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Concordance and discordance between radiology residents and consultant radiologists in interpretation of hysterosalpingography for tubal patency in infertile women

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ABSTRACT

Introduction: The quality of a training program for Radiology residents can be assessed by comparing their ability to accurately read standard images to that of their senior counterparts or consultants.

Objective: To evaluate the concordance and discordance rate between residents and consultant radiologists for reporting tubal patency on hysterosalpingography images in infertile women.

Materials & Methods: A comparative study was conducted at the Radiology Department of Rehman Medical Institute Peshawar, Pakistan from June 2021 to December 2022 on 200 infertile women of ages 18-50 years who underwent fluoroscopic hysterosalpingography (HSG) for tubal patency status. Images were reviewed and interpreted initially by radiology residents (1st year and 2nd year) on their respective workstations, which were then compared to the final reports of radiology consultants. The data were analyzed using IBM SPSS version 26 for descriptive and comparative statistics.

Results: The results showed that out of 200 cases of infertility, 83(41.5%) cases were of primary infertility and 117(58.5%) of secondary infertility. The mean age was 35 ± 9.5 years. Normal uterine cavity with normal peritoneal spill was found in 157(78.50%) cases while 43(21.5%) cases had abnormalities. Out of 43 abnormal HSGs, 37 (86.05%) cases were of fallopian tube blockage while 6 (13.95%) cases had other abnormalities like uterine abnormality (n=3), hydrosalpinx (n=2), cervical stenosis and salpingitis isthmica nodosa (n=1). The total concordance with 1st year residents was 95.5%, and 98% with 2nd year residents. Total discordance was 6.5%, in which 4.5% was with 1st year resident and 2% was with 2nd year resident. Overall inter-observer variability showed moderate agreement, (kappa, k=0.7, 95%CI ±0.51), fair agreement with first year residents (k=0.4, 95%CI 0.3-0.5), and moderate agreement with 2nd year residents (k=0.5, 95%CI 0.39-0.5).

Conclusion: The level of radiology residency training affects discordance rates significantly with the junior resident having higher rates of discordance than the senior residents.

Keywords: Contrast Media; Fallopian Tube; Fluoroscopy; Hysterosalpingography; Infertility; Uterus.

The authors declared no conflict of interest. All authors contributed substantially to the planning of research, data collection, data analysis, and write-up of the article, and agreed to be accountable for all aspects of the work.

INTRODUCTION

Radiology reporting is the main domain of the diagnostic radiologist. It includes extensive experience and knowledge of the justification, protocol, and technique of the procedure performed, the limitations during the imaging process, and the reading and final interpretation of the images. Radiologists are trained during their residency over a period of four years. The quality of the final radiology report is a direct reflection of the radiologist's knowledge, experience, and confidence.[1] During the training period, the initial radiology reporting of different modalities is done by residents, which is then finalized and approved by the consultant radiologist.

Infertility is a growing concern globally, and about 10-15% of couples are affected by it.[2-4] It can be primary or secondary due to tubal blockage, uterine abnormalities or pelvic infections. Of the many investigations being done during the infertility workup and management, Fluoroscopic Hysterosalpingography (HSG) is an established imaging method used for diagnosis of various infertility related conditions such as fallopian tube blockage, uterine abnormalities, cervical stenosis, and endometrial anomalies.[3] Other imaging modalities which play vital roles in assessing infertility in females include pelvic ultrasound, transvaginal ultrasound, hysterosalpingo-ultrasonography and magnetic resonance imaging. Fallopian tube patency, morphology of the uterus and cervix are best assessed by hysterosalpingogram, which is minimally invasive, reliable, safe and cost effective as compared to the other methods of evaluation of these structures. Review of published literature reveals sensitivity of 65% and specificity of 83% in detecting tubal blockage.[5] Furthermore, HSG has a therapeutic role and can be used in conjunction with fertility treatments such as IVF to enhance subfertility. Therefore, HSG is safe and is recommended for women who are having fertility problems as a part of their diagnostic workup. The aim of conducting this study was to evaluate the concordance of radiology reports done by residents as compared to final reports by radiologists.

Since initial reporting is done by residents, it is desirable to determine the credibility of initial reports by residents at different levels of training. The ability of residents to evaluate the uterine and tubal abnormalities in infertile women has been assessed and interobserver variability in interpretation of findings of hysterosalpingography by radiology resident and consultant radiologists has been evaluated.

MATERIALS & METHODS

This comparative study was conducted in the Radiology Department of Rehman Medical Institute, Peshawar, from June 2021 to December 2022. In total 200 patients were selected (age 18-50 years), who underwent serial fluoroscopic study of hysterosalpingography for tubal patency in infertile women. All the studies included were adequate HSG studies (n=200) with image series uploaded on DICOM system or optimum radiographic films. These were reviewed and interpreted initially by radiology residents (1st year and 2nd year) on their respective workstations. These reports were then finalized by senior radiologists (two senior radiologists having more than 10 years of experience in reporting HSG). Residents reviewing the studies were divided into two groups: R1 (junior, year one resident) and R2 (senior, year two resident). The initial reports made by residents were compared to the final reports of radiology consultants to check for any misinterpretation and misdiagnosis. Fluoroscopic images of HSG were reviewed separately in two sessions at their respective workstations by using FAUJI synapse version 5, DICOM system to assess inter observer variability, differences between the initial and final report findings in the same examination, and the discordance rate between each radiology resident and consultant radiologist.

Normal HSG was reported when there was normal shaped uterine cavity, no filling defect in uterine cavity, normal filling of both fallopian tubes, and free peritoneal spillage of contrast. Abnormal HSG was reported when uterine cavity and/or tubal abnormality was seen or / and absence of contrast spillage on both or one side. Abnormal tubes were interpreted as tubal obstruction (unilateral or bilateral) and/or contrast distended tube (hydrosalpinx). The possibility of pelvic adhesion was considered if there were any contrast media loculations in the pelvic cavity.

The inter observer agreement was measured using an unweighted kappa coefficient and a 95% confidence interval. Interpretation of the kappa values were as follows: <0.20 indicated poor performance; 0.21 -0.40 indicated fair performance; 0.41-0.60 indicated moderate performance; 0.61-0.80 indicated good performance; 0.81-1.0 indicated very good performance. The data collected were analyzed by Microsoft Excel and SPSS version 26. For categorical variables, frequency and percentage were computed while mean and standard deviation were determined for continuous variables.

Hysterosalpingography (HSG) Technique: The HSG examination was performed at the Radiology Department of our institution under direct supervision of trained radiologists by radiology residents or technologists. All the patients were referred by gynecologists or family medicine physicians. An informed written consent was taken by briefly explaining this procedure and its complications. This procedure is ideally done during the proliferative phase of the menstrual cycle between 7-12 days of cycle. Before starting the procedure, proper positioning of the patient was done by laying in supine position on a fluoroscopy table, and a scout image of the lower abdomen and pelvis was taken to assess proper positioning, technique and pelvic abnormalities. By using aseptic measures, the patient was placed in a lithotomy position with cannulation of the cervical canal by catheter and 15–20 ml of water-soluble contrast medium, Urografin 76% (sodium Amidotrizoate + Meglumine Amidotrizoate) was injected slowly into the uterine cavity. Direct image visualization was done during the procedure to assess the anatomy of uterine cavity, patency of fallopian tubes, and any pathologies. Spot images / films of different phases of this procedure like early uterine filling, bilateral fallopian tubal filling, and peritoneal spill of contrast were taken. Afterwards, these HSG examinations were interpreted by the direct visualization of images during procedure and spot images, checking for unilateral and bilateral spillage of contrast medium into peritoneal cavity and abnormalities of uterine cavity and cervix.

Figure 1: Spot image of Hysterosalpingography shows blocked left fallopian tube with hydrosalpinx

RESULTS

The results showed that out of the 200 cases, 83(41.5%) were of primary infertility and 117(58.5%) of secondary infertility. The consultant interpreted 157 cases of HSG as normal and 43 cases as abnormal while the residents interpreted 170 cases as normal and reported 30 cases as abnormal. They misinterpreted a total of 13 cases of HSG having abnormal findings, 9 cases by the 1st year resident and 4 cases by the 2nd year resident. Total concordance of 95.5% was with 1st year residents and 98% with 2nd year residents. Total discordance was 6.5%, in which 4.5% was with 1st year residents and 2% was with 2nd year residents (Table 1).

Table 1: Inter variability difference between Readers

Readers	Concordance	Discordance
1st year Residents	95.5%	4.5%
2nd year Residents	98%	2%

Table 2 shows the overall inter observer variability as moderate agreement (k=0.7, 95% CI ±0.51), while with first year residents it was fair agreement (k=0.4, 95% CI 0.31-0.5) and moderate agreement with 2nd year residents (k=0.5, 95% CI 0.39-0.69). The level of residency training affected residents discordance rates significantly with the junior resident having higher rates of discordance than the senior residents. The chi-square statistic is 1.972 with p=0.01793.

Table 2: Statistical analysis of Kappa Values and Confidence Intervals

Cohen's Kappa Value	95% Confidence Interval	
	Lower level	Upper level
Overall k value = 0.7	0.41	0.71
1st year Resident, k = 0.43	0.317	0.56
2nd year Resident, k= 0.5	0.39	0.623

The age range included was 18-50 years (Table 3), whereas mean age was 35±9.5years. The mean age of women with primary infertility was 26.73 years, whereas that for secondary infertility it was 30.71 years. There were 83 (41.5%) cases of Primary Infertility and 117 (58.5%) cases of Secondary Infertility.

Table 3: Age and Infertility distribution of subjects (n=200).

Variables	Frequency	Percentage
Age Groups (years)		
18-30	131	65.5
31-50	69	34.5
Infertility		
Primary	83	41.5
Secondary	117	58.5

(Mean age with primary infertility was 26.7 years and with secondary infertility was 30.71 years).

Normal uterine cavity with normal peritoneal spill was found in 157(78.50%) cases while 43(21.5%) cases had abnormalities (Figure 2).

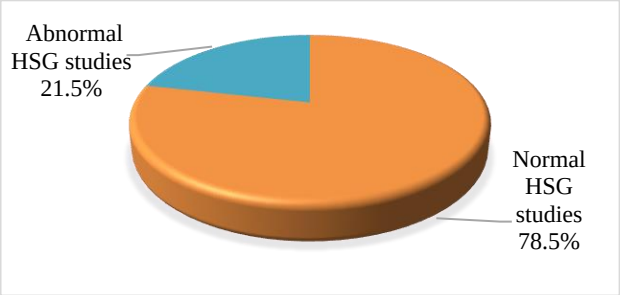

Figure 2: Pie chart presentation of normal and abnormal HSGs

Distribution of uterine abnormalities are shown in Figure 3. Out of 43 abnormal HSGs, 37(86%) cases were of fallopian tube blockage while 06(13.9%) cases had other abnormalities like uterine abnormality, 03 cases (6.9%) had hydrosalpinx, 02 cases (4.6%) had cervical stenosis, and salpingitis isthmica nodosa was 01 case (2.3%). In these 37 cases of Fallopian tube blockage, restricted contrast material spillage and hydrosalpinx, and blockage were more common on the right side in 16(37.2%) cases followed by 14(32.5%) cases on the left side and 07 cases (16.2%) on both sides. Other than blockage of fallopian tubes, 6 cases of uterine filling defects were the most common uterine abnormality. These pathologies were more common in patients with secondary infertility.

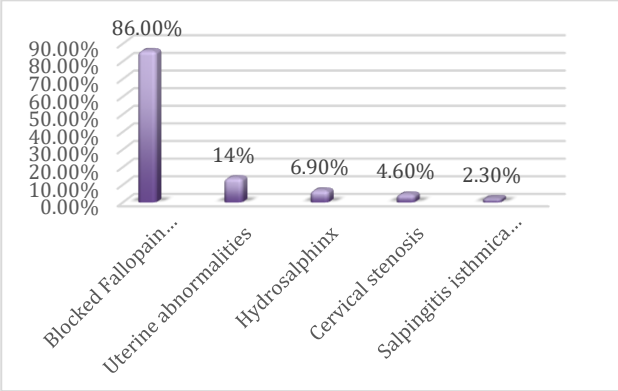

Figure 3: Bar chart Presentation of Uterine Abnormalities (n=43).

DISCUSSION

The HSG images are easy to interpret in the presence of good background knowledge of anatomy and procedure limitations. As the procedures, technique protocolling is part of first year residency curriculum, therefore the first and second year residents were included in our study group. In our study the inter observer variability in reporting of HSG between residents and consultant radiologists showed moderate agreement with a kappa value of (k=0.7 CI, 95+/-0.51). This was comparable with another study done on inter observer variability among junior and senior radiologists by authors in Egypt[5] which showed moderate to good agreement with the kappa value of up to 0.79. To our knowledge, no study has been published on inter-observer variability among residents and radiologists for HSG interpretation.

HSG use for tubal patency diagnosis as well as therapeutic and management of variable causes of infertility in women. In our study, secondary infertility (58.5%) was more prevalent than primary infertility (39.5%). Similar observations were made by a previous research study.[6] In this study, a normal uterine cavity with normal peritoneal spill was found in 157(78.50%) cases while 43(21.5%) cases had abnormalities, which is higher than the 44.2% reported previously in a similar study.[7] This difference could be due to interpretation of the snapshot series of HSG, in which some underlying lesion could be masked by contrast material.

A five years review of cases of infertility done in Africa[8] reported primary infertility in 66.3% of cases and secondary infertility in 33.7% with an average duration of 48.9 months (range 25 to 96 months); HSG diagnosis was compared to laparoscopic diagnosis with the former diagnosing proximal tubal obstruction in 09.37% cases, the latter in 17.71%; for distal tubal obstruction, HSG could diagnose 11.46% of cases, but laparoscopy showed 6.25% of the cases labeled as patent by HSG to be blocked. The authors concluded that the two procedures have a moderate concordance and should be taken as complementary to each other.

In the present study, only 13.9% cases had uterine abnormalities which is much higher than the 0.9% cases reported by Danfulani et al,[9] Out of these 43 abnormal cases, 18.5% were of fallopian

tube blockage which was more on the right side (16 cases) followed by the left side (14 cases), this is comparable to 33.6%, 40% and 43.55% fallopian tube abnormalities recorded in previous studies.[9-11] Moreover, a high frequency of right fallopian tube involvement was reported by previous researchers.[11] Only 2 cases of hydrosalpinx (1%) were also noted in our study. Review of previous studies showed a higher incidence of hydrosalpinx ranging from 7.2 to 11%,[12] and 33.1%[13]. Hydrosalpinx is caused by accumulation of fluid in blocked tubes by pelvic infections and adhesions commonly at the ampullary region of the fallopian tubes. In the current study, women with secondary infertility had a high incidence of tubal disease.

RECOMMENDATION

To increase concordance, avoid misdiagnosis, and to improve inter-reader variability in findings of HSG studies between radiology residents and consultant radiologists, one should understand the procedure properly, taking the details of clinical information, and its correlation with other imaging modalities such as MRI or Transvaginal ultrasound.

Moreover, it is recommended that larger scale and multi center studies should be undertaken to determine better the concordance and discordance rates, so as to improve the overall quality of residents training programs in Radiology

LIMITATION

This was a single center study, and had a relatively small sample size obtained by non-random sampling, hence the results could not be generalized or subjected to robust inferential statistics.

CONCLUSION

A satisfactory concordance rate between residents and consultant radiologists was observed, that improved with the year of training. The level of residency training affected discordance rates significantly with the junior residents having higher rates of discordance than the senior residents.

REFERENCES

1. Petraszko A, Chagarlamudi K, Ramaiya N. Enhancing the value of radiology reports: a primer for residents. Emerg Radiol. 2022 Aug;29(4):671-82.
2. Abubakar AP, Yusuf TS. The profile of infertility in a teaching hospital in North West Nigeria. Sahel Med J. 2014;17:7-11.
3. Pundir J, El Toukhy T. Uterine cavity assessment prior to IVF. Womens Health (Lond). 2010 Nov;6(6):841-7; quiz 847-8. doi: 10.2217/whe.10.61.
4. Khalaf Y. ABC of subfertility tubal subfertility. BMJ. 2003;327:610-3.
5. Ahmed SA and Abo-Taleb H. The validity of HSG in infertility work up. Egypt J Radiol Nucl Med. 2019;50:63.
6. Onwuchekwa CR, Oriji VK. Hysterosalpingographic (HSG) pattern of infertility in women of reproductive age. J Hum Reprod Sci. 2017;10:178-84.
7. Nwankwo NC, Akani CI. Pattern of hysterosalpingography findings in infertility in Port Harcourt. West Afr J Radiol. 2005;12:15-9.
8. Tshabu-Aguemon C, Ogoudjobi M, Obossou A, King V, Takpara I, Alihonou E. Hysterosalpingography and laparoscopy in evaluating fallopian tubes in the management of infertility in Cotonou, Benin Republic. J West Afr Coll Surg. 2014 Apr-Jun; 4(2): 66-75.
9. Danfulani M, Mohammed MS, Ahmed SS, Haruna YG. Hysterosalpingography findings in women with infertility in Sokoto North Western Nigeria. Afr J Med Health Sci. 2014;13:19-23.
10. Bello TO. Tubal abnormalities on hysterosalpingography in primary & secondary infertility. West Afr J Med. 2006;25:130-3.
11. Okafor CO, Okafor CI, Okpala OC, Umeh E. The pattern of hysterosalpingography findings in women being investigated for infertility in Nnewi, Nigeria. Niger J Clin Pract. 2010;13:264-7.
12. Imo AO, Adeoye IS. Radiological assessment of the uterus and fallopian tubes in infertile women at Abakaliki, Nigeria. Niger J Clin Pract. 2008;11:211-51.
13. Asaleye CM, Adetiloye VA, Oyinlola TO. Review of hysterosalphingographic reports done for infertility over a 10 year period. Niger J Health Sci. 2004;4:36-9.