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Evaluation of Hysterosalpingographic Findings among Patients Presenting with Infertility

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ABSTRACT

Aim and Background: Hysterosalpingography (HSG) is routinely employed in evaluating infertility to detect uterine and tubal abnormalities. This study aimed to determine the frequency and types of hysterosalpingographic abnormalities among women presenting with primary and secondary infertility. **Material and Method:** A descriptive cross-sectional study was conducted from December 2024 to May 2025 at Sheikh Zayed Hospital, Rahim Yar Khan. A total of 103 women aged 18-40 years, experiencing infertility for ≥12 months, underwent HSG. Abnormalities assessed included uterine fibroids, adhesions, congenital anomalies, hydrosalpinx, and tubal occlusion. Data analysis employed SPSS version 26. **Results:** Mean age was 29.7 ± 5.1 years, with average infertility duration of 3.8 ± 2.4 years. Primary infertility was observed in 61 (59.2%) and secondary in 42 (40.8%) women. Overall, 80 (77.7%) had abnormal HSG findings, significantly higher in secondary (88.1%) versus primary infertility (70.5%; p=0.031). Uterine abnormalities occurred in 33 (32%), including fibroids 14 (13.6%), polyps or adhesions 8 (7.8%), congenital anomalies 5 (4.9%), and Asherman's syndrome 6 (5.8%). Tubal pathology was identified in 54 (52.4%) women, including tubal occlusion 41 (39.8%), bilateral occlusion 18 (17.5%), unilateral occlusion 23 (22.3%), and hydrosalpinx 14 (13.6%). Longer infertility duration (≥4 years) significantly correlated with abnormal findings (87.5% vs. 69.1%; p=0.042). **Conclusion:** HSG revealed a high frequency of tubal and uterine abnormalities, particularly among secondary infertility patients. Early evaluation via HSG can facilitate timely diagnosis and management, potentially improving reproductive outcomes.

INTRODUCTION

Infertility, defined as the inability to conceive after one year of unprotected intercourse, affects a substantial number of couples worldwide. It is estimated that approximately 10-15% of couples worldwide experience fertility issues, with nearly half of these cases attributed to female infertility factors [1–3]. Among the diagnostic modalities available for assessing infertility, hysterosalpingography (HSG) has emerged as a valuable tool for evaluating the female reproductive system [4].

Hysterosalpingography (HSG) is a widely utilized radiologic procedure in the evaluation of female infertility, which involves the imaging of the uterine cavity and the fallopian tubes after the introduction of a radio-opaque contrast medium. It plays an important role in determining the presence of common abnormalities, such as tubal occlusion, uterine fibroids, and polyps, which may significantly impact a woman's fertility potential [2,5].

Primary infertility refers to couples who have never achieved a pregnancy, while secondary infertility encompasses those who have previously conceived but are unable to conceive again [6]. Assessing hysterosalpingographic findings in women with primary and secondary infertility is clinically important, as it helps pinpoint causes of subfertility that can often be treated. Recognizing these underlying issues may offer affected couples a clearer path to effective management, easing the emotional burden that comes with the struggle to conceive [3,7,8].

Recent studies have shown that tubal and uterine abnormalities are frequently detected on hysterosalpingography in women being investigated for infertility. Omidiji et al. (2019) found that tubal pathologies were the most common, present in over a third of cases, with hydrosalpinx and adhesions also reported [9]. Gupta et al. (2023) observed that both primary and secondary infertility groups often had tubal blockages and peritubal adhesions, while hydrosalpinx was less common [10]. According to Reddy et al. (2019), most patients had

abnormal HSG findings, and congenital uterine anomalies were seen only in women with primary infertility [11].

This research proposal aimed to evaluate and analyze hysterosalpingographic findings among patients presenting with primary and secondary infertility. By delineating a wide range of hysterosalpingographic abnormalities and their association with infertility, we aim to enhance our understanding of the factors contributing to reproductive dysfunction and subsequently improve patient care.

MATERIAL AND METHODS

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Sheikh Zayed Hospital, Rahim Yar Khan, over a six-month period from December 2024 to May 2025. Ethical approval for the study was obtained from the Institutional Review Board (IRB 778/IRB/SZMC/SZH, dated 21-09-2023) before starting the study. All participants were enrolled after obtaining written informed consent. A total of 103 women were included using non-probability consecutive sampling [10]. Inclusion criteria were female patients aged 18 to 40 years, who had been trying to conceive through regular, unprotected intercourse for at least 12 months without success, attended the infertility clinic during the study period, were willing to undergo hysterosalpingography (HSG) as part of their evaluation. Women were excluded from the study if they had already been diagnosed with uterine or tubal problems using other tests, had a known allergy to the contrast dye used for HSG, were experiencing active pelvic infections or sexually transmitted diseases, had undergone HSG in the past, or had medical conditions like kidney problems that made the procedure unsafe.

For the purpose of this study, infertility was defined as the inability to conceive after one year of regular, unprotected sexual intercourse. Primary infertility referred to women who had never conceived, while secondary infertility was defined as failure to conceive following a previous pregnancy. Hysterosalpingography (HSG) was considered a radiological test used to assess the shape and structure of the uterus as well as whether the fallopian tubes were open or blocked. A normal HSG was defined as a uterine cavity with regular pear-shaped outline and free spillage of contrast from both tubes. Abnormal findings included the presence of uterine fibroids (smooth, rounded filling defects), polyps or intrauterine adhesions (irregular cavity outline), hydrosalpinx (dilated, fluid-filled tubes), peritubal adhesions or kinking (irregular tube course), tubal occlusion (no contrast spillage), congenital anomalies such as uterine septum or bicornuate uterus, salpingitis isthmica nodosa (beaded tube appearance), and Asherman's syndrome (filling defects indicating intrauterine adhesions).

Data were collected using a structured interviewer-administered proforma. Information obtained included age, duration of infertility, history of previous pregnancies, miscarriages or abortions, and details of the HSG procedure and its findings. The HSG was performed by trained radiologists, and findings were documented as either normal or abnormal, with specification of the type of abnormality when present.

All data were entered and analyzed using SPSS version 26. Quantitative variables such as age and duration of infertility were presented as mean and standard deviation, while categorical variables including type of infertility, presence of specific uterine or tubal abnormalities, and obstetric history were described as frequencies and percentages. The frequency of abnormal findings was compared between primary and secondary infertility using the Chi-square test or Fisher's exact test where appropriate. Stratification was performed for age, duration of infertility, and prior pregnancy loss to evaluate their effect on study outcomes. A p-value less than 0.05 was considered statistically significant.

RESULTS

A total of 103 women meeting the inclusion criteria were enrolled in the study. The mean age of participants was 29.7 ± 5.1 years, ranging from 19 to 39 years. The average duration of infertility was 3.8 ± 2.4 years. Out of the total, 61 patients (59.2%) presented with primary infertility, while 42 patients (40.8%) had secondary infertility. Regarding reproductive history, previous pregnancies were reported by 38 women (36.9%), all belonging to the secondary infertility group, while 65 women (63.1%) had never conceived. History of miscarriage or abortion was noted in 27 participants (26.2%), predominantly among those with secondary infertility.

Table 1

Frequency of Normal and Abnormal HSG Findings by Type of Infertility (N = 103)

HSG Findings	Primary Infertility (n = 61)	Secondary Infertility (n = 42)	Total (N = 103)	p-value
Normal HSG	18 (29.5%)	5 (11.9%)	23 (22.3%)	0.031
Abnormal HSG	43 (70.5%)	37 (88.1%)	80 (77.7%)	

Among 103 participants, uterine abnormalities were present in 33 (32%). Submucosal fibroids were found in 14 (14%), endometrial polyps or adhesions in 8 (8%), congenital anomalies in 5 (5%) including uterine septum in 3 (3%) and bicornuate uterus in 2 (2%), and Asherman's syndrome in 6 (6%). Uterine pathology was more frequent in secondary infertility 19 (45%) than in primary infertility 14 (23%) (p = 0.018) (Table 2).

Table 2

Uterine Abnormalities on HSG by Type of Infertility (N = 103)

Uterine Abnormality	Primary Infertility (n = 61)	Secondary Infertility (n = 42)	Total (n = 103)	p-value
Any uterine abnormality	14 (23.0%)	19 (45.2%)	33 (32.0%)	0.018
Uterine fibroids	6 (9.8%)	8 (19.0%)	14 (13.6%)	
Polyps or intrauterine adhesions	3 (4.9%)	5 (11.9%)	8 (7.8%)	
Uterine septum	3 (4.9%)	0	3 (2.9%)	
Bicornuate uterus	2 (3.3%)	0	2 (1.9%)	
Asherman's syndrome	0	6 (14.3%)	6 (5.8%)	

Fallopian tube abnormalities were identified in 54 (52%) of 103 patients. Tubal pathology was more frequent in secondary infertility 29 (69%) than in primary infertility 25 (41%) (p = 0.009). Tubal occlusion was seen in 41 (40%), with bilateral occlusion in 18 (18%) and unilateral occlusion in 23 (22%). Hydrosalpinx was present in 14

(14%), including left-sided in 6 (6%), right-sided in 4 (4%), and bilateral in 4 (4%). Peritubal adhesions or kinking were observed in 9 (9%), and salpingitis isthmica nodosa in 5 (5%) (Table 3).

Table 3

Fallopian Tube Abnormalities by Type of Infertility (N = 103)

Tubal Abnormality	Primary (n=61)	Secondary (n=42)	χ^2 Value	p-value
Any tubal abnormality	25 (41.0%)	29 (69.0%)	7.8546	0.005
Tubal occlusion (any)	17 (27.9%)	24 (57.1%)	8.8962	0.002
Bilateral tubal occlusion	8 (13.1%)	10 (23.8%)	1.9727	0.160
Unilateral tubal occlusion	9 (14.8%)	14 (33.3%)	4.9506	0.026
Hydrosalpinx (in patent tubes only)	6 (9.8%)	8 (19.0%)	1.7971	0.180
Peritubal adhesions/kinking	4 (6.6%)	5 (11.9%)	0.8919	0.345
Salpingitis Isthmica Nodosa (SIN)	2 (3.3%)	3 (7.1%)	0.8041	0.369

Abnormal HSG findings were observed in 40 (71%) of women aged ≤30 years and 40 (85%) of those aged >30 years (p = 0.096). Among patients with infertility duration <4 years, abnormalities were seen in 38 (69%), compared to 42 (88%) with a duration ≥4 years (p = 0.042). Women with a history of miscarriage or abortion had a higher rate of abnormal findings, 25 (93%) versus 55 (72%) without such history (p = 0.037). Dual pathology was noted in 7 (16%) with primary infertility and 13 (35%) with secondary infertility (p = 0.104) (Table 4).

Table 4

Abnormal HSG Findings Stratified by Clinical Variables (N=103)

Stratification Variable	Subgroup	Frequency (n)	Percentage (%)	Chi-square (p-value)
Age	≤30 years	40	71.4%	2.77 (0.096)
	>30 years	40	85.1%	
Duration of infertility	<4 years	38	69.1%	4.14 (0.042)
	≥4 years	42	87.5%	
History of miscarriage/abortion	Yes	25	92.6%	4.35 (0.037)
	No	55	72.4%	
Dual pathology (uterine + tubal)	Primary infertility group	7	16.3%	2.64 (0.104)
	Secondary infertility group	13	35.1%	

DISCUSSION

Abnormal hysterosalpingography (HSG) findings were observed in 80 (77.7%) of the 103 women evaluated, consistent with rates documented in previous international literature. Aduayi et al. (2016) reported abnormal findings in 74.5% of Nigerian women undergoing infertility investigations, while Reddy et al. (2019) documented abnormalities in 87.4% of cases within an Indian population [11,12]. Conversely, normal HSG findings noted in 23 (22.3%) of the current cohort align within the broad range previously reported, varying between approximately 18% and 82% across infertile patient populations [13–15]. Significantly fewer normal HSG findings occurred in secondary infertility patients, 5 (11.9%), compared to primary infertility patients, 18 (29.5%), a trend that aligns with established literature emphasizing greater acquired reproductive tract pathology among women with prior conception history [9,16].

Uterine abnormalities were detected by hysterosalpingography (HSG) in 33 (32%) patients, a figure higher than previously reported prevalence ranging between 5–7% in primary infertility and 3–5% in secondary infertility cases [17]. Additionally, uterine filling defects, predominantly fibroids, were noted in 22.9% in another study [9]. The predominant uterine anomaly identified in the current study was submucosal fibroids, present in 14 (13.6%) women, followed by polyps or adhesions in 8 (7.8%). Congenital uterine anomalies including septate uterus in 3 (2.9%) and bicornuate uterus in 2 (1.9%) were exclusively observed among primary infertility patients, corroborating prior reports [11,17]. Additionally, Asherman's syndrome occurred in 6 (5.8%) cases, exclusively within secondary infertility, a higher frequency compared to previous reports of approximately 0.2% [16]. Prior miscarriage or abortion history significantly increased abnormal HSG findings, observed in 92.6% versus 72.4% without such history (p=0.037) [9,12].

Tubal abnormalities were the predominant pathology observed on hysterosalpingography (HSG), identified in 54 (52.4%) patients. Among these abnormalities, tubal occlusion was most frequent, detected in 41 (39.8%) patients, including bilateral occlusion in 18 (17.5%) and unilateral occlusion in 23 (22.3%). These results are consistent with as reported by previous studies ranging from approximately 20% to 41% in primary infertility and 27% to 57% in secondary infertility cohorts [12,14,17]. Similar results were also reported by Omidiji et al. (2019), who noted tubal occlusion in around 35.1% of Nigerian women evaluated for infertility [9]. Conversely, higher rates of tubal abnormalities (66.4%) reported by Aduayi et al. (2016) highlight regional differences potentially related to variations in pelvic infection prevalence [12]. Hydrosalpinx was present in 14 (13.6%) participants, including left-sided in 6 (5.8%), right-sided in 4 (3.9%), and bilateral in 4 (3.9%) patients. These figures align closely with upper-limit frequencies (3–10%) reported in earlier studies primarily involving primary infertility populations [6,13,18], and specifically correspond to findings from Omidiji et al. (2019), who documented hydrosalpinx in approximately 9% of women, predominantly involving the left side [9].

Peritubal adhesions or tubal kinking were reported in 9 (8.7%) patients, a lower frequency compared to previous research such as 14.7% by Omidiji et al. (2019) and 19.1% by Edzie et al. (2024) [9,16]. Comparatively higher prevalence of 68% was reported among Indian women evaluated for infertility [10]. Variations across these studies may reflect differing patient demographics, diagnostic criteria, and regional epidemiological patterns of pelvic inflammatory disease and prior surgical interventions [9,10]. Additionally, salpingitis isthmica nodosa (SIN) was detected in 5 (4.9%) of patients, considerably higher than the frequency (0.2%) reported by another previous study [12]. highlighting potential regional variations possibly due to chronic reproductive

infections, including genital tuberculosis. Clinical factors notably influenced the presence of abnormal hysterosalpingography (HSG) findings in this study. A significantly higher proportion (87.5%) of women with infertility durations exceeding four years showed abnormal findings compared to those with shorter durations (69.1%; p = 0.042). Similarly, women older than 30 years exhibited more frequent abnormalities (85.1%) compared to younger patients (71.4%), although statistical significance was not attained (p = 0.096). Dual pathology involving simultaneous uterine and tubal abnormalities was observed more commonly in patients with secondary infertility (35.1%) relative to primary infertility (16.3%; p = 0.104).

These findings correspond closely with established literature indicating a greater cumulative burden of acquired reproductive tract abnormalities in patients with previous pregnancies, abortions, or uterine interventions. Such data emphasize the continued relevance of early infertility assessment and preventive public health measures aimed at reducing reproductive tract infections and unnecessary uterine procedures, particularly in regions where advanced diagnostic modalities such as laparoscopy remain less accessible.

CONCLUSION

Hysterosalpingography remains a valuable diagnostic tool for evaluating women with infertility, enabling the identification of both uterine and tubal abnormalities that may contribute to reproductive challenges. The present study demonstrates that structural abnormalities are common, particularly among those with secondary infertility and longer infertility duration. Early application of HSG can assist in recognizing remediable conditions, informing appropriate clinical management and optimizing the chances of successful conception.

Authors' Contribution

R.A. conceived and designed the study, collected the data, and prepared the initial draft of the manuscript. **S.Z.** supervised the research and critically reviewed the manuscript. **U.E.F.T.** assisted with data collection and literature review. **M.I.J.** performed statistical analysis and contributed to interpretation of results. All authors revised the manuscript for important intellectual content and approved the final version for submission.

REFERENCES

1. Penzias A, Azziz R, Bendikson K, et al.: Fertility evaluation of infertile women: a committee opinion. Fertil Steril. 2021, 116:1255–65. https://doi.org/10.1016/J.FERTNSTERT.2021.08.038
2. Dishuck CF, Perchik JD, Porter KK, Gunn DD: Advanced Imaging in Female Infertility. Curr Urol Rep. 2019, 20:1–5. https://doi.org/10.1007/s11934-019-0942-0
3. Deyhoul N, Mohamaddoost T, Hosseini M: Infertility-related risk factors: A systematic review. Int J Women's Heal Reprod Sci. 2017, 5:24–9. https://doi.org/10.15296/ijwhr.2017.05
4. Mayer C, Deedwania P: Hysterosalpingogram. StatPearls. Published Online First: 7 September 2022.
5. Toufig H, Benameur T, Twfieg ME, Omer H, El-Musharaf T: Evaluation of hysterosalpingographic findings among patients presenting with infertility. Saudi J Biol Sci. 2020, 27:2876. https://doi.org/10.1016/J.SJBS.2020.08.041
6. Abebe MS, Afework M, Abaynew Y: Primary and secondary infertility in Africa: systematic review with meta-analysis. Fertil Res Pract. 2020, 6:1–11. https://doi.org/10.1186/s40738-020-00090-3
7. Sarkar S, Gupta P: Socio-demographic correlates of women's infertility and treatment seeking behavior in India. J Reprod Infertil. 2016, 17:123–32.
8. Cedars M, Jaffe RB: Infertility and Women. J Clin Endocrinol Metab. 2005, 90:0–0. https://doi.org/10.1210/jcem.90.4.9997
9. Omidiji OAT, Toyobo OO, Adegbola O, Fatade A, Olowoyeye OA: Hysterosalpingographic findings in infertility – What has changed over the years. Afr Health Sci. 2019, 19:1866–74. https://doi.org/10.4314/ahs.v19i2.9
10. Gupta M, Agarwal N, Agrawal A: Evaluation of Pattern of Hysterosalpingography in Infertility Patients. Int J Infertil Fetal Med. 2023, 14:18–21. https://doi.org/10.5005/jp-journals-10016-1302
11. Reddy GS, Jyothi G: Hysterosalpingogram in evaluation of primary and secondary infertility: a two year study at a tertiary care hospital of South India. Int J Reprod Contraception, Obstet Gynecol. 2019, 8:2202. https://doi.org/10.18203/2320-1770.ijrcog20192164
12. Aduayi O, Akanbi G, Akintayo A, Aduayi V: Hysterosalpingography findings among women presenting for gynecological imaging in Ado-Ekiti, South western Nigeria. Int J Reprod Contraception, Obstet Gynecol. 2016, 5:1906–11. https://doi.org/10.18203/2320-1770.ijrcog20161688
13. Canday M, Yurtkal A, Kirat S: Evaluation and perspectives on hysterosalpingography (HSG) procedure in infertility: a comprehensive study. Eur Rev Med Pharmacol Sci. 2023, 27:7107–17. https://doi.org/10.26355/eurrev_202308_33284
14. Karim S, Bashir S, Bibi A, Riaz M, Faiz S, Shafi A, Khakwani AK: Comparison of Hysterosalpingographic findings in patients with Primary and Secondary Subfertility. Pakistan J Med Heal Sci. 2022, 16:302–4. https://doi.org/10.53350/pjmhs22162302
15. Kayani A, Khan R, Siddiqui TS, Rehman AU, Ahmed R, Khan Y: Hysterosalpingographic Pattern of Primary Sub-fertility and Secondary Sub-fertility in Women of Reproductive Age. Pakistan Armed Forces Med J. 2024, 74:1251–4. https://doi.org/10.51253/pafmj.v74i5.5394
16. Edzie EKM, Dzefi-Tettey K, Gorleku PN, et al.: Hysterosalpingographic Findings Among Ghanaian Women with Infertility: A Five-year Trend Analysis. Oman Med J. 2024, 39: https://doi.org/10.5001/omj.2024.57
17. Malik N: A Comparison of Hysterosalpingographic Results in Individuals Experiencing Primary and Secondary Infertility: A Prospective Approach. J Islam Med Dent Coll. 2024, 12:310–7. https://doi.org/10.35787/jimdc.v12i4.1053
18. 18. Adedigba JA, Idowu BM, Hermans SP, Ibitoye BO, Fawole OA: The relationship between hysterosalpingography findings and female infertility in a nigerian population. Polish J Radiol. 2020, 85:e188–95. https://doi.org/10.5114/pjr.2020.94488.