Objective: The objective of this study is to analyze the role of diagnostic hysterolaparoscopy (DHL) for evaluation of infertility in a tertiary care hospital.

Materials and Methods: This retrospective study was conducted from July 2014 to June 2016. Results: Out of 151 patients, 58.28% and 41.72% had primary and secondary infertility, respectively. In primary infertility group 37.5% and in secondary infertility group 49.2% had abnormal findings. Most common finding was adnexal adhesions (pelvic inflammatory disease) and laparoscopic findings were more common than the hysteroscopic ones. Conclusion: DHL was helpful in finding some reversible causes of infertility such as adnexal adhesions, tubal blockage, and uterine synechiae, etc.

Keywords: Hysterolaparoscopy, infertility, tubal blockage
In our study for inclusion, as per definition, minimum 1 year of infertility was taken into account. That means, for primary infertility, inability to conceive after minimum of 1 year of unprotected sexual intercourse and for secondary infertility, the same duration and criteria after previous obstetrical event. Hence, the minimum period of infertility was 1 year. However, in our study, there was no upper limit of duration of infertility. Patients with abnormal hysterosalpingogram were also included in the study irrespective of the presence or absence of another male or female known etiology of infertility. It is an established fact that hysterosalpingography (HSG) gives false-positive result of bilateral tubal block due to reflex spasm of the uterine cornu after injection of the dye. We can overcome this fallacy by performing chromopertubation (CPT) where we have additional benefit of performing cannulation (although this was not included in study outcome). Therefore, in our institute, it is a routine protocol to perform DHL and CPT in a diagnosed case of tubal block by HSG. The patients with abnormal HSG findings (unilateral or bilateral tubal block and uterine anomaly) were included and confirmed by DHL. However, we did not compare the finding of HSG with that of DHL in our study.

Endocrine disorder causing chronic anovulation or oligoovulation such as polycystic ovarian syndrome, hyperprolactinemia, thyroid disorder, etc., was excluded from the study. Couples with abnormalities in semen analysis were also excluded. Patients having any relative and absolute contraindication to laparoscopy were also excluded. DHL with CPT was performed in the preovulatory (day 6–12 of menstrual cycle). Transvaginal sonography before DHL was not performed routinely. If at all performed, it was mainly to evaluate the antral follicular count. All the patients were selected based on abnormal HSG report (tubal block, hydrosalpinx, and uterine anomaly).

DHL was performed in the preovulatory period between days 6 and 11 of the cycle under general anesthesia using a 7 mm Karl Storz laparoscope with a 30° deflection angle telescope. First, hysteroscopy was performed-vagina and cervix were examined for any abnormality (growth, polyp etc.), uterine cavity was examined for the presence of septum, any congenital malformation, fibrotic bands or synechiae, polyps, fibroid, and condition of the endometrium. Both the tubal ostia were visualized and looked for patency.

Pneumoperitoneum was created, and laparoscopy was performed and the following structures were carefully examined for any abnormality-fallopian tubes, ovaries, pelvic peritoneum, pouch of Douglas, and peritoneal cavity. On laparoscopy, pelvic cavity and organs were inspected. Uterus was inspected for its shape, size, position, surface, and presence of fibroid. Cul-de-sac was examined for any adhesions, obliteration, endometriotic nodules or fluid. Ovaries were viewed for size, shape, surface, color, presence of cysts, and relation with tubes. Fallopian tubes were inspected carefully for size, shape, surface, kinking, dilatation, stricture or hydrosalpinx. Any features suggestive of infertility were looked for.

At last, CPT was performed to check for testing tubal patency on both the sides. Methylene blue dye was injected with a 20 ml syringe through Leech Wilkinson cannula or a 14F foley’s catheter inserted in the uterine cavity (the catheter bulb inflated with 5 ml of normal saline). Spillage of the dye from the fimbrial end of tube visualized.

Statistical analysis was performed using SPSS (IBM Corp.SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.) software version 16. Student’s t-test and Chi-square test were performed for comparison of continuous variable and proportions, respectively.

**Results**

A total number of 151 patients underwent DHL out of which 88 (58.28%) suffered from primary infertility and 63 (41.72%) suffered from secondary infertility. The mean age of patients with primary infertility was 27.2 ± 2.6 years while the mean age of secondary infertility group were 32.4 ± 2.2 years. The mean duration of infertility in primary and secondary infertility was 5.1 ± 2.2 years and 4.9 ± 2.7 years, respectively, which was not statistically significant [Table 1].

In the primary infertility group, 17 patients gave a history of dyspareunia and in the secondary infertility group, 11 patients gave similar history. In the primary infertility group, two patients were underweight, seven patients were overweight, 11 were obese, and the rest had normal body mass index [Table 2]. In the secondary infertility group, one patient was underweight, nine patients were overweight, 13 were obese, and the rest had normal body mass index [Table 2]. Among the primary infertility group, 22 had history of the previous ovulation induction and 9 had history of intrauterine insemination [Table 3]. Among the secondary infertility group, 17 had history of previous ovulation induction and 11 had history of intrauterine insemination [Table 3]. None of the patients had undergone *in vitro* fertilization (IVF) in the past.

In both primary and secondary infertility patients, laparoscopic abnormalities (37.5% and 49.2%) were more common than the hysteroscopic ones (7.95% and 14.29%) [Table 4]. In both, the groups laparoscopic...
abnormalities were significant. Thirteen patients belonging to primary infertility group and 5 in secondary infertility had more than one abnormal finding during DHL. The most common abnormalities found during laparoscopy in both the primary and secondary infertility group were features of PID (adnexal adhesion and hydrosalpinx) [Table 5]. Six patients in primary and three in secondary infertility had findings suggestive of tuberculosis, for example, caseous material in pelvis and visible tubercles on fallopian tubes and pelvic serosa (tuberculosis was confirmed later on by polymerase chain reaction). The most common abnormality in hysteroscopy was uterine synechiae [Table 6]. One patient in primary infertility group had cervical stenosis and one patient with secondary infertility had arcuate uterus. Tubal block was more common in primary than secondary infertility [Table 7]. Bilateral block was more common than the unilateral one.

Patients did not suffer from any major complication during or after the procedure. Mild abdominal pain in the perioperative site was the only complaint.

**Discussion**

Infertility is a serious problem to the couple and brings about family unhappiness and mental trauma and is a matter of financial burden. Among female factor infertility, the most common cause is tuboperitoneal pathology accounting for 30%–35% cases,[4] followed by ovulatory dysfunction (20%–30% cases) and uterine pathology (15% cases).[5] The gold standard for evaluating tuboperitoneal pathology is laparoscopy.[6] In our study, pelvic adhesion and hydrosalpinx were the two most common tubopelvic pathologies as seen in laparoscopy. Adnexal adhesion is an established feature of PID.[7] The important etiologies of hydrosalpinx are PID and pelvic tuberculosis.[8] It is a proven fact that hydrosalpinx is associated with infertility and even poor IVF outcome.[9] Now, the prevalence of PID in India ranges from 1% to 17%.[10] Even subclinical PID is substantially associated with infertility and women with subclinical PID achieved 40% less pregnancies compared to women without the same.[11] Tubal factor infertility is the foremost reason of infertility among female patients, the majority of which is due to PID.[12] In our study, apart from hydrosalpinx, few other features such as caseous material in the pelvis, pouch of douglas, and tubercles on the tubes or pelvic serosa were present. The prevalence of genital tract TB in female ranges from 1% to 19% depending on the

| Table 1: Duration of infertility |
|---------------------------------|
|                                | Primary infertility | Secondary infertility |
| Mean duration of infertility (years) | 5.1±2.2            | 4.9±2.7            |

| Table 2: Body mass index (BMI) |
|---------------------------------|
| BMI | Primary infertility | Secondary infertility |
|-----|---------------------|-----------------------|
| <18.5 | 2               | 1                    |
| 18.5-24.9 | 68              | 40                   |
| 25-29.9 | 7               | 9                    |
| >30     | 11              | 13                   |
| BMI=Body mass index |

| Table 3: Previous treatment history |
|-----------------------------------|
|                                | Primary infertility | Secondary infertility |
| Ovulation induction | 22               | 7                     |
| IUI | 9               | 11                    |
| IVF | 0               | 0                     |
| IUI=Intrauterine insemination, IVF=In vitro fertilization |

| Table 4: Prevalence of hysteroscopic and laparoscopic abnormalities |
|------------------------------------------------------------------|
| Procedure             | Primary infertility (88) | Abnormal (%) | Secondary infertility (63) | Abnormal (%) |
|-----------------------|--------------------------|--------------|---------------------------|--------------|
| Laparoscopy           | 55 (62.5)                | 33 (37.5)    | 32 (50.8)                 | 31 (49.2)    |
| Hysteroscopy          | 81 (92.05)               | 7 (7.95)     | 54 (85.71)               | 9 (14.29)    |
| Total                 | 136 (77.27)              | 40 (27.73)   | 86 (63.25)               | 40 (31.75)   |

| Table 5: Laparoscopy findings |
|-------------------------------|
| Findings | Primary infertility (88) (%) | Secondary infertility (63) (%) | Total (151) (%) |
|----------|-------------------------------|-------------------------------|----------------|
| Fibroid  | 7 (7.95)                      | 3 (4.8)                       | 10 (6.6)       |
| Endometriosis | 8 (9)                        | 6 (9.6)                       | 14 (9.3)       |
| Adnexal adhesion       | 18 (20.45)                   | 14 (22.22)                    | 32 (21.2)      |
| Hydrosalpinx           | 15 (17.05)                   | 10 (15.9)                     | 25 (16.6)      |
| Tubal pathology        | 3 (3.4)                      | 4 (6.35)                      | 7 (4.6)        |
| Ovarian pathology      | 9 (10.23)                    | 11 (17.47)                    | 20 (13.2)      |
| Uterine anomaly        | 2 (2.3)                      | 0                             | 2 (1.3)        |
| Others                | 6 (6.8)                      | 3 (4.8)                       | 9 (6)          |
It is an established fact that unlike
In addition,
It is estimated that around 30%–50% patients
In our study,
In our study, 6% patients during laparoscopy and
In our study, overall 9.3% patients had findings of
Pritts et al. concluded that submucosal fibroids (International Federation of Gynecology and Obstetrics [FIGO] L0–L2) which cause distortion of the uterine cavity resulted in the decreased rates of clinical pregnancy, implantation, and ongoing pregnancy/live birth, as well as an increased rate of spontaneous miscarriage. The review by Pritts et al. also concluded that women with fibroids with no submucosal involvement, i.e., pure intramural fibroids (FIGO L3–L4), had decreased rates of implantation and ongoing pregnancy/live birth, and an increased rate of spontaneous miscarriage when compared with controls without fibroids. In addition, there was no evidence to suggest that subserosal (FIGO L5–L7) fibroids decreased any measure of fertility.

The prevalence of uterine anomaly in infertility patient is 8%, the foremost reason being septate uterus. Arcuate uterus is most common in the population without any high risk, and its prevalence is not increased in high-risk groups, for example, having infertility. In our study, 1.3% patients in laparoscopy and 1.99% patients during hysteroscopy were found to have uterine anomaly, the majority being septate and arcuate uterus.

Intrauterine adhesions (Asherman syndrome) are a rare but significant cause of menstrual disturbance and infertility. It is an established fact that unlike developed countries genital tuberculosis is an important cause of Asherman syndrome in India. In our study, the most common finding in hysteroscopy was intrauterine adhesions.

In our study, 17.9% patients had unilateral tubal block whereas 37.7% patients had bilateral tubal block. Our hospital is a tertiary one and majority of the patients are referred here with already diagnosed tubal block on hysterosalpingogram. That can explain the high prevalence of tubal block on chromoperturbation in our study.

Postoperarative period was uneventful for most of the patients. Mild postoperative pain was the only minor complaint which could be controlled with mild analgesics. No hemorrhagic or infective complications were seen during or after the procedure.

**CONCLUSION**

Reversible causes of infertility such as adnexal adhesions, tubal blockade, uterine synechiae, etc., can easily be diagnosed and treated by hysterolaparoscopy. However, in the era of advanced ultrasound, in developing countries diagnostic hysterolaparoscopy may still offer some hope to the infertile couple.

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**Conflicts of interest**
There are no conflicts of interest.

**REFERENCES**

1. Boivin J, Bunting L, Collins JA, Nygren KG. International estimates of infertility prevalence and treatment-seeking: Potential need and demand for infertility medical care. Hum Reprod 2007;22:1506-12.
2. Infecundity, Infertility, and Childlessness in Developing Countries. DHS Comparative Reports No. 9. Calverton, Maryland, USA: ORC Macro and the World Health Organization; 2004.
3. Ombelet W, Cooke I, Dyer S, Serour G, Devroey P. Infertility and the provision of infertility medical services in developing countries. Hum Reprod Update 2008;14:605-21.
4. Miller JH, Weinberg RK, Canino NL, Klein NA, Soules MR. The pattern of infertility diagnoses in women of advanced reproductive age. Am J Obstet Gynecol 1999;181:952-7.
5. Wallach EE. The uterine factor in infertility. Fertil Steril 1972;23:138-58.
6. Mol BW, Collins JA, Burrows EA, van der Veen F, Bossuyt PM. Comparison of hysterosalpingography and laparoscopy in predicting fertility outcome. Hum Reprod 1999;14:1237-42.

7. Molander P, Finne P, Sjöberg J, Sellors J, Paavonen J. Observer agreement with laparoscopic diagnosis of pelvic inflammatory disease using photographs. Obstet Gynecol 2003;101:875-80.

8. Boukaidi SA, Delotte J, Steyaert H, Valla JS, Sattonet C, Bouaziz J, et al. Thirteen cases of isolated tubal torsions associated with hydrosalpinx in children and adolescents, proposal for conservative management: Retrospective review and literature survey. J Pediatr Surg 2011;46:1425-31.

9. Harb H, Al-Rshoud F, Coomarasamy A. The effect of presence and management of hydrosalpinx on miscarriage in IVF. Fertil Steril 2014;102:298.

10. Latha K, Kanani SJ, Maitra N. Prevalence of clinically detectable gynaecological morbidity in India: Results of four community based studies. J Fam Welf 1997;43:8-16.

11. Wiesenfeld HC, Hillier SL, Meyn LA, Amortegui AJ, Sweet RL. Subclinical pelvic inflammatory disease and infertility. Obstet Gynecol 2012;120:37-43.

12. Centers for Disease Control and Prevention, American Society for Reproductive Medicine, Society for Assisted Reproductive Technology. 2007 Assisted Reproductive Technology Success Rates: National Summary and Fertility Clinic Reports. Atlanta (GA): U.S. Department of Health and Human Services, Centers for Disease Control and Prevention; 2009.

13. Varma TR. Genital tuberculosis and subsequent fertility. Int J Gynaecol Obstet 1991;35:1-1.

14. Gupta N, Sharma JB, Mittal S, Singh N, Misra R, Kukreja M, et al. Genital tuberculosis in Indian infertility patients. Int J Gynaecol Obstet 2007;97:135-8.

15. Kennedy S, Bergqvist A, Chapron C, D’Hooghe T, Dunselman G, Greb R, et al. ESHRE guideline for the diagnosis and treatment of endometriosis. Hum Reprod 2005;20:2698-704.

16. Counsellor VS. Endometriosis. A clinical and surgical review. Am J Obstet Gynecol 1938;36:877.

17. Pritts EA, Parker WH, Olive DL. Fibroids and infertility: An updated systematic review of the evidence. Fertil Steril 2009;91:1215-23.

18. Chan YY, Jayaprakasan K, Zamora J, Thornton JG, Raine-Fenning N, Coomarasamy A, et al. The prevalence of congenital uterine anomalies in unselected and high-risk populations: A systematic review. Hum Reprod Update 2011;17:761-71.

19. Thomson AJ, Abbott JA, Deans R, Kingston A, Vancaillie TG. The management of intrauterine synechiae. Curr Opin Obstet Gynecol 2009;21:335-41.

20. Sharma JB, Roy KK, Pushparaj M, Gupta N, Jain SK, Malhotra N, et al. Genital tuberculosis: An important cause of Asherman’s syndrome in India. Arch Gynecol Obstet 2008;277:37-41.