Original Article

Evaluation of hysterosalpingography findings in women with infertility

Shermin S[a], Noor A[b], Farjana S[b], Begum M[c]

ABSTRACT

Background: *Hysterosalpingography (HSG) helps in diagnosis of uterine and fallopian tube abnormalities. Use of HSG in investigating infertile women may provide important information useful to the gynaecologists during treatment planning. The aim of this study was to review the pattern of HSG findings in patients being advised to do the investigation for infertility evaluation.*

Methods: *This cross-sectional observational study included 150 patients undergoing HSG at Popular Diagnostic Centre, Shantinagar, Dhaka, Bangladesh from March to October 2022. All the patients were duly counseled and a written informed consent was obtained. The HSGs were performed between the 7th and 11th day of the menstrual cycle with iodine containing water-soluble contrast media iohexol (Imiro™). A non-steroidal anti-inflammatory drug (NSAID) was given 20 minutes prior to the procedure. All the patients were given prophylactic antibiotic. The clinical data and radiological findings were tabulated and analyzed.*

Results: *The age of the infertile women ranged between 18 and 45 years, with a mean ± SD of 28.18 ± 5.69 years. Majority of the patients (73.3%) were referred due to secondary infertility and 32.72% of them were from 25-29 years group. The mean ± SD duration of marriage (in years) was 7.9 ± 4.3 and that of subfertility (in years) was 4.4 ± 2.8. HSG revealed either uterine or tubal pathology in 34.7% patients and 3.3% patients had abnormalities in both uterus and fallopian tubes. The commonest abnormality reported was bilateral tubal blockade in 19 patients, 4 in primary subfertility and 15 in secondary subfertility patients. Uterine abnormalities were observed in 8.7% patients and arcuate uterus was the commonest (4.70%) finding.*

Conclusion*: HSG revealed either uterine or tubal pathology in one-third of patients and 3.3% patients had abnormalities in both uterus and fallopian tubes. Uterine abnormalities were also detected in 8.7% of the study subjects. Wide and wise application of HSG can avoid the practice of unnecessary and sometimes more aggressive procedures in evaluation of women with infertility.*

Key words: *Hysterosalpingography, infertility.*

BIRDEM Med J 2024; 14(1): 3-9
DOI: https://doi.org/10.3329/birdem.v14i1.71011

Author information

a. Shahana Shermin, Registrar, Department of Obstetrics & Gynaecology, BIRDEM Women and Children Hospital, Dhaka, Bangladesh.

b. Aysha Noor, Shayla Farjana, Senior Medical Officer, Department of Obstetrics & Gynaecology, BIRDEM Women and Children Hospital, Dhaka, Bangladesh.

c. Monowara Begum, Consultant, Obstetrics & Gynaecology, Consultation Chamber, Popular Diagnostic Centre, Shantinagar, Dhaka, Bangladesh.

Address of correspondence: Shahana Shermin, Registrar, Department of Obstetrics & Gynaecology, BIRDEM Women and Children Hospital, Dhaka, Bangladesh. Email: shahana.shermin@yahoo.com

Received: April 24, 2023

Revision received: August 29, 2023

Accepted: December 26, 2023

INTRODUCTION

Hysterosalpingography (HSG) is the radiographic evaluation of the uterus and fallopian tubes. It is widely used for tubal evaluation in female infertility.[1] HSG, using either a water or lipid soluble contrast media, is the traditional and standard method for evaluating tubal patency and may offer some therapeutic benefit.[2] A technique of diagnostic imaging for the evaluation of infertility should be non-invasive, less expensive, rapid, of simple execution and also be able to provide information on tubal patency and pelvic diseases. For these reasons, HSG remains a useful diagnostic investigation tool in the diagnostic work-up of infertile patients.[3]

Tubal disease is an important cause of female infertility and should be specifically excluded.[2] Prevalence of tubal abnormalities is approximately 30% in infertility while uterine abnormality is thought to be contributing factor in approximately 10% of infertile women and 50% of women with recurrent early pregnancy loss. Therefore, assessment of uterine cavity and fallopian tubes is standard practice in the baseline investigations for infertility.[4-6]

Imaging plays a vital role in the work up for infertility. Depending on clinical assessment, imaging tests often requested in the work up for an infertile woman may include ultrasonography (US), HSG, sonohystero-salpingography (SIS), hysterosalpingo contrast sonography (HyCoSy) and laparoscopy with chromopertubation.[7] It is recommended by RCOG that women who are not known to have comorbidities (such as pelvic inflammatory disease, previous ectopic pregnancy or endometriosis) should be offered HSG to screen for tubal occlusion because this is a reliable test for ruling out tubal occlusion and it is less invasive and makes more efficient use of resources than laparoscopy.[8]

Despite significant advances in new diagnostic tools like magnetic resonance imaging, hysteroscopy and laparoscopy, conventional HSG still plays an essential role in the accurate diagnosis of uterine and fallopian tube abnormalities.[4] It can document proximal and distal tubal occlusion, demonstrate salpingitis isthmica nodosa, reveal tubal architectural details of potential prognostic value and suggest the presence of fimbrial phimosis or peritubular adhesions.[2] In assessment of tubal patency the sensitivity of HSG is 93.3%, specificity is 91.1%, positive predictive value is 38% and negative predictive value is 94%.[2,9] HSG also defines the size and shape of the uterine cavity and can reveal developmental anomalies (unicornuate, septate, bicornuate uteri) or other acquired abnormalities having potential reproductive consequences.[2]

Infertility is a critical component of reproductive health and affects men and women across the globe. Worldwide, 48.5 million couples are unable to have a child, of which 19.2 million couples are unable to have a first child and 29.3 million couples are unable to have an additional child. A large portion (14.4 million) of these couples live in South Asia and a further 10.0 million are in Sub-Saharan Africa.[10] The couples have to go through not only the agony of childlessness but also too many investigations which poses a great financial burden. In a low resource setting like ours, where the burden of population over the health care system is too large, HSG comes up as an economical as well as non-invasive, still accurate tool to screen the patients not only for infertility but also various pathologies involving tubes and uterus.

In developing countries like ours with limited resources, HSG can be wisely used to investigate and even manage the women with infertility. Use of HSG in investigating infertile women may provide important information useful to the gynaecologists during treatment planning. It also provides useful information on pattern and proportion of uterine and tubal abnormalities necessary for formulating various strategies for prevention of infertility, as almost all causes of tubal blockage are preventable. The aim of this study was to review the pattern of HSG findings in patients being advised to do HSG for infertility evaluation.

METHODS

This cross-sectional observational study included 150 patients who underwent HSG at Popular Diagnostic Centre, Shantinagar, Dhaka, Bangladesh from March to October 2022. These patients were referred for this investigation from various infertility specialists and private clinics in Dhaka. The clinical data and radiological findings were tabulated and analyzed.

The HSGs were performed between the 7th and 11th day of the menstrual cycle as per recommendations.[11] Before the procedure, all patients were duly and properly counseled and a written informed consent was obtained. Water-soluble contrast media iohexol (Imiro™), containing 350 mg iodine/mL was introduced using a cannula placed in the cervical canal under aseptic conditions. Films were taken with the patient in the supine anteroposterior projection and oblique views were done when necessary. The spot films demonstrated the cervical canal, uterine cavity, fallopian tubes and peritoneal spill. On average 10 mL of contrast medium was administered for each patient and up to 20 mL was required in some of the cases where most of the dye came out through cervical os on first instance. A non-steroidal anti-inflammatory drug (NSAID) was given 20 minutes prior to the procedure to reduce discomfort and to reduce the chance of cornual spasm. All the patients were given prophylactic antibiotic.

RESULTS

HSG reports of 150 patients were analyzed. The age of the infertile women ranged between 18 and 45 years, with a mean ± SD of 28.18 ± 5.69 years. Mean age of primary subfertility group of patients was 25.23 ± 4.76 years and that of secondary subfertility was 29.25 ± 5.64 years. The 25-29 years group consisted of the highest number of patients (30.7%) evaluated by HSG in this study. The least proportion of patients were from the group of >40 years (3.3%). Majority of the patients (73.3%) were referred due to secondary infertility and 32.72% of them were from 25-29 years group (Table I). None of the patients had previously undergone HSG examination.

Patients were advised to do a number of investigations including HSG within 4-6 years of marriage in 32.7% of patients. Another 31.3% patients' duration of marriage was >10 years and majority (39.09%) of patients with secondary subfertility were in this group. The mean ±SD duration of marriage (in years) was 7.9±4.3. Duration of subfertility was 1-3 years and 4-6 years in 41.3% and 42.7% patients respectively with similar distribution in both primary and secondary subfertility patients. The mean±SD duration of subfertility (in years) was 4.4±2.8. (Table II).

Hysterosalpingography report was normal in 62% patients while among the rest of the patients 34.7% had either uterine or tubal pathology and 3.3% patients had abnormalities in both uterus and fallopian tubes. Among the patients with primary subfertility, 25% had abnormal HSG findings while it was 42.73% in the patients with secondary subfertility. The commonest abnormality reported was bilateral tubal blockade in 19 patients, 4 in primary subfertility and 15 in secondary subfertility patients. Other abnormalities were unilateral tubal blockade either left or right and different uterine anomalies. Uterine abnormalities were observed in 8.70% patients and arcuate uterus was the commonest finding. (Table III)

Table I. Age distribution of patients (N=150)

Age range(years)	Frequency (%)	Primary subfertility (n=40)	Secondary subfertility (n=110)
<20	7 (4.7%)	3 (7.50%)	4 (3.63%)
20-24	36 (24.0%)	17 (42.50%)	19 (17.27%)
25-29	46 (30.7%)	10 (25.0%)	36 (32.72%)
30-34	38 (25.3%)	9 (22.50%)	29 (26.36%)
35-39	18 (12.0%)	1 (2.50%)	17 (42.50%)
≥40	5 (3.3%)	0	5 (4.54%)

Table II. Distribution of patient according to duration of marriage and duration of subfertility (N=150)

Variable	Frequency (%)	Primary subfertility (n=40)	Secondary subfertility (n=110)	Normal findings (n=93)	Abnormal findings (n=57)
Duration of marriage (years)					
1-3	19 (12.7%)	11 (27.5%)	8 (7.27%)	14	5
4-6	49 (32.7%)	21 (52.5%)	28 (25.45%)	29	20
7-9	35 (23.3%)	4 (10%)	31 (28.18%)	22	13
≥10	47 (31.3%)	4 (10%)	43 (39.09%)	28	19
Duration of subfertility (years)					
1-3	62 (41.3%)	16 (40%)	46 (41.81%)	39	23
4-6	64 (42.7%)	18 (45%)	46 (41.81%)	38	26
7-9	13 (8.7%)	3 (7.5%)	10 (9.09%)	10	3
≥10	11 (7.3%)	3 (7.5%)	8 (7.27%)	6	5

Table III. Distribution of tubal and uterine findings at HSG (N=150)

Findings	Frequency (%)	Primary subfertility (n=40)	Secondary subfertility (n=110)
Normal findings	93 (62%)	30 (75%)	63 (57.27%)
Abnormal findings	57 (38%)	10 (25%)	47 (42.73%)
Tubal findings			
Both tubes patent	100 (66.70%)	31 (77.50%)	69 (62.72%)
Bilateral tubal block	19 (12.70%)	4 (10%)	15 (13.63%)
Left tubal block	17 (11.30%)	3 (7.50%)	14 (12.72%)
Right tubal block	14 (9.30%)	2 (5%)	12 (10.90%)
Uterine findings			
Normal findings	137 (91.30%)	37 (92.50%)	100 (90.90%)
Unicornuate uterus	3 (2.0%)	2 (5%)	1 (0.90%)
Bicornuate uterus	2 (1.30%)	0	2 (1.81%)
Arcuate uterus	7 (4.70%)	1 (2.50%)	6 (5.45%)
Asherman syndrome	1 (0.70%)	0	1 (0.90%)

DISCUSSION

In this study HSG reports of 150 patients were analyzed. The mean age of the infertile women was 28.18 ± 5.69 years and the 25-29 years group consisted of the highest number of patients (30.7%) with similar trend in both the primary and secondary infertility groups. This finding is supported by studies done previously in our country by Khan et al.[12], Haque et al.[13] and Nahar et al.[14] and abroad by Poonam[15], Kiguli-Malwadde et al.[16], Kiridi et al.[17] and Haider et al.[18] Mean age of primary subfertility group of patients was 25.23 ± 4.76 years and that of secondary subfertility was 29.25 ± 5.64 years. These were 30 years and 35 years respectively in a study by Aziz et al.[19]

Majority of the patients (73.3%) were referred due to secondary infertility. This result is in agreement with Khan et al.[12] who reported it to be 60% in a study conducted earlier in Bangladesh. The figures were almost similar in studies conducted in India, Nepal and Pakistan whereas it was much higher in African population.[4,5,16,17,19-24] This outcome is also consistent with the observation that secondary infertility in women is of higher prevalence in developing countries than primary infertility while the opposite is true for developed ones. It is suggested that the higher prevalence of secondary infertility in these developing countries is attributed to post-abortal sepsis, puerperal sepsis and pelvic inflammatory disease (PID) resulting from sexually transmitted infections (STI) especially.[23,25]

In our study, the HSG was normal in 62% women. It is in common to a study by Bello[22] where normal examination was noted in 60% cases. In studies conducted in our neighbouring countries of South Asia region 48 to 70% cases were reported to have normal uterine cavity and free peritoneal spill on both sides.[15,26,27] The range of normal findings in patients with infertility was much low (16.6-60%) for women in African countries as tubal blockage due to PID is very high in their population.[5,16,17,20,22,28,29] We found normal HSG reports more (75%) in primary infertility (vs. 57.27% in secondary subfertility). Aziz et al.[18] also had similar observation that most of the patients with primary infertility had normal HSG examination suggesting the reason being other than physical.

In this study mean duration of infertility among the studied women was 4.4±2.8 years which is almost similar to the findings of others.[12,14,15,30] A total of 84% of the cases reported at the infertility centre within 1-6 years and most of the abnormal findings were also in this group which differs from an earlier study by Kabala et al. where majority of patients who had longer duration of infertility, between 7 to > 10 years, showed significant

maximum number of abnormalities (73%).[31] This long duration in their study could be due to hesitancy of patients in seeking early advice, unawareness of the importance of early treatment among the infertile couple or in some cases financial restrain in some of the African countries.

In some studies, tubal block was the commonest reason in primary infertility which might be a reflection of high prevalence of PID and especially tuberculosis in the studied population.[27,32] The tubal factor is reported to account for 25-35% of subfertility in the western medical literature but Patil mentioned the prevalence appears to be higher in India due to the higher rates of unrecognized PID and tuberculosis.[25] The scenario is not much different in our country. In this study tubal abnormality (blockage, unilateral or bilateral) was found to be the most common cause of infertility. The commonest abnormality reported was bilateral tubal blockade in total 19 patients which is 12.70% of the study population. Other abnormalities were unilateral tubal blockade either left or right and different uterine anomalies. This is similar to other reports.[4,5,12,17,18,21,26,29,31,33] In some other studies one side tubal blocks were more commoner than bilateral tubal blocks.[5,19,26,34]

Bilateral tubal block was present in 4 patients with primary subfertility and in 15 patients with secondary subfertility, which were 10% and 13.63% of the respective groups. It must be mentioned that spasm could have accounted for some of the tubal blockages. Bilateral or unilateral hydrosalpinx which also recorded a prevalence of 13.4%, together with tubal blockage which is a tubal factor, accounted for 57% of the abnormal findings in a study done in Ghana and these findings are a reflection of high prevalence rate of pelvic inflammatory diseases in Ghana.[4] Fatima et al.[35] reported that a large percentage (40%) of their studied patients presented with tubal block in secondary infertility while 8.75% in the primary infertility cases. The frequencies of tubal obstruction were about 19% in women with primary infertility and 29% in secondary infertility in another study.[36] In a study by Shrivastava et al.[37]incidence of tubal blockage in both primary (19.1%) and secondary subfertilty (18.7%) was almost same, in contrary to previous belief and it also differs with our study.

Uterine abnormalities were observed in 8.70% patients with Mullerian anomalies constituting 8% of it and arcuate uterus was the commonest finding (4.70%) in this study. In the study by Poonam et al. maximum number of patients had hypoplastic uterus (52.38%) followed by bicornuate uterus. Unicornuate and arcuate uterus accounted for 9.52% each.[15] Congenital uterine anomalies such as unicornuate, bicornuate, septate and arcuate uterus were observed in 5.04% of patients in another study.[26] Commonest abnormality found in a study by Buker et al. was bicornuate uterus (4%). This is similar to few other reports from Nigeria.[20,38] Mullerian defect was present in 7.50% and 8.16% of primary and secondary infertility patients. This was 3.2% and 2.0% of cases in another study.[37]

In this study only 1 (0.70%) patient had Asherman syndrome or uterine synechia on HSG. Botwe et al.[4] reported 0.8% patients with uterine synechiae but these were quite high in the studies done by Kiridi et al.[17] and Bukar et al.[20], 19.0% and 12.9% respectively which were also in PID prevalent countries of Africa.

Hysterosalpingography revealed either uterine or tubal pathology in over one-third of patients and 3.3% patients had abnormalities in both uterus and fallopian tubes. Uterine abnormalities were detected in less than one in ten of study subjects. Hysterosalpingography is very important in the initial diagnostic assessment of female infertility.

Authors' contribution: SS designed the study, prepared, reviewed and drafted the manuscript. SS did literature search SF and AN helped in data collection and reviewed manuscript. MB helped in patient selection and performing procedures. All authors read and approved final manuscript to be submitted.

Consent: Informed written consent was taken from the patients regarding their involvement in this scientific work. Ethical clearance was obtained from the authority of Popular Diagnostic Centre, Shantinagar, Dhaka.

Funding: None.

Conflicts of interest: Nothing to declare.

REFERENCES

1. Simpson WL Jr, Beitia LG, Mester J. Hysterosalpingography: A reemerging study. RadioGraphics 2006;26(2):419-31.

2. Practice Committee of the American Society for Reproductive Medicine. Diagnostic evaluation of the infertile female: A committee opinion. Fertil Steril 2015;103:e44-e50.

3. Capobianco G, Crivelli P, Piredda N, Maiore M, Cherchi PL, Dessole M, et al. Hysterosalpingography in infertility investigation protocol: Is it still useful? Clin Exp Obstet Gynecol 2015;42(4):448-51.

4. Botwe BO, Bamfo-Quaicoe K, Hunu E, Anim-Sampong S. Hysterosalpingographic findings among ghanaian women undergoing infertility work-up: A study at the Korle-Bu Teaching Hospital. Fertility Research and Practice 2015;1(9). DOI: 10.1186/s40738-015-0001-6.

5. Danfulani M, Mohammed MS, Ahmed SS, Haruna YG. Hysterosalphingographic findings in women with infertility in Sokoto North Western Nigeria. Afr J Med Health Sci 2014;13(1):19-23.

6. Gulekli B, Child TJ, Tan SL. Initial investigation of the patient female and male. In: Gardner DK, Weissman A, Howles CM, Shoham Z, editors. Textbook of Assisted Reproductive Technologies: Laboratory and Clinical Perspectives. USA: CRC Press; 2008. p.464.

7. Williams C, Giannopoulos T, Sherriff EA. ACP best practice no 170. Investigation of infertility with emphasis on laboratory testing and with reference to radiological imaging. J Clin Pathol 2003;56:261-7.

8. www.nice.org.uk [Internet]. Fertility problems: assessment and treatment. NICE Guidelines [CG156]. 2013 February [reviewed 2015 March; cited 2016 Jan 22]. Available from: https://www.nice.org.uk/guidance/CG156.

9. Jain P, Bansal D, Deodhar P. Re-emerging role of HSG Vs laparoscopy for infertility work-up at rural hospital set up. J Res Med Den Sci 2015;3(4):487-9.

10. Mascarenhas MN, Flaxman SR, Boerma T, Vanderpoel S, Stevens GA. National, regional, and global trends in infertility prevalence since 1990: A systematic analysis of 277 health surveys. PLoS Med 2012; 9(12):e1001356.

11. Chalazonitis A, Tzovara I, Laspas F, Porfyridis P, Ptohis N, Tsimitselis G. Hysterosalpingography: Technique and applications. Curr Probl Diagn Radiol 2009;38(5):199-205.

12. Khan MI, Jesmin S, Jerin J, Shermin S, Chowdhury TA. Hysterosalpingography in infertility. Delta Med Col J 2014;2(1):9-12.

13. Haque S. Role of hysterosalpingography for evaluation of infertility. Bangladesh Medical Journal 2010;39(1):16-23.

14. Nahar S, Jahan D, Akter N, Das B. Laparoscopic evaluation of tubo-peritoneal causes of infertility. Bang Med J Khulna 2013;46:16-20.

15. Poonam. The role hysterosalpingography in cases of subfertility. Kathmandu University Medical Journal 2007;5(4):456-60.

16. Kiguli-Malwadde E, Byanyima RK. Structural findings at hysterosalpingography in patients with infertility at two private clinics in Kampala, Uganda. Afr Health Sci 2004;4(3):178-81.

17. Kiridi EK, Ibrahim IA, Lawani L. Hysterosalpingography: Still relevant in the evaluation of infertility in the Niger Delta. Int J Med Biomed Res 2015;4(1):50-4.

18. Haider G, Rani S, Talpur S, Zehra N, Munir A. Laparoscopic evaluation of female infertility. J Ayub Med Coll Abbottabad 2010;22(1):136-8.

19. Aziz MU, Anwar S, Mahmood S. Hysterosalpingographic evaluation of primary and secondary infertility. Pak J Med Sci 2015;31(5):1188-91.

20. Bukar M, Mustapha Z, Takai UI, Tahir A. Hysterosalpingographic findings in infertile women: A seven year review. Niger J Clin Pract 2011;14:168-70.

21. Eze CU, Ohagwu CC, Abonyi LC, Njoku J, Irurhe NK, Igbinedion FO. A spectrum of hysterosalpingographic findings in infertile women in Benin City, Nigeria. J Reprod & Infertility 2013;4(2):13-8.

22. Bello TO. Tubal abnormalities on hysterosalpingography in primary and secondary infertility. West Afr J Med 2006;25(2):130-3.

23. Dhont N, Luchters S, Muvunyi C, Vyankandondera J, Naeyer DL, Wijgert JVD. The risk factor profile of women with secondary infertility: An unmatched case-control in Kigali, Rwanda. BMC Womens Health 2011;11:32.

24. Ibekwe PC, Udensi AM, Imo AO. Hysterosalpingographic findings in patients with infertility in South eastern Nigeria. Niger J Med 2010;19:165-7.

25. Patil M. Assessing tubal damage. J Jum Reprod Sci 2009;2:2-11.

26. Nirwan LK. Hysterosalpingogram (HSG): Reemerging study in digital fluoroscopy. Poster No.: C-2278. Congress: ECR 2013. DOI: 10.1594/ecr2013/C-2278Results.

27. Bano K, Abbasi FY, Liaquat N. Structural findings on hysterosalpingography in primary infertility. JSOGP 2015;5(3):151-55.

28. Kitilla T. Hysterosalpingography in the evaluation of infertility: A four-year review. Ethiop Med J 2010;48(4):267-75.

29. Bacevac J, Ganoviæ R. Diagnostic value of hysterosalpingography in examination of fallopian tubes in infertile women. Srp Arh Celok Lek 2001;129(1-2):18-21.

30. Kumar S, Awasthi RT, Gokhale N. Assessment of uterine factor in infertile women: Hysterosalpingography vs hysteroscopy. MJAFI 2003;60(1):39-41.

31. Kabala RB. Imaging findings in infertile female patients who underwent hysterosalpingography investigation at Muhimbili National Hospital [dissertation]. Tanzania: Muhimbili University of Health and Allied Sciences; 2011.

32. Kenal P, Sharma S. Study of primary infertility in females by diagnostic laparoscopy. I J Medical 2006;1(2):7-9.

33. Kulshrestha V, Kriplani A, Agarwal N, Singh UB, Rana T. Genital tuberculosis among infertile women and fertility outcome after antitubercular therapy. International Journal of Gynecology and Obstetrics 2011;113(3):229-34.

34. Gokhan G, Gamze Y, Oznur G, Isin K, Lale W, Birol D. Hysterosalpingography, laparascopy or both in the diagnosis of tubal disease in infertility. World Journal of Laparascopic Surgery 2008:1(2):23-26.

35. Fatima Y, Asghar M. Hysterosalpingographic based diagnosis of tubo-ovarian pathologies in infertility. Gomal Journal of Medical Sciences 2012;10(1):46-49.

36. Al Subhi T, Al Jashnmi RN, Al Khaduri M, Vaidyanathan G. Prevalence of tubal obstruction in the hysterosalpingogram of women with primary and secondary infertility. Journal of Reproduction & Infertility 2013;14(4):214-16.

37. Shrivastava VR, Rijal B, Shrestha A, Shrestha HK, Tuladhar AS. Detection of tubal abnormalities by HSG in Nepalese subfertile women. Nepal Med Coll J 2009 Mar;11(1):42-45.

38. Mgbor SO. Pattern of hysterosalphingographic findings in gynaecological patients in Enugu. Niger Med J 2006;47:14-16.