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Original Article

Hysterosalpingographic Evaluation of Uterus and Fallopian Tubes of Infertile Women

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Abstract

Background

Hysterosalpingography (HSG) is a routinely performed radiological investigation for evaluation of uterine cavity morphology and fallopian tube patency in infertile women. This study was undertaken to describe patterns of HSG findings and to assess any significant difference in uterine and fallopian tube findings in women with primary and secondary infertility in eastern part of Nepal.

Material and Methods

Hospital based cross sectional descriptive study was conducted by retrospectively analyzing HSG records of 216 infertile women (both primary and secondary infertility) done from April 2014 to August 2016. Radiological findings in uterus and fallopian tubes were recorded and analyzed. Association between two categorical variables was examined by Chi-square test.

Results

Majority of infertile women (53.2%) had primary infertility. Abnormal HSG was seen in 44.9% infertile women and higher in secondary infertility (57.4%) than with primary infertility (33.9%) (OR = 2.63, 95% CI = 1.51 – 4.57, P value = 0.001). Tubal abnormality was common than uterine abnormality (36.1% versus 8.8%, P value = 0.001). Tubal abnormalities were higher in women with secondary infertility than with primary infertility (52.5% versus 21.7%), whereas uterine abnormalities were common with primary infertility compared to secondary infertility (12.2% versus 5.0%) (P value = 0.001).

Conclusion

Abnormal HSG was more associated with secondary infertility. Infertility was significantly associated with tubal abnormality than with uterine abnormality. Tubal abnormalities are common in women with secondary infertility whereas uterine abnormalities are common in women with primary infertility and are statistically significant.

Keywords: *Hysterosalpingography, Nepal, Primary infertility, Secondary infertility, Tubal abnormality, Uterine abnormality*

Introduction

Hysterosalpingography (HSG) is a routinely performed radiological investigation for

evaluation of uterine cavity morphology and fallopian tube patency in infertile women by instillation of radiographic

contrast media into uterine cavity through cervical canal [1, 2]. Clinically according to the international committee for monitoring Assisted Reproductive Technology (ICMART) and the World Health Organization (WHO) revised glossary, infertility "is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after twelve months or more of regular unprotected sexual intercourse" [3], and is further classified as primary when there is no occurrence of previous pregnancy and secondary when previously pregnancy has occurred [4]. According to an analysis conducted by WHO, an estimated 48.5 million reproductive age couples were infertile in 2010 worldwide. Inability to conceive and bear a child can lead to psychological and social problems in a couple [5], hence investigation of infertile couple to identify a cause and its subsequent treatment is crucial. Female factor is responsible for 40 – 55% of the causes of infertility, of which fallopian tubal and peritubal factors are seen in 30-40% of cases and uterine abnormalities implicated in about 15%. [4]. HSG is relatively quick, safe and non-invasive technique for evaluation of uterine cavity and fallopian tube lumen and is best imaging modality to examine fallopian tubes [6]. Advances in a field of reproductive medicine have increased the role of HSG in evaluation of infertile women with increase in number of HSG examinations done these days. Various pathologies like congenital uterine anomalies, endometrial polyp, submucosal uterine fibroid, uterine synechiae, adenomyosis, fallopian tubal blockage, hydrosalpinx and peritubal adhesions can be identified by HSG. Indication of HSG other than infertility includes evaluation of women with recurrent abortions, to check patency of fallopian tubes after tubal ligation or recanalization and assessment of uterus before myomectomy. Even though

complications like pain, discomfort, infection, vasovagal reaction, uterine perforation, intravascular or lymphatic intravasation of contrast media and allergic reactions related to contrast media can be seen during and after HSG, it plays a significant role in management of female infertility [1, 2].

Local data regarding prevalence and patterns of abnormalities seen in HSG examinations of infertile women are important to obtain baseline information and thus for further planning of infertility treatment and reproductive health management. This study was undertaken to describe patterns of HSG findings in uterus and fallopian tubes of infertile women and to assess any significant difference in uterine and fallopian tube findings in women with primary and secondary infertility seeking infertility treatment in teaching hospital in eastern part of Nepal.

Materials and Methods

This hospital based cross sectional descriptive study was conducted by retrospectively analyzing HSG records of infertile women (both primary and secondary infertility) referred for HSG examination to Department of Radiodiagnosis and Imaging of Nobel Medical College Teaching Hospital (NMCTH), Biratnagar over a period of 29 months from April 2014 to August 2016. Ethical clearance for the study was obtained from IRC-NMCTH. HSG records of 216 infertile women were included for the study after excluding patients with history of salpingectomy or tubal ligation.

HSG examination is done in our department following standard protocol. Procedure is explained to the patient and consent obtained prior to examination. Ongoing vaginal bleeding, active pelvic infection, recent uterine or tubal intervention / surgery and history of allergy to contrast

media are considered contraindication for the procedure. The couple is asked to avoid unprotected intercourse from day one of menstrual cycle till the day of HSG examination to ensure the risk of potential pregnancy is eliminated. HSG is done between 6th – 10th day of last menstrual cycle after cessation of vaginal bleeding. In the presence of female attendant, the patient is placed supine on X-ray table in lithotomy position and 20 mg of Hyosine Butylbromide is given intravenously. Following aseptic technique speculum is placed in vagina, cervix localized and cleansed by iodine solution. Volsellum is used to hold anterior lip of uterine cervix and Leech Wilkinsons cannula or foley's catheter (8F) inserted into distal cervical canal. Side marker is placed on one side of pelvis (right or left) and scout image of pelvis taken before instillation of contrast medium into uterine cavity. 10 - 15 ml of water soluble iodinated contrast medium (76% urograffin) is instilled into uterine cavity via a cannula / catheter maintaining tight seal to prevent reflux of contrast. Spot radiographs are then obtained demonstrating uterine cavity, fallopian tubes and peritoneal spillage of contrast media. All the HSG records were reviewed and analyzed by author himself. Age, parity and infertility duration were recorded on data sheet. Variables like size, shape and outline of uterine cavity; filling defects within uterine cavity; opacification, visualization and caliber of bilateral fallopian tubes and peritoneal spillage of contrast from fallopian tubes were studied and recorded. The examination was declared normal when HSG demonstrated regular outlined triangular uterine cavity without filling defects, with opacification and visualization of normal caliber bilateral fallopian tubes and free peritoneal spillage of contrast media. Failure of opacification of fallopian tubes was considered to be blocked (unilateral or bilateral). Dilated

fallopian tubes was labeled as hydrosalpinx (unilateral or bilateral) and demonstration of alternating dilatation and narrowing along the length of fallopian tubes called beaded. Similarly, uterine abnormalities were classified accordingly, as congenital (Mullerian duct anomalies) and acquired (synechiae, fibroid). Obtained data were recorded in Microsoft Excel spreadsheet and analyzed using IBM SPSS statistics 20 software. Frequency, percentage and mean with standard deviation (SD) were calculated to explore the characteristics of categorical and numerical variables. Association between two categorical variables was examined by Chi-square test. Logistic regression was used to find out the association between HSG findings and type of infertility after adjusting age group as a confounding variable. Probability of significance was set at 5% level.

Results

Of the total 216 infertile women included in this study, 115 (53.2%) had primary infertility and 101 (46.8 %) secondary infertility. Mean age (years) \pm standard deviation (SD) was 29.42 ± 4.32 with age range of 20 – 40 years. Mean age (years) \pm SD of women with primary and secondary infertility was 27.10 ± 3.71 (range: 20 – 36 years) and 32.07 ± 3.34 (range: 24 – 40 years) respectively. Mean duration of infertility (years) \pm SD of total patients was 7.16 ± 3.63 years (range: 2 – 18 years), with mean duration of 5.24 ± 2.31 years (range: 2 – 14 years) and 9.34 ± 3.63 years (range: 4 – 18 years) for primary and secondary infertility respectively. Majority (96 (44.4%)) of women belonged to 26 – 30 years age group and majority (97 (44.9%)) had infertility of 6 - 10 years.

Table 1: HSG findings with type of infertility

| HSG finding | Primary infertility | Secondary infertility | Total | Odds ratio (OR) (95% confidence interval (CI)) | P value * |
|-------------|---------------------|-----------------------|-------------|--|-----------|
| Normal | 76 (66.1%) | 43 (42.6%) | 119 (55.1%) | 2.63 (1.51 – 4.57) | 0.001 |
| Abnormal | 39 (33.9%) | 58 (57.4%) | 97 (44.9%) | | |
| Total | 115 (100%) | 101 (100%) | 216 (100%) | | |

*Chi-square test

Out of 216 infertile women, 97 (44.9%) had abnormal HSG. Abnormal HSG was seen in 39 (33.9%) and 58 (57.4%) women with primary and secondary infertility respectively (OR = 2.63, 95% CI = 1.51 – 4.57, P value = 0.001). Also, HSG abnormality is significantly associated with type of infertility even after adjusting age effect. (Table 1).

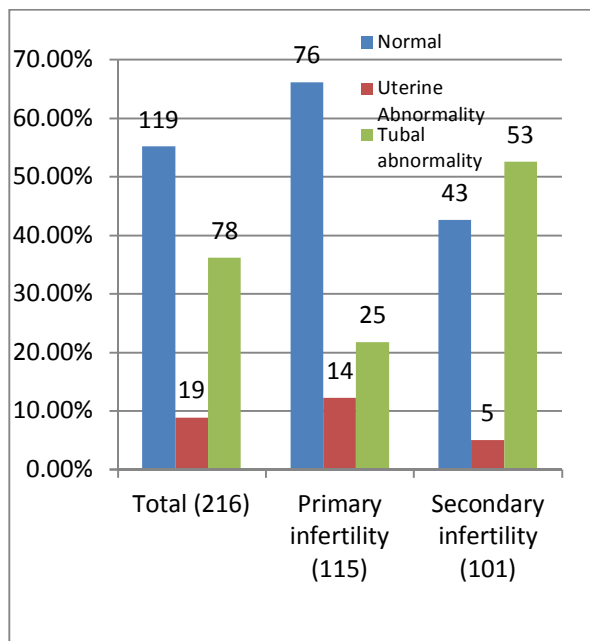


Figure 1 : Distribution of HSG findings

Table 2: Type of abnormality in HSG (n = 97)

| Abnormality | Primary infertility (n = 39) | Secondary infertility (n = 58) | Total (n = 97) |
|-------------|------------------------------|--------------------------------|----------------|
| Uterine | 14 (35.9%) | 5 (8.6%) | 19 (19.6%) |
| Tubal | 25 (64.1%) | 53 (91.4%) | 78 (80.4%) |

As shown in table 2 tubal abnormality was more associated with infertility than uterine abnormality and is statistically significant (P value = 0.001). Uterine abnormality is significantly associated with primary infertility whereas tubal abnormality is higher in secondary infertility in comparison to the uterine abnormality (P value = 0.001). (Table 2).

Table 3: Distribution of uterine findings in HSG according to type of infertility.

| Findings in uterus | Primary infertility (n = 115) | Secondary infertility (n = 101) | Total (n = 216) |
|--------------------|-------------------------------|---------------------------------|-----------------|
| Normal | 101 (87.8%) | 96 (95.0%) | 197 (91.2%) |
| Bicornuate uterus | 3 (2.6%) | 1 (1.0%) | 4 (1.9%) |
| Unicornuate uterus | 3 (2.6%) | 0 (0.0%) | 3 (1.4%) |
| Septate uterus | 1 (0.9%) | 0 (0.0%) | 1 (0.5%) |
| Arcuate uterus | 1 (0.9%) | 0 (0.0%) | 1 (0.5%) |
| Fibroid | 4 (3.5%) | 2 (2.0%) | 6 (2.8%) |
| Synechiae | 2 (1.7%) | 2 (2.0%) | 4 (1.9%) |

Uterine abnormalities were found in 19 (8.8%) infertile women out of 216 and in 14 (12.2%) and 5 (5.0%) women with primary and secondary infertility respectively. This difference in occurrence of uterine abnormalities between primary and secondary infertility is statistically significant (P value = 0.001). Of the total

19 uterine abnormalities, congenital uterine anomalies were seen in 9 (4.2%) and acquired abnormalities in 10 (4.6%) women. (Table 3).

Table 4: Distribution of tubal findings in HSG according to type of infertility

| Findings in fallopian tubes | Primary infertility (n = 115) | Secondary infertility (n = 101) | Total (n = 216). |
|--|-------------------------------|---------------------------------|------------------|
| Normal | 90 (78.3%) | 48 (47.5%) | 138 (63.9%) |
| B/L tubal block | 7 (6.1%) | 14 (13.9%) | 21 (9.7%) |
| Right tubal block | 5 (4.3%) | 10 (9.9%) | 15 (6.9%) |
| Left tubal block | 2 (1.7%) | 9 (8.9%) | 11 (5.1%) |
| B/L hydrosalpinx | 3 (2.6%) | 7 (6.9%) | 10 (4.6%) |
| Right hydrosalpinx | 1 (0.9%) | 6 (5.9%) | 7 (3.2%) |
| Left hydrosalpinx | 2 (1.7%) | 5 (5.0%) | 7 (3.2%) |
| Right tubal block with left hydrosalpinx | 1 (0.9%) | 1 (1.0%) | 2 (0.9%) |
| Left tubal block with right hydrosalpinx | 2 (1.7%) | 1 (1.0%) | 3 (1.4%) |
| Beaded tubes | 2 (1.7%) | 0 (0.0%) | 2 (0.9%) |

Tubal abnormalities were found in 78 (36.1%) infertile women out of 216 and in 25 (21.7%) and 53 (52.5%) women with primary and secondary infertility respectively. This difference in incidence of tubal abnormalities between primary and secondary infertility is statistically significant (P value = 0.001). Of the tubal abnormalities, tubal blockage was most common abnormality present in 47 (21.8%) women followed by hydrosalpinx in 24 (11.1%) women. Beaded fallopian

tube was seen in 2 (0.9%) of infertile women. (Table 4).

(Figures: 2 – 5)



Figure 2: Normal HSG

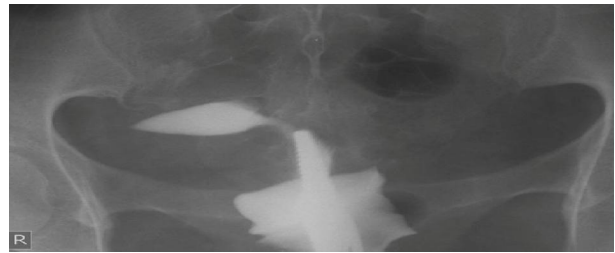


Figure 3: B/L tubal block

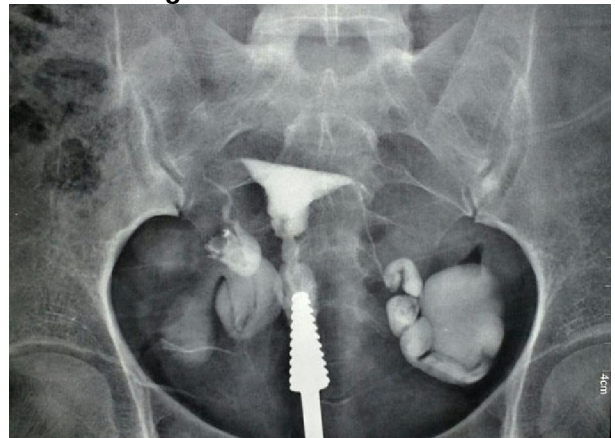


Figure 4: B/L hydrosalpinx



Figure 5: Bicornuate uterus

Discussion

Infertility is a global health problem with little change in its level over a period of two decades between 1990 – 2010 and can lead to various psychological and social problems to an infertile couple [5]. Hence proper evaluation of infertile couple is of paramount importance to identify its cause and plan subsequent management. HSG still remains an initial imagining modality in evaluation of uterine cavity and fallopian tube lumen of infertile women and is best imaging modality to examine fallopian tubes [6].

Majority of infertile women (53.2%) in this study had primary infertility in concordance with another study done in Nepal by Shrivastava VR et al [7], which also states higher proportion of women with primary infertility than with secondary infertility. A number of studies [8 -13] too show higher percentage of women with primary infertility as compared to secondary infertility, though in different proportions. However, in other studies [14 -24] there was preponderance of secondary infertility. In this study, abnormal HSG was seen in 44.9% infertile women, higher than 29.0% seen in study of Shrivastava VR et al [7]. Relatively comparable rate of HSG abnormality was observed in studies conducted by Nampakdianan K et al [8], Mesbahi S et al [10] and Poonam [11] which showed abnormal HSG in 38.5%, 42.0% and 52.4% women respectively. However HSG abnormalities were higher in studies of Ramzan R et al [9], Bukar et al [19], Malwadde EK et al [21], Haque S [23], Cisse R et al [24] and Danfulani M et al [25] with 61.9%, 70.6%, 83.4%, 61.7%, 62.1% and 56.1% respectively. This study showed abnormal HSG to be more associated with secondary infertility (57.4%) than with primary infertility (33.9%) (OR = 2.63, 95% CI = 1.51 – 4.57, P value = 0.001), and a women with secondary infertility 2.63 times more

likely to have an abnormal HSG compared to women with primary infertility, which is comparable to the study of Nampakdianan K et al [8] who found abnormal HSG in 32.7% and 54.0% women with primary and secondary infertility respectively. Higher number of normal HSG found in women with primary infertility suggests that the cause may be non-structural or due to male infertility factor. Hence investigation of male partner in couple with primary infertility is important and should be carried out. However, in study of Shrivastava VR et al [7] and Ramzan R et al [9] little difference was found in abnormal HSG incidence between women with primary and secondary infertility (Shrivastava VR et al - 30.0% and 27.2%, Ramzan R et al - 59.7% and 64.8%). Infertility was found to be significantly associated with tubal abnormality than with uterine abnormality in this study (36.1% versus 8.8%) (P value = 0.001). Different other studies show wide variation in occurrence of tubal abnormality with 19.0%, 28.9%, 21.0%, 42.8%, 43.5%, 40.0%, 61.8%, 45.0%, 72.9%, 38.3%, 62.0% and 35.3% in studies of Shrivastava VR et al [7], Nampakdianan K et al [8], Mesbahi S et al [10], Poonam [11], Okafor CO et al [13], Bello TO [15], Akinola RA et al [16], Lawan RO et al [18], Bukar M et al [19], Haque S [23], Cisse R et al [24] and Danfulani M et al [25] respectively. Also, uterine abnormality was seen in 4.6%, 9.6%, 25.0%, 24.8%, 14.9%, and 38.3% of infertile women in studies conducted by Shrivastava VR et al [7], Nampakdianan K et al [8], Mesbahi S et al [10], Poonam [11], Haque S [23] and Cisse R et al [24] respectively. In contrary to studies [7, 8, 11, 23, 24] which showed tubal abnormalities to be common than uterine abnormalities, the study by Mesbahi S et al [10] showed higher percentage of abnormality in uterus than in tubes (25.0% versus 21.0%).

This study showed tubal abnormalities to be higher in women with secondary infertility than with primary infertility (52.5% versus 21.7%) and is statistically significant (P value = 0.001). This finding is in agreement with that of Nampakdianan K et al [8] of 48.5% versus 21.4%, and Bello TO [15] of 44.8% versus 20.8%. Higher incidence of tubal abnormalities in secondary infertility may be due to poor health care after previous pregnancy or abortion, higher prevalence of pelvic inflammatory disease and increased risk of sexually transmitted diseases. This is in disparity with the finding of Shrivastava VR et al [7], which state no much difference in tubal abnormality between primary and secondary infertility (19.1% versus 18.7%). Of the tubal abnormalities, tubal blockage was found to be most common abnormality, present in 21.8% women followed by hydrosalpinx in 11.1%, in consistent with studies of Poonam [11] (34.3% and 5.7%), Akinola RA et al [16] (41.8% and 9.0%), Lawan RO et al [18] (32.7% and 10.5%), MalwaddeKE et al [21] (38.9% and 12.8%) and Fatima Y et al [26] (30.0% and 16.3%), although in different proportions. Tubal blockage and hydrosalpinx were found in almost similar number in study of Cisse et al [24] (25.9% and 25.3%). In contrast, Bello TO [22] found hydrosalpinx to be more common than tubal blockage (23.3% and 20.8%). Also, high incidence of hydrosalpinx (44.5%) was noted in study of Adetiloye [27]. Beaded fallopian tube was seen in 0.9% infertile women, similar as reported by Akinola RA et al [16] (0.5%) and Fatima Y et al [26] (1.3%) and lower than that reported by Ramzan R et al [9] (5.9%) and Poonam [11] (2.9%). Uterine abnormalities in this study was common in women with primary infertility compared to women with secondary infertility (12.2% versus 5.0%, P value = 0.001), in concurrence with the finding of

Shrivastava VR et al [7] (5.4% versus 2.9%) and Nampakdianan K et al [8] (9.4% versus 4.3%). Congenital uterine anomalies were seen in 4.2% and acquired abnormalities in 4.6% women. Bicornuate uterus (1.9%) was the most common congenital anomaly noted, followed by unicornuate uterus (1.4%); while fibroid (2.8%) was the most common acquired abnormality, followed by synechiae (1.9%). Comparable incidence of congenital uterine anomaly was found by Bukar M et al [19] (3.7%) and Arthur et al [28] (4.0%); lower by Shrivastava VR et al [7] (2.8%), Sanfilippo et al [29] (1.4%) and Nickerson [30] (1.6%) and higher by Ramzan R et al [9] (6.4%), Poonam [11] (20.0%), and Aziz MU et al [20] (6.2%). Bicornuate uterus was also found to be commonest congenital uterine anomaly by Bukar M et al [19] (1.8%) and Aziz MU et al [20] (4.0%), whereas unicornuate uterus was commonest in study of Shrivastava VR et al [7] (1.6%) with bicornuate uterus seen in 1.2%. Uterine fibroid (16.9%) was as well seen to be commonest acquired uterine abnormality in study of Eze CU et al [31] (synechiae 5.3%), in contrast to the finding of Bukar M et al [19] who reported synechiae (12.9%) to be common than fibroid (5.9%).

As this study was based on single center, results may not represent entire population. Findings of other investigations like hysteroscopy or laparoscopy were not available; hence precision of HSG in identifying uterine and tubal abnormalities could not be exactly determined. Therefore, further multicentric studies and additional diagnostic techniques like hysteroscopy or laparoscopy in conjunction with HSG are needed to be carried out to determine diagnostic accuracy of HSG.

Conclusion

HSG is an excellent imaging modality for evaluation of uterine cavity and fallopian tube lumen of infertile women. Women with

secondary infertility are more likely to have an abnormal HSG than women with primary infertility and tubal abnormalities are more common than uterine abnormalities. Tubal abnormalities are commonly observed among women with secondary infertility in comparison to primary infertility, whereas uterine abnormalities are common among women with primary infertility as compared with secondary infertility and are statistically significant.

Conflict of interest: There is no conflict of interest to be declared.

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