



# **Hysterosalpingography Findings among Women Presenting for Infertility Evaluation in Bayelsa State, South-South Nigeria**

**E. K. Kiridi <sup>a,b</sup>, P. C. Oriji <sup>c\*</sup>, J. U. Ugwoegbu <sup>d</sup> and I. J. Abasi <sup>e</sup>**

<sup>a</sup> Department of Radiology, Niger Delta University Teaching Hospital, Okolobiri, Bayelsa State, Nigeria.

<sup>b</sup> Silhouette Radiodiagnostic Consultants, Yenagoa, Bayelsa State, Nigeria.

<sup>c</sup> Department of Obstetrics and Gynaecology, Federal Medical Centre, Yenagoa, Bayelsa State, Nigeria.

<sup>d</sup> Department of Radiology, Federal Medical Centre, Owerri, Imo State, Nigeria.

<sup>e</sup> Department of Obstetrics and Gynaecology, Niger Delta University Teaching Hospital, Okolobiri, Bayelsa State, Nigeria.

## **Authors' contributions**

*This work was carried out in collaboration among all authors. Author EKK wrote the research protocol, carried out hysterosalpingography, reported hysterosalpingography films and collected data. Author PCO conceptualised the research topic, collated data, wrote the introduction, methodology, results, discussion and the first draft of the manuscript. Author JUU reported hysterosalpingography films. Author IJA managed literature search and wrote the abstract. All authors read and approved the final manuscript.*

## **Article Information**

DOI: 10.9734/JAMMR/2022/v34i531292

### **Open Peer Review History:**

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://www.sdiarticle5.com/review-history/85210>

**Original Research Article**

**Received 15 January 2022**

**Accepted 19 March 2022**

**Published 21 March 2022**

## **ABSTRACT**

**Background:** Hysterosalpingography is an investigative modality used in the evaluation of the uterine cavity, fallopian tubes, and adjacent peritoneal cavity following the injection of contrast material through the cervical canal.

**Objective:** To determine the pattern of pathologies seen in infertile women undergoing hysterosalpingography.

**Materials and Methods:** This prospective research was conducted at the Obstetrics and Gynaecology, and Radiology Departments of the two tertiary health institutions in Bayelsa State,

Nigeria, from January to July, 2021. Hysterosalpingography was done for 350 infertile women, after obtaining written informed consent. Data were entered into a pre-designed proforma, and analysed using Statistical Product and Service Solutions (SPSS) version 25.0. Results were presented in frequencies and percentages for categorical variables, and mean and standard deviation for continuous variables.

**Results:** The most common tubal finding was blockage; 7 in 10 (71.7%) women had at least one blocked tube. One hundred and nine (31.1%) had both tubes blocked, the left tube was blocked in seventy-nine (22.6%), while the right tube was affected in sixty-three (18.0%) women. Hydrosalpinx affected the right, left and both tubes in 20 (5.7%), 8 (2.3%) and 4 (1.1%) women respectively. Uterine findings were fibroids (21.1%), intrauterine adhesion (3.4%) bicornuate uterus (0.9%) and adenomyosis (1.1%).

**Conclusion:** This study revealed a high incidence of tubal blockage in the women being evaluated for infertility. The plausible reason for this observation may be due to post-abortion sepsis and pelvic inflammatory disease that may have arisen from induced abortion, as observed in our study. Hysterosalpingography remains a very crucial investigative modality that plays a central role in the evaluation of infertile women.

*Keywords: Hysterosalpingography; infertile; tubal; blockage; uterine.*

## 1. INTRODUCTION

Hysterosalpingography is an investigative modality used in the evaluation of the uterine cavity, fallopian tubes, and adjacent peritoneal cavity following the injection of contrast material through the cervical canal [1]. Hysterosalpingography remains the most common method of ascertaining tubal patency in our environment and perhaps the most common form of uterine instrumentation in infertile women [2]. Apart from hysterosalpingography, investigative modalities are transvaginal ultrasound scan, hysteroscopy, sonohysterosalpingography, laparoscopy and dye test, and magnetic resonance hysterosalpingogram.

Infertility is the failure to conceive despite 12 months of regular unprotected sexual intercourse. It is primary if a couple is unable to achieve pregnancy, while secondary infertility is the inability to achieve pregnancy after a previous pregnancy, irrespective of the outcome of that pregnancy. Infertility is a condition that can affect couples psychologically. It is a socially distressing medical condition that remains a public health concern in many developing countries including Nigeria [3]. Infertility is a unique condition, because it involves a couple, rather than a single individual. Fertility rate in Nigeria is approximately 5.25 children per woman in 2020 [4]. A study of a random sample of 867 women from the general population having unprotected sexual intercourse with a male partner reported pregnancy rates within 6, 12,

and 24 months of 54%, 76%, and 89%, respectively [5].

Worldwide, the prevalence of infertility is highest in Eastern Europe, North Africa/Middle East, Oceania, and Sub-Saharan Africa [6]. Generally, 6% – 15.7% of couples are affected by infertility, worldwide [7–10]. In Sub-Saharan Africa, the prevalence of infertility varies. It is 14.3% in The Gambia [7], 10.4% in Sudan [8] and 32% in South-South Nigeria [11]. In the United Kingdom and the United States of America, infertility is estimated to be 6% and 10% respectively [10]. Experiences from actual clinical practice indicate that infertility is a major burden on clinical service delivery in Nigeria, and reports indicate that infertility is the most frequent reason for gynaecological consultation in Nigeria [12].

The findings on hysterosalpingography may be normal or abnormal. The pathologies seen on hysterosalpingography are classified into tubal, peritubal, uterine and cervical.

The objective of this study was to determine the pattern of pathologies seen in infertile women undergoing hysterosalpingography in Bayelsa State, South-South Nigeria.

## 2. MATERIALS AND METHODS

This study was conducted at the Departments of Obstetrics and Gynaecology, and Radiology of the Federal Medical Centre, Yenagoa and Niger Delta University Teaching Hospital, Okolobiri, both in Bayelsa State, Nigeria. These are the two tertiary hospitals in the State. The survey was

conducted over a seventh-month period, from January to July, 2021. The main aim of these tertiary hospitals is to provide service, training and research. Hospitals in Bayelsa State and surrounding Rivers and Delta States refer their patients to these Centres. This was a prospective, descriptive, cross-sectional study. Women that presented to the gynaecological clinic for evaluation of infertility, were referred to the Radiology department for hysterosalpingography as part of their investigations.

The sample size for this study was calculated using the formula:

$$n = z^2pq/d^2 \quad [13]$$

Where:

n = minimum sample size  
z = normal standard deviation set at 95% confidence limit = 1.96  
p = prevalence of infertility which was 32% (0.32) from a previous study in South-South Nigeria [11].  
q = 1 – p (complementary probability).  
d = margin of error = 5% = 0.05  
Calculation:  
 $n = (1.96)^2 \times 0.32 \times 0.68 / (0.05)^2$   
 $n = 3.8416 \times 0.32 \times 0.68 / 0.0025$   
 $n = 0.8359 / 0.0025$   
 $n = 334.37$

After giving room for attrition of 5%, 'n' was adjusted to 350.

Therefore, 350 women being evaluated for infertility were randomly selected for this study from the gynaecological clinic. These women were recruited consecutively until the sample size was complete. Hysterosalpingography was performed for these women in both tertiary health institutions.

Infertile women referred for hysterosalpingography, and women that gave consent and completely filled the consent/questionnaire form were included in the study.

Exclusion criteria included abnormal uterine/vaginal bleeding before the procedure, on-going menstruation, pregnancy, discharge on inspection of the cervix, cervical stenosis/cervical pathology, evidence of pelvic inflammatory disease, previous history of contrast

hypersensitivity, and all patients that declined consent or incompletely filled the consent form and questionnaire.

The nature of the study, the procedure and the likely benefits to the patients were explained to them.. Their age, level of education, occupation, parity, body mass index and other patients' information were obtained and documented. Afterwards, they were referred to the Radiology Department for hysterosalpingography.

## 2.1 Procedure

Hysterosalpingography was carried out in the proliferative phase of the menstrual cycle (between the 7th and 10th day). Lead apron to protect the body and eye shield were put on. After passing urine to empty her urinary bladder, the patient was initially placed in the supine position on the X-ray table. The scout radiograph of the antero-posterior view of the pelvis was taken. She was then placed in the lithotomy position, and draped to ensure privacy. After hand-washing and putting on sterile gloves, under a good light source, a sterile Cusco's speculum was inserted into the vagina to expose the cervix.

The ecto-cervix was cleaned with chlorhexidine solution, and the anterior lip of the cervix grasped with a tenaculum. A self-retaining cannula was inserted into the cervix, and the speculum was removed for the patient's comfort. Urographin, a water-soluble, high osmolar contrast medium (10 – 20 ml) was warmed to body temperature, and injected slowly into the endometrial cavity. Three radiographs were taken to outline the uterine cavity, fallopian tubes and intraperitoneal spillage respectively. The cannula was removed, the vulva was cleaned, and she dressed up. The hysterosalpingography films were reported by the Consultant Radiologist. The outcome of the procedure was discussed with the women.

## 2.2 Data Analysis

Data were entered into a pre-designed proforma, and were analysed using Statistical Product and Service Solutions for windows® version 25 (SPSS Inc.; Chicago, USA). Results were presented in frequencies and percentages for categorical variables and mean and standard deviation for continuous variables. P-value less than 0.05 was taken as being statistically significant.

### 3. RESULTS

#### 3.1 Sociodemographic Characteristics and Anthropometric Indices of the Women

A total of 350 women were recruited for the study. Two hundred and sixty-three (75.1%) women were in the fourth decade of life, while less than 5% were aged less than 30-year-old (3.4%). Mean age of participating women was 35.9 years with a standard deviation of 4.6 years (Table 1).

Majority (71.1%) of the women had tertiary level of education, and 44.6% employed as civil servants. All (100.0%) the participants were Christians, and they were married. Eighty-five

(24.3%) were mildly obese, while 12 of them (3.4%) were moderately obese (Table 1).

#### 3.2 Gynaecological Features and Infertility-Related Factors

One hundred and thirty-nine (39.7%), ninety-nine (28.3%) and eighty-four women (24.0%) were nulliparous, multiparous and primiparous women respectively (Table 2). Forty (11.5%) participants have been married for more than 10 years as at the time of the hysterosalpingography. Two hundred and seventy-three (78.0%) women and seventy-seven (22.0%) women were managed for secondary and primary infertility respectively (Table 2). About a quarter had infertility for 6 to 10 years (Table 2).

**Table 1. Sociodemographic characteristics and anthropometric indices**

Characteristics	Frequency (N = 350)	Percent (%)
<b>Age group (years)</b>		
< 30	12	3.4
30 – 39	263	75.1
≥ 40	75	21.4
<b>Mean age ± SD in years</b>	35.9 ± 4.6	
<b>Mean age of menarche ± SD in years</b>	13.8 ± 1.6	
<b>Level of education</b>		
Primary	12	3.4
Secondary	89	25.4
Tertiary	249	71.1
<b>Occupation</b>		
Civil Servant	156	44.6
Professional	36	10.3
Trader/Artisan	122	34.9
Unemployed	36	10.3
<b>Body mass index categories</b>		
Normal weight	79	22.6
Overweight	174	49.7
Class I obesity	85	24.3
Class II obesity	12	3.4
Class III obesity	0	0
<b>Mean weight ± SD in kg</b>	69.2 ± 13.6	
<b>Mean height ± SD in m</b>	1.58 ± 0.05	
<b>Mean BMI ± SD in kg/m<sup>2</sup></b>	27.5 ± 4.5	

**Table 2. Gynaecological features and infertility-related factors**

<b>Characteristics</b>	<b>Frequency (N = 350)</b>	<b>Percent (%)</b>
<b>Parity</b>		
Nulliparity	139	39.7
Primiparity	84	24.0
Multiparity	99	28.3
Grandmultiparity	28	8.0
<b>Median Parity (Range)</b>	1 (0 – 10)	
<b>Duration of marriage (years)</b>		
< 5	187	53.4
6 – 10	123	35.1
11 – 15	24	6.9
> 16	16	4.6
<b>Mean duration of marriage ± SD</b>	6.2 ± 4.5	
<b>Number of children</b>		
None	242	69.1
1 – 2	88	25.1
≥ 3	20	5.7
<b>Median number of children (Range)</b>	0 (0 – 10)	
<b>Type of infertility</b>		
Primary	77	22.0
Secondary	273	78.0
<b>Duration of infertility (years)</b>		
< 5	246	70.3
6 – 10	88	25.1
11 – 15	16	4.6
<b>Duration of infertility ± SD</b>	4.6 ± 3.1	

**3.3 History of Previous Gynaecological Problems**

Two hundred and fifteen (61.4%), 175 (50.0%) and ninety-seven (27.7%) women reported history of induced abortion, dysmenorrhea, and chronic pelvic pain respectively (Fig. 1).

**3.4 Hysterosalpingography Findings among Participants**

**3.4.1 Tubal findings**

Only 27.1% of the women had normal hysterosalpingography (Fig. 2). The most common tubal finding was blockage; 7 in 10

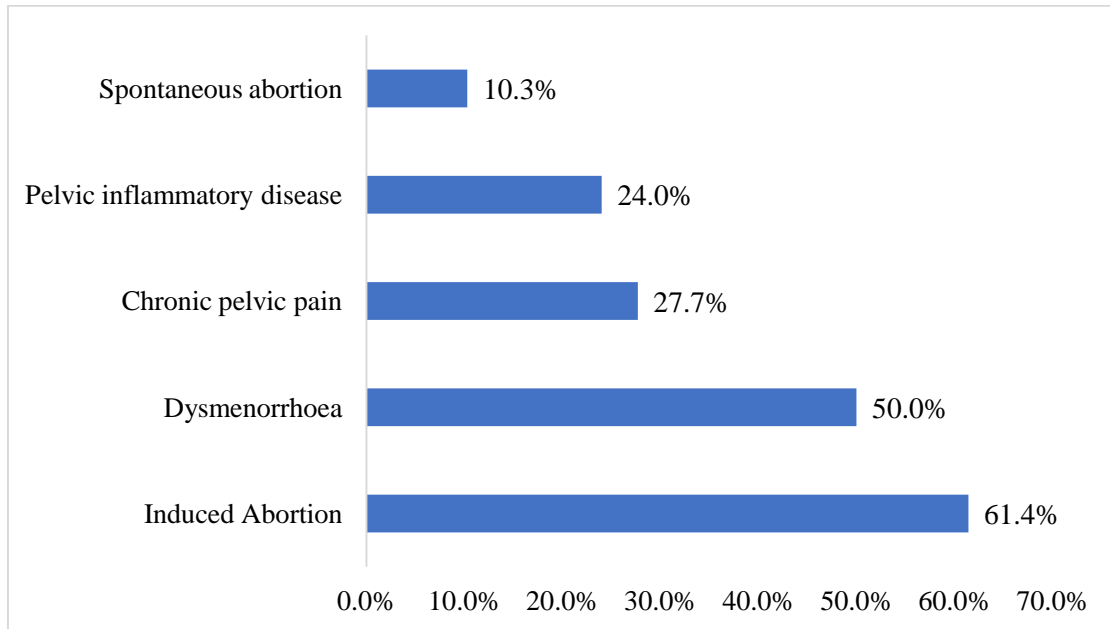
(71.7%) women who had hysterosalpingography had at least one blocked tube. One hundred and nine (31.1%) had both tubes blocked, the left tube was blocked in seventy-nine (22.6%), while the right tube was affected in sixty-three (18.0%) women. Hydrosalpinx affected the right, left and both tubes in 20 (5.7%), 8 (2.3%) and 4 (1.1%) women respectively (Table 3, Figs. 3 – 5).

**3.4.2 Uterine findings**

Uterine findings were fibroids (21.1%), intrauterine adhesion (3.4%) bicornuate uterus (0.9%) and adenomyosis (1.1%). (Table 4, Figs. 5 & 6).

**Table 3. Tubal findings during hysterosalpingography**

<b>Tubal findings</b>	<b>Side of the body – N = 350 (%)</b>			
	<b>Right alone</b>	<b>Left alone</b>	<b>Both</b>	<b>None</b>
Blockage	63 (18.0)	79 (22.6)	109 (31.1)	99 (28.3)
Hydrosalpinx	20 (5.7)	8 (2.3)	4 (1.1)	318 (90.9)
Salpingitis isthmica nodosa	0 (0.0)	4 (1.1)	4 (1.1)	342 (97.7)
Peritubal adhesions	12 (3.4)	4 (1.1)	0 (0.0)	334 (95.4)



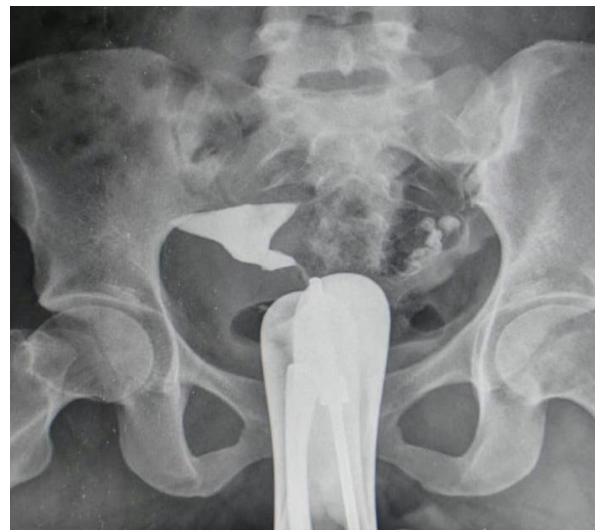
**Fig. 1. History of previous gynaecological problems**

**Table 4. Uterine findings during hysterosalpingography**

Uterine findings	Frequency	Percent (%)
Fibroid	75	21.1
Intrauterine adhesions	12	3.4
Bicornuate uterus	3	0.9
Adenomyosis	4	1.1
Normal Hysterosalpingography	95	27.1



**Fig. 2. Normal study**



**Fig. 3. Right tubal occlusion**



**Fig. 4. Left tubal occlusion**



**Fig. 5. Moderately enlarged uterine cavity, with smooth filling defect suggestive of submucous uterine fibroid. Bilateral tubal occlusion. Contrast intravasation into pelvic and uterine vessels**



**Fig. 6. Irregular filling defect suggestive of intrauterine adhesion. Bilateral loculated spillage, suggestive of peritubal adhesions**

#### **4. DISCUSSION**

Despite advancement in technology, hysterosalpingography is still preferred because it is cheap, readily available, and reliable. It is the most commonly used investigative modality for the evaluation of infertile women. The findings on hysterosalpingography may be normal or abnormal. The pathologies seen on hysterosalpingography are classified into tubal, peritubal, uterine and cervical.

Our study revealed a mean age  $\pm$  SD of  $35.9 \pm 4.6$  years. It also revealed that the greatest number of infertile women were within the age range of 30 – 39 years. This is the reproductive age-group. Other studies have reported similar mean age and age range [14–17]. Many women in our environment now prefer to complete their education before getting married and attempting pregnancy. This is evidenced by the majority of women in this study with tertiary level of education presenting for infertility evaluation.

Another plausible reason for the age range in this study may be due to the preference of the women in this environment for traditional birth attendants' places, patent medicine dealers and prayer houses, before presenting to the hospital for proper evaluation and treatment. The means age in our study agree with the fact that as a women ages, the ability to conceive declines [18].

This study reveals that majority of the patients were overweight and obese. The prevalence of obesity in the population of infertile women is high, and many studies have documented the association of obesity with infertility [19]. In obese women, there is increased levels of androgens in circulation, which contributes to anovulation and menstrual irregularities, which in turn causes reduced ability to conceive and response to fertility management.

Secondary infertility was the most common cause of infertility in this study. This is in tandem with the reports from many studies [16,20,21]. The plausible reason for this observation may be due to post-abortion sepsis and pelvic inflammatory disease that may have arisen from induced abortion, as observed in our study. Others may be due to post-puerperal sepsis from previously managed pregnancies in unhygienic environments, sexually transmitted infections and post-operative/procedure infections.

In our study, only 27.1% of the women had normal hysterosalpingography. This is similar to the report of 25.4% by Aduayi et al., in Ado-Ekiti, Nigeria; [14] 26.9% by Udobi and Aronu in Awka, Nigeria; [21] 29.2% by Onwuchekwa and Oriji in Port Harcourt, Nigeria; [22] and 29.1% by Okafor et al., in Nnewi, Nigeria [15]. Lower value of 16.6% have been reported in Kampala, Uganda [23]. Our value was lower than the 45.2% reported by Olatunji et al. [16] in Ogun State, Nigeria; 34.6% by Makwe et al. [20] in Lagos, Nigeria; and 62% by Gul et al., in Quetta, Pakistan [24]. The reason for these differences is not readily understood. It may be from differences in sexuality and health-seeking behaviour of women in the different regions of the world.

Bilateral tubal blockade was seen in 31.1% of the women. This is similar to 30.8% reported by Makwe et al. [20] in Lagos. It is higher than 4 – 25.4% reported by previous studies [14–16,22,24]. The reason for these differences may also be from differences in sexuality and health-seeking behaviour of women in the different

regions of the world. Bilateral hydrosalpinx was present in 1.1% of the women. This was lower than 4.6 – 8.8% reported in previous studies [15,16,22]. Hydrosalpinx was more on the right in our study. This was in tandem with the observation in some studies [15,16,25]. However, the preponderance of left hydrosalpinx was reported in some other studies [20,26,27]. The reason for this difference is not clear. The low incidence of hydrosalpinx in the women in our environment reflects the low incidence of gonorrhoea-related infertility as observed in a previous study in our Centre [28]. Peritubal adhesions were seen in 4.5% of the women. Some other studies have reported similar finding [14,20,21]. Peritubal adhesions may result from post-operative adhesions, endometriosis or previous poorly managed pelvic inflammatory disease.

The commonest uterine abnormality observed in this study was uterine fibroid. This was in agreement with the report of Aduayi et al. [14] and Olatunji et al. [16] The relationship of uterine fibroids with infertility is more of casual than causal [25]. However, the position of uterine fibroids may influence fertility. For instance, any fibroid at the cornual end of the uterus may occlude the tubal ostia, and then cause tubal factor infertility. Submucous fibroids may prevent implantation of the embryo, and may also be associated with spontaneous miscarriages. Pedunculated fibroids may twist around the tubes thereby kinking them. The pattern in our study agrees with the report that intrauterine lesions are more common in women being evaluated for infertility [29]. Submucous fibroids appear on hysterosalpingography as areas of regular filling defects. This should not be confused with the filling defects in intrauterine adhesions which are irregular. The very low proportion of women with congenital uterine abnormalities in this study is in keeping with the fact that Nigeria is within the infertility belt of Africa, where majority of the cases of infertility are more of acquired, rather than congenital, as observed in our study.

The strength of this research is domiciled in the fact that it is a two-centre prospective study. The fact that only two consultant radiologists did the hysterosalpingography, reduced bias, and increased the reproducibility of the report of this investigative modality. The limitation of this study lies in the fact that it is hospital-based. Therefore, the findings may not reflect what is present in the general population of infertile women. A multi-



centre randomised control trial with a larger sample size will be more representative.

## 5. CONCLUSION

This study revealed a high incidence of tubal blockage in the women being evaluated for infertility in Bayelsa State, Nigeria. To reduce this, women should be educated and counselled early in life on the complications of unsafe abortion, pelvic inflammatory disease, use of barrier methods of contraceptives (until they are ready for pregnancy), on the practice of good personal hygiene and to present to the hospital when features of pelvic inflammatory disease or sexually transmitted infection ensue. Pregnant women should also be encouraged to present to a hospital where labour will be managed hygienically to prevent puerperal sepsis, which is also a long-term cause of tubal blockage.

## CONSENT

Written informed consent was obtained from the women that met the inclusion criteria.

## ETHICAL APPROVAL

The research work was examined and approved by the research and ethics committee of the hospitals.

## ACKNOWLEDGEMENT

We appreciate all the patients and staff of both health institutions for all the roles they played in making this research successful. Dr. Adedotun Daniel Adesina is also appreciated for analysing the data for this study.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

1. Atalabi OM, Fayemiwo SA, Oladokun AA, Bakare RA. Pattern of asymptomatic sexually transmitted infections in women undergoing hysterosalpingography for infertility evaluation in Ibadan Nigeria. *Trop J Obstet Gynaecol.* 2013;30(2):91-98. DOI: 10.4314/tjog.v30i2
2. Oguntoyinbo AE. Adesina KT. Olaninoye AO. Aboyeji AP. Olanrewaju WI. Oniyangi M. Pre-HSG microbial isolates from endocervical swabs in infertile women in Ilorin, Nigeria. *West Afr J Radiol.* 2014;21(2):59–63. DOI: 10.4103/1115-1474.134604
3. Akinloye O, Truter EJ. A review of management of infertility in Nigeria: framing the ethics of a national health policy. *Int J Womens Health.* 2011;3:265-275. DOI: 10.2147/IJWH.S20501
4. Nigeria Fertility rate, 1950-2021 - knoema.com. Knoema. Available: <https://knoema.com/atlas/Nigeria/topics/Demographics/Fertility/Fertility-rate> Accessed March 4, 2022.
5. Slama R, Hansen OKH, Ducot B, Bohet A, Sorensen D, Giorgis Allemand L. Estimation of the frequency of involuntary infertility on a nation-wide basis. *Hum Reprod Oxf Engl.* 2012;27(5):1489-1498. doi:10.1093/humrep/des070
6. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: A systematic analysis of 277 health surveys. *PLoS Med.* 2012;9(12):e1001356. DOI: 10.1371/journal.pmed.1001356
7. Anyanwu MO, Idoko P. Prevalence of Infertility at the Gambian Teaching Hospital. *Women Health Gynecol.* 2017;3(2):1-4.
8. Abdalla NM. Pattern of Infertility Among Couples in Gezira Area, Sudan. *Med J Cairo Univ.* 2011;79(2):529-532.
9. Panti AA, Sununu YT. The profile of infertility in a teaching Hospital in North West Nigeria. *Sahel Med J.* 2014;17(1):7. DOI: 10.4103/1118-8561.129145
10. Ugwuja EI, Ugwu NC, Ejikeme BN. Prevalence of low sperm count and abnormal semen parameters in male partners of women consulting at infertility clinic in Abakaliki, Nigeria. *Afr J Reprod Health.* 2008;12(1):67-73.
11. Odunvbun WO, Oziga DV, Oyeye LO, Ojeogwu CL. Pattern of infertility among infertile couple in a secondary health

- facility in Delta State, South South Nigeria. *Trop J Obstet Gynaecol.* 2018;35(3): 244.  
DOI: 10.4103/TJOG.TJOG\_61\_18
12. Adeyemi AS, Adekanle DA, Afolabi AF. Pattern of gynaecological consultations at Ladoke Akintola University of Technology Teaching Hospital. *Niger J Clin Pract.* 2009;12(1):47-50.
  13. Araoye MO. Subjects Selection. In: *Research Methodology with statistics for Health and Social sciences.* Ilorin. Nathadex Publishers. 2003:115–129.
  14. Aduayi OS, Akanbi GO, Akintayo AA, Aduayi VA. Hysterosalpingography findings among women presenting for gynecological imaging in Ado-Ekiti, South western Nigeria. *Int J Reprod Contracept Obstet Gynecol.* 2017;5(6):1906-1911.  
DOI: 10.18203/2320-1770.ijrcog20161688
  15. 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(3):264-267.
  16. Olatunji AA, Jagun OE, Toyobo OO, Ashaolu OA, Adekoya OA. Hysterosalpingogram findings among women with infertility in Ogun State, Nigeria. *Ann Health Res.* 2017;3(2):75-81.
  17. Danfulani M, Haruna Y, Mohammed M, Ahmed S. Hysterosalpingographic findings in women with infertility in Sokoto North Western Nigeria. *Afr J Med Health Sci.* 2014;13:19.  
DOI: 10.4103/2384-5589.139438
  18. Maheshwari A, Hamilton M, Bhattacharya S. Effect of female age on the diagnostic categories of infertility. *Hum Reprod Oxf Engl.* 2008;23(3):538-542.  
DOI: 10.1093/humrep/dem431
  19. Zain MM, Norman RJ. Impact of obesity on female fertility and fertility treatment. *Womens Health Lond Engl.* 2008;4(2):183-194.  
DOI: 10.2217/17455057.4.2.183
  20. Makwe CC, Ugwu AO, Sunmonu OH, Yusuf-Awesu SA, Ani-Ugwu NK, Olumakinwa OE. Hysterosalpingography findings of female partners of infertile couple attending fertility clinic at Lagos University Teaching Hospital. *Pan Afr Med J.* 2021;40:223.  
DOI: 10.11604/pamj.2021.40.223.29890
  21. Udobi S, Aronu M. Hysterosalpingographic findings in women with infertility in Awka, Anambra State, South-East Nigeria. *Niger J Surg Sci.* 2017;27(2):47-47.
  22. Onwuchekwa CR, Oriji VK. Hysterosalpingographic (HSG) Pattern of Infertility in Women of Reproductive Age. *J Hum Reprod Sci.* 2017;10(3):178-184.  
DOI: 10.4103/jhrs.JHRS\_121\_16
  23. Kiguli-Malwadde E, Byanyima RK. Structural findings at hysterosalpingography in patients with infertility at two private clinics in Kampala, Uganda. *Afr Health Sci.* 2004;4(3):178-181.
  24. Gul P, Jomezai S, Naheed F, Gul P. Patterns Of Hysterosalpingographic Findings In Infertile Patients Presenting In A Tertiary Care Hospital of Quetta. *J Bahria Univ Med Dent Coll.* 2019;9(4):299-302.  
DOI: 10.51985/JBUMDC2018087
  25. Oriji PC, Kiridi EK, Allagoa DO, Omietimi JE, Orisabinone IB, Makinde OI, et al. Pattern of tubal pathology in infertile women undergoing hysterosalpingography at the Federal Medical Centre, Yenagoa, Bayelsa State, Nigeria. 2020;2(1):11-17.
  26. Phillips CH, Benson CB, Ginsburg ES, Frates MC. Comparison of uterine and tubal pathology identified by transvaginal sonography, hysterosalpingography, and hysteroscopy in female patients with infertility. *Fertil Res Pract.* 2015;1:20.  
DOI: 10.1186/s40738-015-0012-3
  27. Bukar M, Mustapha Z, Takai UI, Tahir A. Hysterosalpingographic findings in infertile women: a seven year review. *Niger J Clin Pract.* 2011;14(2):168-170.  
DOI: 10.4103/1119-3077.84008
  28. Oriji CP, Kiridi KE, Allagoa DO, Omietimi JE, Orisabinone IB, Makinde OI, et al. The use of NAAT- PCR to determine asymptomatic chlamydia and gonorrhoea infections in infertile patients undergoing hysterosalpingogram at the federal medical centre, Yenagoa, South-South Nigeria. *Int J Reprod Contracept Obstet Gynecol.* 2020;9(4):1507-1514.

- DOI: 10.18203/2320-1770.ijrcog20201214
29. Ait BY, Gervaise A, Fernandez H. Which is the method of choice for evaluating uterine cavity in infertility workup? J Gynecol Obstet Biol Reprod. 2010;39(8):606-613. DOI: 10.1016/j.jgyn.2010.08.004

© 2022 Kiridi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*  
*The peer review history for this paper can be accessed here:*  
<https://www.sdiarticle5.com/review-history/85210>