

**ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL
COLLEGE
DEPARTMENT OF OBSTETRICS AND
GYNECOLOGY**

Hysterosalpingography Findings among Women Undergoing
Infertility Workup at St. Paul's Hospital Millennium Medical College
Addis Ababa, Ethiopia: A One Year Patients' Chart Review

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Abstract

Background: Infertility is a major public health concern in several African countries. The primary investigation modalities for female infertility used widely today is hysterosalpingography, a radiographic technique for evaluating the uterine cavity and fallopian tubes patency. Hysterosalpingography is an easy, relatively safe, and cheap diagnostic modality. Despite its frequent utilization in the country, there are only limited studies in the Ethiopian context regarding the patterns of hysterosalpingography findings. This study is intended to determine the predominance of various hysterosalpingography results in patients that went through infertility work-up at SPHMMC between March 1st, 2019, and February 29th, 2020.

Methods: Hospital-based cross-sectional study was done on infertile women who had infertility workup in SPHMMC between March 1st, 2019, and February 29th, 2020 by reviewing their medical charts. The charts were selected via simple random sampling technique. Descriptive analysis was employed to determine the pattern of hysterosalpingography findings and chi-square and multivariate logistic regression analyses were used to identify factors associated with it. Variables with a p-value <0.05 were taken as statistically significant factors.

Result: This study shows that 57% of infertile women had abnormal hysterosalpingography findings in the cervix, uterus, and fallopian tubes or more than one of the structures. The tubal finding was the most frequently noted structural abnormality (45%) in which 70.23% of who were bilateral. HSG findings with tubal abnormality had a statistically significant association with history TB treatments with a p-value of 0.000, OR 4.2 (95% CI 2.3-9), and with a history of gynecologic surgery which has also a P value of 0.007, OR 2.7 (95% CI 1.34-5.56). Asherman syndrome, peritubal adhesion, and hydrosalpinx were detected in 4.8, 4.1 and 4.1% of hysterosalpingography study respectively.

Conclusion: There was a high incidence of tubal disease in the women presenting with infertility. This study highlighted that HSG is a very useful modality in detecting female genital tract abnormality in infertile women. Hence this important diagnostic procedure should be made available in SPHMMC for adequate assessment of the women with infertility, where almost all procedures have taken place at a private health facility.

Key concepts

Infertility, hysterosalpingography, tubal pathology, tuberculosis; SPHMMC

1. Introduction

1.1 Background

Infertility is a gynecologic problem classically defined as the failure of a couple to conceive after 12 months of frequent intercourse without the use of contraception in women under age 35, and after six months in women over age 35. The impact of subfertility/infertility to a couple in particular and the community, in general, depends on the prevalence of infertility in that area and the regional socio-cultural values attached to childbearing. The conflict of personal, interpersonal, socio-cultural, and religious expectations can bring a sense of failure, loss, and exclusion to those who are affected. Worldwide, there are an increasing number of women presenting in medical fertility centers with subfertility/infertility or other consequential morbidities (1).

The factors that lead to infertility are multiple and include ovulatory dysfunction, tubal or pelvic pathology, the male partner (male factor), and other unexplained causes. Ovulatory dysfunction accounted as an underlying cause of infertility in approximately 30%. Tubal or uterine factors are responsible for another 20% of infertility and malefactors take nearly 40% of the share. Anatomical abnormalities of cervical factors and immunological problems contributed to roughly 5% of cases (2).

Infertility evaluation is recommended in any couple that has failed to conceive in 1 year after unprotected regular intercourse. But, several scenarios may prompt earlier intervention. For example, delaying assessment in an ovulatory woman or a woman with a history of severe PID may not be appropriate. Of particular note, the fecundability is highly age-related, with a significant decrease beginning at approximately 32 years of age and a more rapid decline after age 37 (3). Despite further advancements in gynecological imaging in the Western world, the ready availability and cost-effectiveness of hysterosalpingography (HSG) still make it a key investigation in the evaluation of the female genital tract, particularly in the initial diagnostic workup of female infertility in most developing countries (4).

Although it is an invasive procedure, HSG remains an important investigative modality in the evaluation of women with infertility. HSG has proven to be an important diagnostic method in clinical gynecology for so many decades and is of particular value in the investigation of the uterine and tubal factors of female infertility (5). Thus, it remains a reliable test of assessing the uterine cavity and fallopian tubal patency even though it has low sensitivity for the diagnosis of pelvic adhesions (6). Other rare clinical indications for HSG include checking the efficacy of tubal sterilization before artificial insemination to exclude structural abnormalities of the genital tract, assessment of the tube before attempted reversal of sterilization recurrent spontaneous abortions, preoperative evaluation before myomectomy, and postoperative evaluation following tubal ligation among others (7).

Taking into consideration its disadvantages such as patient discomfort and radiation exposure, some authorities believe that laparoscopy and hysteroscopy can replace HSG (8). However, the superiority of HSG in detecting uterine and intraluminal tubal pathology, its ready accessibility and cost-effectiveness still make it the gold standard procedure for evaluating female infertility in most developing countries (9). Although its cornerstone evaluative role in infertility, the predominance of the findings of the HSG work-ups has not been evaluated and documented at St. Paul's Millennium Medical College (SPHMMC). Therefore, this study was designed to assess the pattern of HSG findings among infertile women undergoing infertility workup at this particular setup, SPHMMC.

2. Methods and Materials

2.1 Study Design

A hospital-based cross-sectional study was conducted

2.2 Study setting

The study was conducted at SPHMMC, a huge hospital located in Addis Ababa which is a capital city of Ethiopia. Built-in 1969, the hospital serves about 200,000 patients annually on average and a catchment population of more than 5 million, on top of training a range of health science students. It delivers clinical service in a range of activities including maternal and childcare. Moreover, the hospital is the only governmental center where a well-functioning infertility clinic is available. Annually, more than 2000 women visit the fertility clinic, making the average monthly number nearly 170.

2.3 Inclusion and exclusion criteria

2.3.1 Inclusion criteria

- All women who had been diagnosed to have infertility and who had hysterosalpingography included in the study.
- For those who had more than one HSG report, the HCG with better information was included

2.3.2 Exclusion criteria

- Medical records with grossly missing information in HSG report
- Unreadable HCG reports
- Age greater than 50year old

2.4 Sample size determination

The sample size was determined using a single population proportion formula by taking $p=78\%$ (The prevalence of tubal blockage from a study done TAH which is the highest proportion among the study (2), absolute precision 5%, and non-responder rate 10%.

$$n = \frac{(z_{\alpha/2})^2 p(1-p)}{d^2}$$
$$n = \frac{(1.96)^2 \times 0.78 (1 - 0.78)}{(0.05)^2}$$

Thus, the final sample size was: $263.6 + 26.4 = 291$

2.5 Sampling procedure

Women who have attended the fertility care outpatient unit of obstetrics and gynecology department at SPHMMC and who had HSG as a diagnostic workup were selected by simple systematic random method until sample size achieved. Missing or grossly incomplete charts of the sampled ones were replaced by other medical records.

2.6 Variables in the study

2.6.1 Dependent variable

- Tubal HSG finding
- Uterine HSG finding
- Peritubal/perifimbrial HSG findings

2.6.2 Independent variables

- Socio-demographic factors such as age, educational level, marital status, residence
- Parity
- History of pelvic evacuation
- History of abortion
- Previous history of pelvic surgery
- History of treatment for tuberculosis
- Duration of infertility
- Type of infertility

2.7 Data collection procedure and quality control

Data were collected from the fertility clinic of SPHMMC using a structured checklist. The questionnaire was prepared by reviewing related literature done in other areas. The data were collected via thorough medical chart review by trained health professionals, under close supervision and facilitation by the principal investigator.

2.8 Methods of data analysis

Data entering, coding, and clearing for the quantitative data, and the analysis was performed using SPSS version 24.0. After checking its completeness and consistency of each filled questionnaire, further clearance was made using this software. The socio-demographic & clinical characteristics of participants were computed by using simple descriptive statistics (mean, percentage, frequencies, and standard deviation). Relationships between the dependent and the selected independent variables were analyzed using chi-square, bivariate and multivariate logistic regression analysis. P-value of <0.05 and 95% confidence level were used as a difference of statistical significance for those variables who had an association with the dependent variable.

2.9 Ethical Considerations

Ethical clearance was obtained from the Institutional Review Board of the college. A permission letter was submitted to the fertility clinic from the Obstetrics and Gynecology Department & Research Directorate to conduct the study. The purpose of the study was explained to coordinators working at the record unit and fertility clinic. With this, rapport was achieved. During data collection, the information collected will be kept anonymous and confidential.

3. Results

3.1 Socio-demographic profile of respondents

This study included data derived from 291 infertile women who had hysterosalpingography at SPHMMC using a structured checklist. The age range was between 20 to 46 years with a mean 33.3 ± 5 . Nearly two-thirds of 186 (63.9%) were from Addis Ababa while the remaining 105 (36.1%) reported being out of Addis Ababa.

Table 1: Socio-demographic profiles of women attending infertility clinic in SPHMMC, AA, Ethiopia, from March 1, 2019 to February 29, 2020.

Variable		Frequency (n=291)	Percent (%)
Residence	Addis Ababa	186	63.9
	Out of Addis Ababa	105	36.1
Age range (years)	20-25	8	2.7
	26-30	59	20.3
	31-35	96	33
	36-40	105	36.1
	>40	23	7.9
Marital status	Married	258	88.7
	Divorced	2	0.7
	Unknown	31	10.7
Educational status	Illiterate	37	12.7
	Primary school	90	30.9
	Secondary school	102	35.1
	College level	58	19.9
	Unknown	4	1.4

2 Clinical profiles of infertile women

Of all the 291 respondents, the majority of the infertile women (244; 83.8%) were nulliparous, with only 47 (16.2%) of women being able to have at least one history of birth. Regarding the type of fertility, nearly two-third (182; 62.5%) of women had been diagnosed to have primary infertility whereas the remaining 109 (37.5%) had been labeled to have a secondary one, as shown in Table 2. Taking a look at the duration of failure to conceive, majority of the women (168; 57.7%) were unable to conceive for more than 5 year

Table 2: Distribution of client clinical historical record on 291 infertile women attending infertility clinic at SPHMMC, AA, Ethiopia, from March 1, 2019, to February 29, 202

Variable		Frequency (N=291)	Percent
Hx of abortion	Yes	81	27.8
	No	210	72.2
Hx of live births	Yes	47	16.2
	No	244	83.8
Type of infertility	Primary	182	62.5
	Secondary	109	37.5
Duration of infertility	<2 years	10	3.4
	2-3 years	54	18.6
	3.1-5 years	59	20.3
	>5 years	168	57.7
Hx of gynecologic surgery	Yes	41	14.1
	No	250	85.9
Type of gynecologic surgery	Possible Ux surgery	9	3.1
	Possible adnexal surgery	15	5.2
	Cesarean delivery	14	4.8
	Unspecified	4	1.4
Hx of uterine evacuation	Yes	16	3.5
	No	275	94.4
HIV serostatus	Positive	10	3.4
	Negative	118	40.5
	Unknown	163	56
Hx of Rx for TB	Yes	58	19.9

	No	233	80.1
Type of TB	Pulmonary	29	10
	Gastrointestinal	3	1
	Genitourinary	26	8.9

Most (250; 85.9%) infertile women had no record of pelvic surgery while the remaining 41 (14.1%) reported undergoing some sort of pelvic surgery. Of those individuals who had undergone pelvic surgery, 15 (36.6%) reported to for possible adnexal problems, while 14 (31.4%) & 9 (22%) had it for caesarean delivery and an indication of a uterine problem, respectively. On the other hand, almost one-fifth of all the women (58; 19.9%) had a history of treatment for some form of tuberculosis (TB), of whom 29 (50%) had TB of pulmonary focus, 5 (17.2%) of them were seropositive for HIV and 26 (44.8%) had a genitourinary type of tuberculosis.

3.3 The distribution of HSG findings

Following the study, 291 conclusive radiological reports were reviewed. All except 1(290, 99.7) % were undertaken at a private health facility. Of those, 125 infertile women (43%) had unremarkable hysterosalpingography reports while the remaining 166 (57%) had pathologies in the cervix, uterus, and fallopian tubes or more than one of the structures. The distribution of the clients' findings at HSG is presented in Tables 3.1

Table 3.1: HSG findings distribution among 291 infertile women in SPHMMC, from March 1, 2019, to February 29, 2020

Findings	Frequency	Percept (%)
Normal findings	121	43
Abnormal findings		
Left tubal block	17	5.8
Right tubal block	22	7.6
Bilateral tubal block	92	31.6
Left hydrosalpinx	2	0.7
Right hydrosalpinx	3	1
Bilateral hydrosalpinx	7	2.4

Uterine synechia/Asherman's syndrome	14	4.8
Congenital malformations	7	2.4
Smooth filling defect	9	3.1
Irregular filling defect	5	1.7
Cervix stenosis/obliteration	5	1.7
Left peritubal adhesion	12	4.1
Left peritubal adhesion	12	4.1
Bilateral peritubal adhesion	12	4.1

By far, the most common HSG finding was a tubal block which was evidenced in 130 (45%) of infertile women, 92(70.23%) of whom were bilateral. The proximal tubal blockage was found in 37(28%), a distal bilateral tubal blockage was found in 15(11.5%) and bilateral tubal blockage with the unspecified location was found in 38(28%) of tubal blockage as it is outlined in Table 3.2.

Similarly, the commonest uterine abnormal finding in the HSG study was uterine synechia/Asherman's syndrome, which was noted in 14 (4.8) of the studied women. Moreover, peritubal adhesion was reported in 36 (12.3%) of infertile women who underwent infertility work up at SPHMMC between March 1, 2019, and February 29, 2020.

Additionally, hydrosalpinx was found to be a common structural cause of infertility in women per HSG findings in 12 (4.1%) of women's HSG report, with bilateral involvement being relatively commoner than unilateral ones. Among infertile women who undergo infertility workup (2.4%) had congenital malformation and 5(1.7%) had cervical stenosis /obliteration.

Table 3.2: Distribution of tubal HSG finding among 291 infertile women who had a tubal abnormality in SPHMMC from March 1, 2019, to February 29, 2020

Tubal finding	Frequency	Present (%)
Bilateral proximal blockage	37	28.5
Bilateral distal blockage	15	12.5

Bilateral tubal blockage with unspecified location	38	29
Rt proximal blockage	7	5.4
Rt coronal blockage	2	1.5
Bilateral coronal	2	1.5
Rt distal blockage	6	4.6
Rt unspecified blockage	6	4.6
Lt proximal blockage	6	4.6
Lt distal blockage	9	6.9
Left coronal blockage	1	0.77
Lt unspecified blockage	1	0.77

3.5. Factors associated with abnormal hysterosalpingography findings

In the present study, certain socio-demographic and clinical factors were examined statistically using the chi-square test and with bivariate and multivariate logistic regression to find out any sort of association some dependent variable with the outcomes of hysterosalpingography findings. Among factors analyzed, history of treatment for tuberculosis (p-value <0.001), OR 4. 2(95% CI 2.3-9), and history of gynecologic surgery (p-value of 0.007, OR 2.7(95%CI 1.34 -5.56), had a statistically significant association with tubal HSG abnormal findings. However, the history of TB treatment has no statistically significant associations with uterine abnormal HCG findings.

Those infertile women with a history of gynecologic surgery also had a significant association with uterine abnormal HCG finding with a P-value of 0.04, OR2.42 (95% CI- 1.04-5.6). All infertile women who had pelvic surgery had tubal abnormal HCG findings. In contrast, history of abortion, history of uterine evacuation, type of infertility, and type of TB attacks, as well as HIV-TB co-infection, appeared not to show any statistically significant with the abnormal HSG finding

4. Discussion

Infertility is a major public health problem in Africa since childlessness is seen as a major tragedy particularly in women's lives and can result in marital instability and suicidal tendencies (10). In the current study, it was revealed that primary infertility is more common than secondary infertility. This finding was similar to the study made by Kitilla in Ethiopia, Umar et al in Kano, Nigeria, and Larsen in sub-Saharan African, which concluded that primary infertility is more common than the second one (11,12,13). This may be due to lack of infertility treatment facility at large or patients not considering abortion as pregnancy and sometime women may not interest to talk about abortion history.

In contrast to the findings of the present study, the studies made with HSG on infertile women in Kampala, Uganda, and Ilorin, Nigeria, showed that secondary infertility was more common than the primary one (14,15,16). This study's outcome is in contrast with the general opinion that secondary infertility in women is of higher prevalence in developing countries than primary infertility while the opposite is true for developed ones. 43 % of the infertile women in this study had normal HSG findings, and this is somewhat lower than 55 % reported in Switzerland (17).

This indicates that the cause of their inability to conceive could be attributed due to ovarian dysfunction, hypothalamic problem, or due to their male counterparts, and even a significant portion of the problem can be idiopathic. On the contrary, the cause could be on the women's part due to detection failures since HSG lacks some sensitivity.

This finding is much higher than the 16.6, 29.4 and 36 % recorded in Uganda (18), Nigeria (5), and Ethiopia (19), respectively. It is also worth noting that in addition to its diagnostic value, HSG is also used for therapeutic purposes to unblock the blocked fallopian tubes and that may have resulted in some of the normal findings. Furthermore, premature ovarian failure can be an important culprit, as a significant number of the studied patients were above the age of 35.

Regarding the number of abnormalities per hysterosalpingogram, tubal pathologies were the most common abnormalities in this study, comprising primarily tubal blockage and hydrosalpinx. Tubal blockage constituted 45% of the cases while hydrosalpinx accounted for 4.1% of the cases, which was lower than a report by similar previous studies where the incidence of hydrosalpinx ranged from 20 to 33.1% (20, 21).

Tubal pathologies have also been reported as the most common pathology in several studies (6, 22, and 23). It must be mentioned that spasm and technical drawbacks, such as under filling, could have accounted for some of the tubal blockages. Moreover, peritubal adhesions were reported in 12.4% of the cases, which may result from adnexal surgical interventions and infectious salpingitis.

Similarly, the common uterine pathology depicted in this study was Asherman's syndrome (4.8%), a condition characterized by adhesions and/or fibrosis of the endometrium by adhesions and/or fibrosis of the endometrium, commonly associated with recurrent and substandard gynecologic interventions involving the intrauterine cavity (24). A similar finding was recorded in numerous literatures, closest to the finding of 5% in Benin, Nigeria (25). Regarding the associated factors with abnormal HSG findings, the previous history of treatment for tuberculosis and type of gynecologic surgery history revealed a statistically significant association with HSG abnormal findings. Pelvic surgery, particularly those involving the adnexal structures, can sometimes cause damage and scarring to the fallopian tubes (26).

There is a significant association between the previous history of pelvic surgery and the occurrence of tubal pathology in the population studied as almost 86% of the women that had a history of tuberculosis appeared to have tubal abnormalities. This may be due to, in extreme cases, tuberculosis affects the uterine lining, fallopian tubes, and other reproductive structures, impairing fecundity. This study didn't assess factors such as a history of pelvic infection, septic abortions, and an ectopic pregnancy that could have an important effect on the structural anatomy of the genitourinary region.

5. Strength and Limitation of the Study

5.1 Strength

- It clearly shows the pattern of hysterosalpingography abnormality in infertile women in the study area
- It shows the magnitude of the HSG abnormality in the infertile women
- This study was not affected by the COVID-19 crisis.

5.2 Limitation

- The study was a facility-based cross-sectional study limited to women who attended the infertility clinic at SPHMMC. The findings may not represent the pattern of HSG findings in other settings of the country as there are differences in geographical features, the prevalence of infections and chronic comorbidities, and differing access to standard gynecologic intervention and obstetric care.
- This study is expected to be prone to the limitation of a cross-sectional survey. Hence, establishing a causal relationship is difficult.
- The source of data for this study was based on medical records and provided limited validation opportunities for obtaining information from the self-report of respondents. For example, a significant number of missing data could have been generated via interviews from respondents.
- Some important factors such as chronic pelvic inflammatory disease and pelvic infection following STI were not considered in this study as most of the charts reviewed lack data in this regard.

6. Conclusion

There was a high incidence of tubal disease in the women presenting with infertility. A bilateral tubal blockage is the most common abnormality detected during infertility workup. Women with a history of pelvic surgery and history of TB treatment had a significant association with the development of abnormal HSG tubal findings. This study highlighted that HSG is a very useful modality in detecting female genital tract abnormality in infertile women.

7. Recommendation

HSG is still a helpful diagnostic modality in women with infertility. Hence this important diagnostic procedure should be made available in SPHMMC for adequate assessment of the women with infertility, where almost all procedure has taken place at the private health facility.

List of Abbreviations

HSG: Hysterosalpingography; HIV: Human Immunodeficiency Virus; STIs: Sexually Transmitted Infections; PID: Pelvic Inflammatory Disease; SPSS: Statistical Package for Social Science; SPHMMC: St. Paul's Hospital Millennium Medical College.

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