International Journal of Life Sciences, Biotechnology and Pharma Research Vol. 14, No. 5, May 2025 Online ISSN: 2250-3137
Print ISSN: 2977-0122

DOI: 10.69605/ijlbpr_14.5.2025.126

ORIGINAL RESEARCH

Radiological Spectrum of Hysterosalpingography Findings in Female infertility: A Retrospective Study at a tertiary Care Centre

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Received: 07 April, 2025 Accepted: 28 April, 2025 Published: 17 May, 2025

ABSTRACT

Background: Infertility is a significant global public health concern, with female factors contributing to approximately 30% of cases. Mechanical causes such as tubal blockage and uterine anomalies are major contributors. Hysterosalpingography (HSG), a radiographic modality, plays a pivotal role in evaluating these causes through imaging of the uterus and fallopian tubes. The present study was aimed to assess the radiological findings observed on HSG in women with primary and secondary infertility, to determine the prevalence of normal versus abnormal patterns, and to evaluate common age-related abnormalities. **Methods**: "This retrospective cross-sectional study was conducted in the Department of Radiodiagnosis at Sri Devaraj URS Medical College, Kolar". A total of 77 women aged 20–45 years, diagnosed with either primary or secondary infertility, were included. Descriptive statistics were used for frequency and percentage distributions, while the Chi-square and independent t-tests were employed for inferential analysis. **Results**: The mean age of participants was 31.64 ± 6.71 years. Of the 77 cases, 62.3% presented with primary infertility, while 37.7% had secondary infertility. Normal HSG findings were observed in 63.6% of patients. Bilateral tubal blockage was more frequently observed in cases of secondary infertility. Fallopian tube anomalies were present in 35.1% of cases. **Discussion**: The findings corroborate earlier studies that identify tubal blockages as the most prevalent abnormality in infertile women. However, this study reports a lower prevalence of tubal anomalies compared to studies from Nepal and Nigeria, possibly due to differences in methodology, population characteristics, and socioeconomic factors. The study reinforces the utility of HSG as a reliable, cost-effective diagnostic tool for initial infertility workup.

Keywords: Female infertility, Hysterosalpingography, Tubal blockage, Uterine anomalies, Radiological findings, Retrospective study.

INTRODCUTION

Infertility constitutes a worldwide public health issue, with incidence differing across various regions[1]. Mechanical factors account for over 30% of female infertility, and several techniques, including transvaginal ultrasonography, hysterosalpingography (HSG), hysteroscopy, and laparoscopy, have been employed to examine these issues[2, 3].

Hysterosalpingography (HSG) is a commonly employed radiographic technique for examining female infertility. This approach entails the radiographic evaluation of the uterus and fallopian tubes by administering radio-opaque contrast medium through the cervical canal. The Hysterosalpingography (HSG) procedure is performed during the follicular phase of the menstrual cycle to prevent interference with possible early pregnancy, achieving optimal results via fluoroscopy with image intensification[4,5].

Despite its enduring relevance in clinical practice, discrepancies in radiological findings have spurred continuous study into the enhancement of HSG procedures and interpretative standards[4].Radiological patterns identified during HSG, including filling

DOI: 10.69605/ijlbpr_14.5.2025.126

deficiencies, contour irregularities, and contrast leaks, might provide essential insights into underlying clinical problems such as tubal obstructions, uterine adhesions, or congenital malformations[6,7]. The interpretation of these pictures relies on the operator's experience and the technological quality, which may influence diagnostic accuracy and subsequent patient management[8,9].

This study evaluates the outcomes of Hysterosalpingography (HSG) in relation to female infertility, hence improving diagnostic understanding. It differentiates between normal and abnormal results, assesses anomalies, and recognises prevalent findings by age category. Stratifying the population by age provides insights into age-related subfertility factors.[10-12]The research will enhance diagnostic precision by elucidating the reasons of infertility, including tubal obstructions and uterine abnormalities, thereby facilitating more accurate diagnosis. This will provide targeted interventions such as IVF or surgery, resulting in improved patient outcomes. Furthermore, by correlating specific HSG findings with suitable treatment techniques, the study will assist doctors in identifying the most efficacious approaches, hence reducing wasteful procedures and personalising care.

METHODOLOGY

"This retrospective cross-sectional study was performed in the Department of Radiodiagnosis at Sri Devaraj URS Medical College, Tamaka, Kolar", involving 77 women who satisfied the inclusion criteria. The sample size was determined according to the prevalence of abnormal HSG findings as reported **by Khanal U et al**.,[5] utilising a 95% confidence level and a 10% margin of error. Women between the ages of 20 and 45 diagnosed with primary or secondary infertility will be included, however those with recent uterine or pelvic surgery, significant uterine or cervical pathology, contraindications to HSG, or absence of permission will be excluded. Hysterosalpingography (HSG) should ideally be conducted during the 8th and 10th days of the menstrual cycle. Patients will be directed to fast for 4 hours, refrain from sexual intercourse, and void their bladder before the procedure. The technique will entail a bimanual inspection, speculum placement, and canula insertion via the cervix, subsequently administering 15–20 cc of Urografin contrast media under sterile conditions. Fluoroscopy (FLEXAVISION SHIMADZU DRF) will evaluate the uterine cavity, tubal patency, and peritoneal leakage, with a maximum X-ray exposure restricted to 30 seconds. A solitary composite image will be produced for diagnostic objectives. Clinical indications and HSG findings will be recorded in a systematic manner. Data analysis will utilise SPSS version 22, with categorical variables represented as frequencies and percentages. Continuous variables will be reported as means and standard deviations. The Chi-square test will assess relationships among categorical variables, whereas the independent t-test will compare means, with a p-value of <0.05 being statistically significant.

RESULTS

In this study, a total of 77 female patients were included, and their average age was 31.64 years, with a standard deviation of 6.71 years. All of the participants were between the ages of 20 and 40 years of age. According to the clinical indications that were supplied by gynaecologists on referral forms, 48 cases were classified as main infertility, which accounts for 62.3% of the total, while 29 instances, which accounts for 37.7% of the total, were classified as secondary infertility.

Figure 1 shows that the majority of patients who had their HSG examinations reviewed had normal findings. There were 77 HSG examinations evaluated. However, there were also documented instances of aberrant findings. The left-sided tubal obstruction **(Figure 2)** was seen more frequently than the right-sided blockage**.** This is an important factor to consider. In addition, uterine fibroids and other diseases were found **(Table 1& Figure 3),** with fibroids being described in one instance of secondary infertility. It was found that patients who were experiencing secondary infertility were more likely to have bilateral tubal occlusions. Variants such as myometrial folds and indications that are suggestive of pelvic inflammatory illness, such as dilated fallopian tubes, were also discovered as additional findings.

TABLE 1: HSG FINDINGS IN OUR STUDY

HSG FINDINGS	TOTAL NO. (%)	PRIMARY INFERTILITY	SECONDARY INFERTILITY
NORMAL	49 (63.6%)	34 (70.8%)	15 (51.7%)
LEFT TUBAL OCCLUSION	12 (15.6%)	4 (8.3%)	8 (27.6%)
RIGHT TUBAL OCCLUSION	7 (9.1%)	5 (10.4%)	2 (6.9%)
UTERINE FIBROID	1 (1.2%)	0 (0%)	1 (3.4%)
OTHER FINDINGS	8 (10.4%)	5 (10.4%)	3 (10.3%)
TOTAL	77	48 (62.3%)	29 (37.7%)

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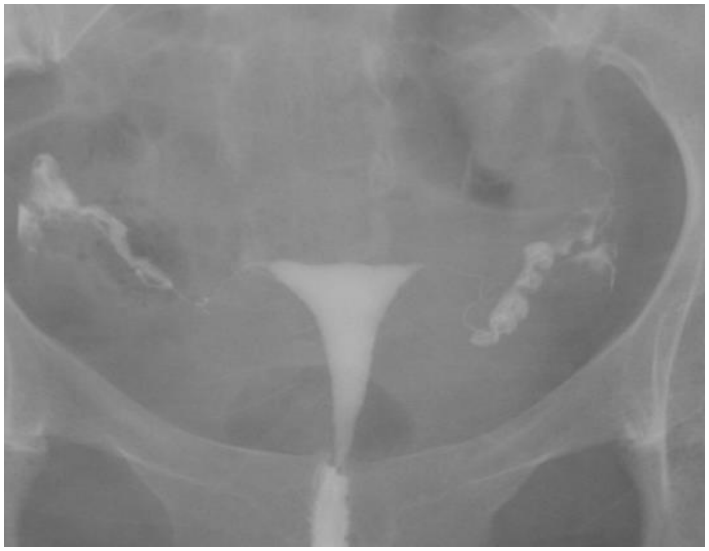

Fig 1: Normal hysterosalpingogram (HSG), with bilateral spillage of contrast.

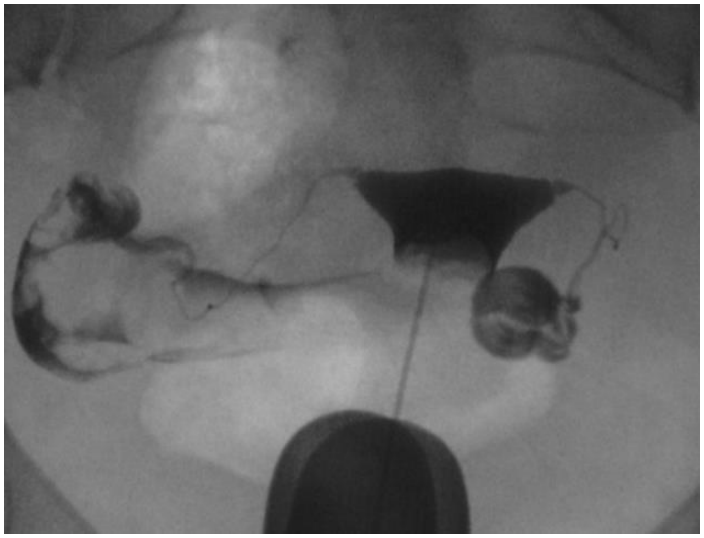

Fig 2: The distal left fallopian tube is prominent with no peritoneal spillage of the contrast. Right fallopian tube shows free spillage. Uterus is in the midline and appears normal.

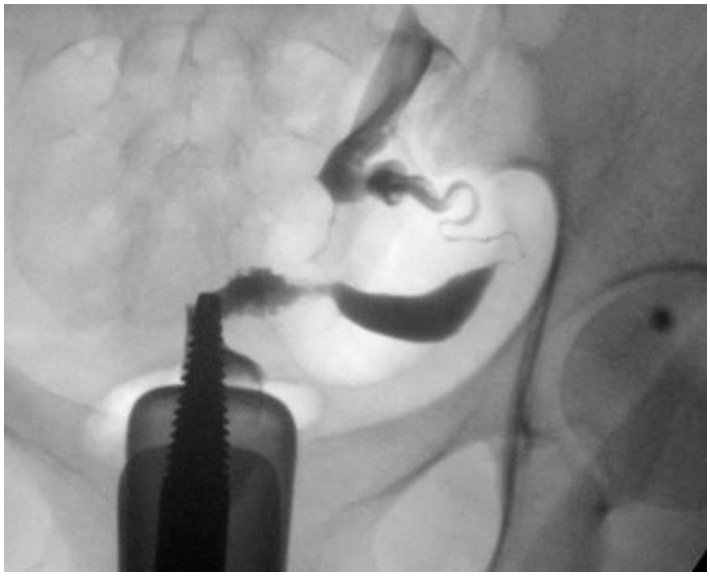

Fig 3: Hysterosalpingogram shows the left side of the uterus filling in the contrast study suggesting a unicornuate uterus.

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DISCUSSION

Infertility is classified as primary when the couple has never achieved pregnancy, and as secondary when a previous verified pregnancy has occurred. Infertility may result from male factors when there are abnormalities in sperm count or morphology, as well as other structural male-related disorders[13,14]. Female factor infertility may result from fallopian tube obstruction, uterine or endometrial anomalies, cervical stenosis or incompetence, and anovulation[15,16]. Both couples may contribute to infertility to varying extents, or no identifiable cause may be determined. Approximately 30% of infertility is attributable to female issues, 30% to male issues, and 30% to combined male and female issues, with 10% exhibiting no identifiable reason. These figures, however, are contingent upon the study's location[17,18].

This study aimed to assess the range of radiological results on Hysterosalpingography (HSG) and their relevance in diagnosing female infertility. This retrospective analysis considered a total of 77 patients. In the present study, sample size of 77, 63.6% of cases had normal fallopian tubes with unobstructed contrast material spillage. **Kamal et al.**[19]discovered that 52% of 100 infertile women exhibited abnormal results in their hysterosalpingography (HSG), with fallopian tube anomalies identified as the predominant cause of infertility, impacting nearly half of the subjects. Specifically, 54.3% of women with primary infertility and 50% of those with subsequent infertility demonstrated tubal abnormalities. A comparable study was carried out by **M. Danfulani et al**.[8] (2015) in Sokoto, North Western Nigeria, and by **Onwuchekwa CR et al**.[20] (2017), revealing that 43.85% and 49.5% of cases exhibited normal HSG, respectively.

Makwe et al.[22] examined 266 medical records and HSG data, discovering that tubal pathology was the predominant anomaly identified, present in 54.9% of women, with about one-third (30.8%) demonstrating bilateral tubal blockage. The right fallopian tube had a 43.2% blockage rate, while the left tube demonstrated a 41.7% rate; hydrosalpinx was identified in 10.2% of women with left tube involvement, in contrast to 9% for the right tube. The authors identified multiple risk factors for tubal pathologies, including age (odds ratio of 1.055), prior salpingectomy (odds ratio of 6.151), and myomectomy (odds ratio of 4.6), underscoring the significance of HSG as a screening instrument for assessing tubal-factor infertility in the studied population. Nonetheless, the data of our study indicate a higher prevalence, while only 24.7% exhibited tubal blockage in our research.

Regarding fallopian tube anomalies, 35.1% of cases exhibited such conditions, which is rather low when juxtaposed with studies conducted in Eastern Nepal, where the prevalence was 63.3%, and in Nigeria, where it was 35.33%[23,24]. Consequently, disparities may arise from the socio-cultural and economic status of patients in specific regions of respective countries. Additionally, the source of divergence may also stem from methodological diversity.

This study possesses multiple drawbacks.

Retrospective design fundamentally relies on the accuracy and completeness of existing medical records, potentially leading to information bias. The limited sample size of 77 patients constrains the generalisability of the findings to larger populations. The study was conducted at a single institution, potentially failing to account for regional or population-based variations in the reasons of infertility and interpretations of HSG.

CONCLUSION

This study underscores the diagnostic efficacy of Hysterosalpingography (HSG) in assessing female infertility, namely in detecting tubal obstructions and uterine anomalies. Although most patients exhibited normal results, left-sided and bilateral tubal occlusions were more commonly linked to subsequent infertility. The results align with other area research[25], while discrepancies arise from methodological and demographic variables. This study emphasises the significance of HSG as a primary imaging modality, highlighting its utility in directing subsequent management approaches, including surgical procedures or assisted reproductive technologies, hence enhancing the precision and efficacy of infertility treatment planning.

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