk Factors in Women Undergoing Infertility Evaluation in Makurdi, Nigeria. *Gynecol Reprod Health.* 2020;4(3):1-6.
  26. Ahmadi F, Hosseini F, Javam M, Pahlavan F. Hysterosalpingography findings of leiomyomas and how they look in artistic eyes: new diagnostic signs. *Br J Radiol.* 2021; 94:20200019.