Original Research Article

RELATIONSHIP BETWEEN ABNORMAL CERVICAL FINDINGS AND ABNORMAL RESULTS AT HYSTEROSALPINGOGRAPHY IN INFERTILE WOMEN

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 relationship between abnormal cervical findings and abnormal results at hysterosalpingography in infertile women.

Materials and Methods: This descriptive, cross-sectional study conducted at the Obstetrics and Gynaecology, and Radiology Departments of four health institutions in Bayelsa State, Nigeria, between June and December, 2022. Hysterosalpingography was done for 332 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: Cervical finding was normal in only 49.7% (n=165) of the participants undergoing HSG. The abnormal cervical findings include deformed (27.7%), hyperaemic (5.7%), dull (5.7%), hard (5.7%) and short (5.4%) cervix. There was a statistically significant relationship between abnormal cervical findings during HSG and tubal blockade (χ^2 = 196.7; p – 0.001), presence of salpingitis (χ^2 = 41.1; p – 0.001), peritubal adhesion (χ^2 = 19.9; p – 0.001) and intrauterine adhesion (χ^2 = 35.62; p – 0.001).

Conclusion: Intrauterine adhesion, salpingitis, tubal blockade and peritubal adhesion on HSG is associated with some abnormal cervical findings in about half of infertile women in this study. The same pathological processes responsible for injury to the upper genital tract and tubal infertility may have caused injury to the cervix in the group of women.

Keywords: Hysterosalpingography findings, Infertile women, Abnormal cervix, Hyperaemic cervix, Hard cervix, Deformed cervix.

INTRODUCTION

Hysterosalpingography (HSG) is a common investigative modality used for the evaluation of infertile women. HSG assesses the uterine cavity, fallopian tubes, and adjacent peritoneal cavity following the injection of contrast material through the cervical canal.[1] Apart from HSG, other investigative modalities used for the evaluation of infertility include transvaginal ultrasound scan, hysteroscopy, sonohysterosalpingography, laparoscopy and dye test and magnetic resonance hysterosalpingogram. Infertility is the inability of a couple to achieve pregnancy despite 12 months of regular, penetrative, unprotected sexual intercourse.[2] It is primary if a couple is unable to achieve pregnancy, and it is

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secondary if there is inability to achieve pregnancy after a previous pregnancy, irrespective of the outcome of that pregnancy.

Some factors have been reported to significantly increase the chances of abnormal findings on HSG.[3–8] These factors include older women, poor level of education, nulliparity, secondary infertility, long duration of marriage, long duration of infertility, induced abortion, HIV-infection, post-abortion and puerperal sepsis, previous history of pelvic inflammatory disease (PID), chronic pelvic pain, previous ectopic pregnancy, previous gynaecological and abdominal surgery and early age at sexual debut.[3–8] From the clinical experience of the authors, women with certain abnormal cervical findings noted during HSG were observed to have abnormal HSG results. We therefore, sought in this research to determine if abnormal appearance, consistency and length of the cervix are significantly associated with abnormal HSG findings. To the best of our knowledge, there is no previous study with the same objective.

SUBJECTS AND METHODS

Study design and setting: This descriptive, cross-sectional study was conducted at the Radiology Departments and Infertility Clinics of the Federal Medical Centre, Yenagoa; Niger Delta University Teaching Hospital, Okolobiri; Diete Koki Memorial Hospital, Yenagoa; and Silhouette Radiodiagnostic Consultants, Yenagoa; all in Bayelsa State, Nigeria. It was conducted over a seventh-month period, between June and December, 2022. These facilities offer radiological, obstetric and gynaecological care services to the people of Bayelsa State and nearby Rivers and Delta States, all of which are located in the South-South geopolitical region of Nigeria.

Ethics: The protocol for this study was approved by the Research and Ethics Committee of the Federal Medical Centre Yenagoa, Bayelsa State, Nigeria (FMCY/REC/ECC/2022/682).

Sample size: This was calculated using the formula:

$n = z^2pq/d^2$ [9]

Where:

n = minimum sample size

z = normal standard deviation set at 95% confidence limit = 1.96

p = proportion of infertile women with abnormal findings on HSG, which was 72.9% (0.729) from a previous study in South-South Nigeria.[10]

q = 1 – p (complementary probability).

d = margin of error = 5% = 0.05

Calculation:

$n = (1.96)^2 \times 0.729 \times 0.271 / (0.05)^2$

$n = 3.8416 \times 0.729 \times 0.271 / 0.0025$

$n = 0.7539 / 0.0025$

n = 301.55

After considering attrition of 10% (30.16%), 'n' was adjusted to 332.

Therefore, 332 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.

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

Exclusion criteria: Women with abnormal uterine/vaginal bleeding before the procedure, on-going menstruation, 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. Written informed consent was obtained from the women that met the inclusion criteria. 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.

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, a bimanual examination was done to determine the consistency and length of the cervix. Under a good light source, a disposable sterile Cusco's speculum was inserted into the vagina to expose the cervix and observe its appearance. The findings on palpation and inspection of the cervix were documented. The cervical findings were graded into six categories, which included 1 – normal, 2 – hyperaemic, 3 – dull, 4 – hard, 5 – short and 6 – deformed. A short cervix for the purpose of this study was defined as a cervical length less than 2.5 cm.

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 (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 patient would dress up. The hysterosalpingography films were reported by the Consultant Radiologists. The outcome of the procedure was discussed with the women.

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.

RESULTS

Baseline characteristics of the study participants

There were 332 women who participated in the study. Their mean age was 32.6 ± 6.6 years. Majority (44.6%) were in the fourth decade of life, while 129 (38.9%) women were aged 20 – 29 years. Most (66.9%) of the women had tertiary level of education. About 2 in every 5 (39.2%) women were civil servants. The mean weight, height and body mass index were 75.4 ± 15.8 kg, 1.61 ± 0.09 m, and 28.5 ± 4.2 kg/m^2, respectively. Almost half (44.3%) of the participants were overweight and obese (44.6%) (Table 1). Majority (72.0%) of the women were nulliparous women. About three-quarters (77.4%) were assessed for secondary infertility. Mean duration of infertility was 4.5 ± 3.9 years (Table 2).

Cervical findings in the women during hysterosalpingography.

Of the women that participated in the study, 165 (49.7%) were noted to have normal cervical findings during hysterosalpingography. The most common abnormal cervical finding was a deformed cervical appearance (27.7%). The prevalence of other abnormal cervical findings is as shown in Figure 1.

Hysterosalpingography findings

Seventy (21.1%) women had bilateral tubal blockage; while unilateral tubal blockade was seen in 64 (19.3%) women. Unilateral hydrosalpinx and Salpingitis Isthmica nodosa was seen in 37 (11.1%) women. Other pathologies detected from HSG are as presented in Table 3.

Relationship between cervical findings and hysterosalpingography findings

There was a statistically significant relationship between abnormal cervical findings during HSG and tubal blockade (χ^2 = 196.7; p – 0.001), presence of salpingitis (χ^2 = 41.1; p – 0.001), peritubal adhesion (χ^2 = 19.9; p – 0.001) and intrauterine adhesion (χ^2 = 35.62; p – 0.001). Sixty of the 64 (93.8%) women who had unilateral tubal blockade and 100% of those with bilateral tubal blockade had abnormal cervical findings. All women (100.0%) with salpingitis and peritubal adhesion also had abnormal cervical finding. Of women with intrauterine adhesion, 35 out of 36 (97.2%) had abnormal cervical finding (Table 4).

Hyperaemic cervix had a significant association with tubal blockade only (χ^2 = 68.52; p – 0.001). Eighteen out of the Twenty women with hyperaemic cervix had unilateral tubal blockade (Table 5). Dull (χ^2 = 78.41; p – 0.001) and hard cervix (χ^2 = 60.81; p – 0.001) were also significantly associated with only tubal blockade. Nineteen out of twenty women with a dull cervix had unilateral tubal blockade and 18 out of 20 with a hard cervix had bilateral tubal blockade (Table 6). Short cervix had a significant association with tubal blockade (χ^2 = 10.5; p – 0.005), presence of salpingitis (χ^2 = 142.2; p – 0.001) and intrauterine adhesion (χ^2 = 146.7; p – 0.001). The tubes were patent in almost all (94.7%) of the women

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with a short cervix but almost all of them (94.7%) had salpingitis and intrauterine adhesion (Table 7). Deformed cervix was significantly associated tubal blockade (χ^2 = 109.1; p – 0.001), presence of salpingitis (χ^2 = 11.61; p – 0.001), peritubal adhesion (χ^2 = 52.62; p – 0.001) and intrauterine adhesion (χ^2 = 10.02; p – 0.002). About one out of three women with unilateral tubal blockade and three out of four with bilateral tubal blockade had a deformed cervix. The cervix was also deformed in 51.4%, 50% and all (100%) of women with salpingitis, intrauterine adhesion and peritubal adhesion respectively (Table 7).

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Table 1: Baseline characteristics of the study participants

Characteristics	Frequency, n = 332	Percent (%)
Age group (years)		
20 – 29	129	38.9
30 – 39	148	44.6
>40	55	16.6
Age in years – Mean ± SD	32.6 ± 6.6	
Level of education		
Primary	18	5.4
Secondary	92	27.7
Tertiary	222	66.9
Residential area		
Within Bayelsa	295	88.9
Outside Bayelsa	37	11.1
Occupation		
Civil servant	130	39.2
Trader	93	28.0
Unemployed	73	22.0
Banker	18	5.4
Artisan	18	5.4
Anthropometric measurement		
Weight in kg – mean ± SD	75.4 ± 15.8	
Height in metres – mean ± SD	1.61 ± 0.09	
Body mass index in kg/m^2 – mean ± SD	28.5 ± 4.2	
Categories of body mass index		
Normal weight	37	11.1
Overweight	147	44.3

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Table 1: Gynaecological features of the study participants

Characteristics	Frequency, n = 332	Percent (%)
Parity		
Nulliparous	239	72.0
Primiparous	55	16.6
Multiparous	38	11.4
Age group at menarche (years)		
10 – 12	38	11.4
13 – 14	220	66.3

>15	74	22.3
Age at menarche in years – mean ± SD	13.8 ± 1.5	
Duration of marriage (years)		
<5	204	61.4
6 – 10	91	27.4
>10	37	11.1
Mean duration of marriage in years – Mean ± SD	5.6 ± 4.6	
Infertility		
Primary	75	22.6
Secondary	257	77.4
Duration of infertility (years)		
<5	241	72.6
>5	91	27.4
Mean infertility duration – Mean ± SD	4.5 ± 3.9	

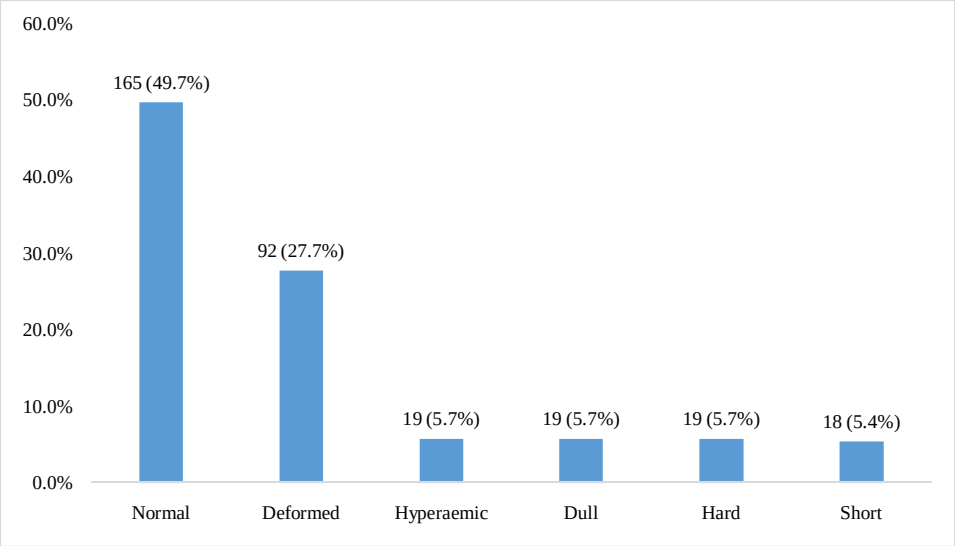

Figure 1: Bar chart showing cervical findings and frequency

Table 2: Hysterosalpingography findings

HSG findings	Frequency, n = 332	Percent (%)
Tubal Blockade		
No blockade	198	59.6
Unilateral tubal blockade	64	19.3
Bilateral tubal blockade	70	21.1
Hydrosalpinx		
Not Present	295	88.9

Present	37	11.1
Salpingitis Isthmica Nodosa		
Not Present	295	88.9
Present	37	11.1
Peritubal Adhesion		
Not Present	313	94.3
Present	19	5.7
Other findings		
Uterine fibroids	37	11.1
Intrauterine adhesion	36	10.8

Table 3: Relationship between abnormal cervical findings and Hysterosalpingography findings

HSG Findings	Cervical finding		χ^2 (p-value)
	Normal	Abnormal	
Tubal Blockade			
No blockade	161 (81.3)	37 (18.7)	196.7
Unilateral blockade	4 (6.3)	60 (93.8)	(0.001*)
Bilateral blockade	0 (0.0)	70 (100.0)	
Hydrosalpinx			
Not present	146 (49.5)	149 (50.5)	0.05
Present	19 (51.4)	18 (48.6)	(0.831)
Salpingitis			
Not Present	165 (55.9)	130 (44.1)	41.1
Present	0 (0.0)	37 (100.0)	(0.001*)
Peritubal adhesion			
Not present	165 (52.7)	148 (47.3)	19.9
Present	0 (0.0)	19 (100.0)	(0.001*)
Uterine fibroids			
Not Present	146 (49.5)	149 (50.5)	0.05
Present	19 (51.4)	18 (48.6)	(0.831)
Intrauterine adhesion			
Not Present	164 (55.4)	132 (44.6)	35.6
Present	1 (2.8)	35 (97.2)	(0.001*)

*Statistically significant

Table 5: Relationship between hyperaemic cervix and Hysterosalpingography findings

HSG Findings	Hyperaemic		χ^2 (p-value)
	Present	Absent	
Tubal Blockade			
No blockade	2 (1.0)	196 (99.0)	68.5
Unilateral blockade	18 (28.1)	46 (71.9)	(0.001*)
Bilateral blockade	0 (0.0)	70 (100.0)	
Salpingitis			
Not Present	20 (6.8)	275 (93.2)	2.7
Present	0 (0.0)	37 (100.0)	(0.102)
Peritubal adhesion			
Not Present	20 (6.4)	293 (93.6)	1.3
Present	0 (0.0)	19 (100.0)	(0.256)
Intrauterine adhesion			
Not Present	19 (6.4)	277 (93.6)	0.8
Present	1 (2.8)	35 (97.2)	(0.386)

*Statistically significant

Table 6: Relationship between Dull/Hard cervix and Hysterosalpingography findings

Characteristics	Dull		χ^2	Hard		χ^2
	Present	Absent	(p-value)	Present	Absent	(p-value)
Tubal Blockade						
No blockade	1 (0.5)	197 (99.5)	78.41	1 (0.5)	197 (99.5)	60.81
Unilateral blockade	19 (29.7)	45 (70.3)	(0.001*)	1 (1.6)	63 (98.4)	(0.001*)
Bilateral blockade	0 (0.0)	70 (100.0)		18 (25.7)	52 (74.3)	
Salpingitis						
Not Present	20 (6.8)	275 (93.2)	2.72	20 (6.8)	275 (93.2)	2.72
Present	0 (0.0)	37 (100.0)	(0.102)	0 (0.0)	37 (100.0)	(0.102)
Peritubal adhesion						
Not Present	20 (6.4)	293 (93.6)	1.33	20 (6.4)	293 (93.6)	1.33
Present	0 (0.0)	19 (100.0)	(0.256)	0 (0.0)	19 (100.0)	(0.256)
Intrauterine adhesion						
Not Present	19 (6.4)	277 (93.6)	0.81	19 (6.4)	277 (93.6)	0.81
Present	1 (2.8)	35 (97.2)	(0.386)	1 (2.8)	35 (97.2)	(0.386)

*Statistically significant

Table 7: Relationship between Short/Deformed cervix and Hysterosalpingography findings

Characteristics	Short		χ^2	Deformed		χ^2
	Present	Absent	(p-value)	Present	Absent	(p-value)

Tubal Blockade						
No blockade	18 (9.1)	180 (90.9)	10.5	19 (9.6)	179 (90.4)	109.1
Unilateral blockade	1 (1.6)	63 (98.4)	(0.005*)	21 (32.8)	43 (67.2)	(0.001*)
Bilateral blockade	0 (0.0)	70 (100.0)		52 (74.3)	18 (25.7)	
Salpingitis						
Not present	1 (0.3)	294 (99.7)	142.2	73 (24.7)	222 (75.3)	11.61
Present	18 (48.6)	19 (51.4)	(0.001*)	19 (51.4)	18 (48.6)	(0.001*)
Peritubal adhesion						
Not Present	19 (6.1)	294 (93.9)	1.2 (0.269)	73 (23.3)	240 (76.7)	52.62
Present	0 (0.0)	19 (100.0)		19 (100.0)	0 (0.0)	(0.001*)
Intrauterine adhesion						
Not Present	1 (0.3)	295 (99.7)	146.7	74 (25.0)	222 (75.0)	10.02
Present	18 (50.0)	18 (50.0)	(0.001*)	18 (50.0)	18 (50.0)	(0.002*)

*Statistically significant

DISCUSSION

From this study, normal cervical findings were noted in 49.7% of the infertile women undergoing HSG. This is low compared to the 82.5% rate of normal cervical findings reported in a previous study that reviewed cervico-hysterograms for notable cervical abnormalities in Jos, North-Central Nigeria.[11] This disparity may be due to differences in what was considered a normal cervix.

This study showed that some abnormal cervical findings noted during HSG have a significant association with abnormal HSG results. Cervical abnormalities like hyperaemic cervix, dull, hard, short and deformed cervix were significantly associated with tubal blockade, presence of intrauterine adhesion, salpingitis and peritubal adhesion. Specifically, this study found that almost all the women with hyperaemic cervix, dull cervix and hard cervix had unilateral tubal blockade on HSG. Almost all the women with a short cervix had salpingitis and intrauterine adhesion, but their tubes were mostly patent. Further from our result, a significant proportion of women with deformed cervix had tubal blockade, salpingitis, peritubal adhesion and intrauterine adhesion.

We infer from the result of this study, that intrauterine adhesion; salpingitis; tubal blockade; and peritubal adhesion noted in the infertile women, perhaps share a common pathological process with the cervical abnormalities described. We also infer that this may be pointing to the common causes of infertility in the study environment. The major factors associated with tubal infertility in our environment are infections from PID, post-abortion sepsis and puerperal sepsis.[12] The causative organisms in PID and cervical manipulation in the process of an abortion are capable of causing injuries concurrently to both the cervix and upper genital tract. The organisms implicated in the aetiology of PID are capable of causing cervicitis and hyperaemia of the cervix. Trauma to the cervix in the process of surgical abortion can result in scarring of the cervix, dull, hard and deformed cervix.

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We did not find any other study that sought to determine the relationship between abnormal HSG results and the kinds of abnormal cervical findings noted in this study. Thus, we could not directly compare our findings from this study with any other. Notwithstanding, we expect the findings from this study to stimulate conduct of similar studies. Future studies may also seek to determine the relationship between abnormal cervical findings, abnormal HSG results and previous history of PID, surgical abortion and post-abortion sepsis in infertile women. This study will provide a basis for comparison for such subsequent studies.

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CONCLUSION

Intrauterine adhesion, salpingitis, tubal blockade and peritubal adhesion on HSG are associated with some abnormal cervical findings in about half of infertile women in this study. The same pathological processes responsible for injury to the upper genital tract and tubal infertility may have caused injury to the cervix in the group of women.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that they have no known competing financial interests OR non-financial interests OR personal relationships that could have appeared to influence the work reported in this paper.

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