

# Laparoscopic Evaluation of Bilateral Tubal Occlusion for Management of Infertility in Dhaka

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## Abstract

All patients undergoing diagnostic laparoscopy for primary and secondary infertility due to tubal factor at Dhaka Central International Medical College and Hospital from June 2017 to July 2018 are included. Reasons for tubal factor infertility, rates, and therapeutic procedures are investigated. Results: Seventeen (35.4

**Index terms**— laparoscopy, tubal occlusion, infertility, therapeutic procedure, management.

performed as one of the valuable tools in the infertility treatment before progressing to infertility cures [4,5]. Generally, the occurrence of infertility is predicted to be 10%-15% amongst young couples [6][7]. Ovulatory difficulties are the vital widespread reason for female infertility. In 80% of the cases, infertility usually occurs due to some conditions such as endometriosis or polycystic ovary syndrome (PCOS), while in 20% of the cases the etiology of this condition is unexplained [8]. A report published in 1997 shows that about 3%-7% of all couples have an unresolved problem of infertility. However, experiencing infertility for at least one year is reported in 12-28% of cases [9]. Due to the infertility problems and long duration of response to treatment, its correct diagnosis to provide appropriate treatment strategies is highly crucial. There are multiple techniques for the treatment of female infertility. Furthermore, identifying the etiology of infertility and its subsequent treatment does not always lead to viable pregnancy and live birth [8].

Although around 85% to 90% of healthy young couples conceive by one year of attempting and largely conceive by six months, still 10% to 15% -couples have problems conceiving and suffer infertility or subfertility [10][11]. Reproductive endocrinologist reflect a couple to be infertile when: (a) The couple has not conceived subsequently 12 months of contraceptive free intercourse (the female is less than 34 years old); (b) The couple has not conceived subsequently 6 months contraceptive free -intercourse (the female is more than 34 years old) [12,13]. The major causes of infertility include; 1. Male factors (20%-30%), 2. Female factors (40%-55%), 3. Male and female factors together (10%-40%), 4. Unexplained infertility (10%-20%) [14]. Infertility is classified into two types: 1. Primary infertility where no prior pregnancies have occurred. 2. Secondary infertility where a previous pregnancy has occurred (might not need to be a live birth). While generally, infertility rates have stayed steady in the previous 30 years in the USA, generally birth and fertility rates are decreasing owing to several social and cultural drifts: women pursuing higher education and careers, postponing marriage for men and women, delaying childbearing, more frequent divorce, and reliable contraception and family formation.

Amongst infertile couples, male infertility counts for around 35%. The reasons for male infertility evolve infertility is not being able to attain pregnancy for one year of recurrent, unshielded intercourse [1]. The basic reasons for infertility comprise ovulatory disorders (%), tubal disease (%), uterine or cervical issue and endometriosis and male infertility [1,2]. Assessment usually starts after 12 months, however, can be initiated earlier if infertility is assumed founded on history or the age of the female spouse is over 35 years [1]. Occurrence of infertility seems to be rising in developed countries for causes dissimilar from those in developing countries. Main bases according to WHO (World Health Organization) on a global basis are pelvic tuberculosis, postabortal and postpartum infections leading to tubal obstruction and undernourishment [3]. A vigilant record and physical inspection can recommend a solo or multiple etiology directing the additional study. Pelvic ultrasonography, hormonal assay, and hysterosalpingography are the initial examinations for the uterine, ovarian and tubal disease. Diagnostic laparoscopy is typically the standard procedure I from four key causes: (1) hypothalamic-pituitary disorders (1%-2%); (2) primary gonadal disorders (30%-40%); (3) disorders of sperm transport (10%-20%); and (4) idiopathic (40%-50%). Mostly male infertility is currently idiopathic giving unclear reasoning of the process

that controls testicular and sperm operation. Female infertility symbolizes nearly 65% of the causes for the infertile couple. For female infertility, disruption can happen at any cases to instigate infertility: (1) it is necessary for the ovaries to ovulate a matured oocyte on a regularly (ovarian factor); (2) the cervix has to seize and carry sperm into the uterus and fallopian tubes (cervical factor); (3) the fallopian tubes have to seize the ovulated ova and carry sperm and embryo (tubal factor); and (4) the uterus has to permit the embryo to imbed and assist regular evolution and progress (uterine factor) [15]. Tubal factor infertility owing to occlusion and peritoneal pathology initiating adhesions is the key general reason for female infertility and identified in around 30% to 35% of younger and older infertile women [15]. The most predominant reason for tubal factor infertility is pelvic inflammatory disease and severe salpingitis [16]. The important causes of female infertility are 1. Tubal factors (20%-40%), 2. Ovulatory dysfunction (20%-40%), 3. Miscellaneous causes (10%-15%) [17]. The process accountable for tubal factor infertility consists of anatomic anomalies which prevent the coalition of sperm and ovum. Proximal tubal obstructions prevent sperm from getting into the far fallopian tube where fertilization usually happens. Distal tubal occlusions inhibit ovum seize from the neighboring ovary [18].

For most infertile women with no known risk for tubal or pelvic lesions, assessment of the fallopian tubes will usually start with hysterosalpingography (HSG) followed by a diagnostic laparoscopy after six months or more [19,20]. In other cases, it allows time for treatment-independent conception or a possible fertility-enhancing effect of HSG [21]. The HSG is a valuable inspecting tool for the significant major obstruction to fertility, bilateral tubal occlusion. It is not suitable concerning adhesions or endometriosis. Laparoscopy confirms the HSG findings in approximately 80 percent of cases concerning the determination of tubal patency, but in only 45 percent of cases concerning the diagnosis of other tubal lesions [22,23]. Thus, multiple clinical supervisions sidestep HSG and progress straight to laparoscopy for accessing instantaneously the fallopian tubes and the pelvic peritoneal cavity [24]. Hysteroscopy is a technique that permits the physician to view inside the uterus for diagnosing and treating reasons of unusual bleeding.

Furthermore, hysteroscopy is implemented to reveal the basis for unsolved spotting or bleeding in post-menopausal women. It varies if it is diagnostic or operative and if an additional method (e.g., laparoscopy) executes at a similar time. In general, diagnostic hysteroscopy takes a reduced amount of time than operative [25]. The indications for laparoscopic surgery have increased widely over the last couple of years owing to its multiple benefits over laparotomy [26]. Growing numbers of gynecological surgeons have adopted a laparoscopic approach to the treatment of ectopic pregnancies (EPs), adhesions, endometriosis, hydrosalpinges, and ovarian cysts [27,28]. Laparoscopy may be utilized for Myomectomies [29].

A review of 206 infertile women undertaking laparoscopy was conducted in Israel [32]. A study performed on 115 infertile women at Fatemiyeh Teaching Hospital, Hamedan, Iran from March 2011-September 2012 showed that the comparison between HSG and LS techniques provides a significant difference in diagnosis of distal fallopian tube occlusion and unilateral fallopian tube occlusion among infertile women [35]. A study conducted on 208 medical records of infertile women at the Yaoundé General Hospital in Benin, Cameroon during December 2007 to December 2012 showed that HSG is of inadequate diagnostic significance in tubal factor infertility and little diagnostic importance in pelvic adhesions [36]. Another cross-sectional study from Hayatabad Medical Complex, Peshawar, Pakistan from January to December 2005 with 136 (70.46%) patients with primary and 57 (29.54%) with secondary infertility undertaking diagnostic laparoscopy showed that tubal disease is a common factor responsible for infertility, and diagnostic laparoscopy is a valuable technique for complete assessment of female infertility and making treatment decisions [37]. A study on 114 primary and secondary infertility patients from a tertiary health care center at Maharashtra, India showed that HSG and Laparoscopy are not alternative but approving techniques for the investigation of tubal patency in infertility [38].

A cross-sectional study with 190 couples in Bangladesh at selected fertility centers of Dhaka city (from September 2011 to March 2012) showed that

## 1 E

Amongst the United States board-certified reproductive endocrinologists 89% routinely instruct diagnostic laparoscopy for couples presenting with a primary complaint of infertility [30]. In Canada, 63% of infertile couples underwent diagnostic laparoscopy in the year in 1995 [31,32]. Results from another Canadian study of 794 participating couples from 11 clinics selected from 1 April 1984 to 31 March 1987 showed that laparoscopy functioned more suitable than HSG as a forecaster of future fertility [33]. A Belgian review analyzed the accessible proof with respect to concerning alternative diagnostic methods for detecting tuboperitoneal infertility and about the status of diagnostic laparoscopy in women infertility. In some particular clinical venues, the solid proof was found to endorse the utilization of diagnostic laparoscopy in the existing fertility procedure [34]. there are 52% cases of female factors, 13% male factors, unexplained 27% and both male and female factors lie behind 8% of cases. This study concluded that proper evaluation with details personal, medical and gynecological history of both female and male need to evaluate the cause and formulate a management plan to treat the secondary subfertile couple [39]. Another epidemiological study of 61 sub-fertile women suffering from primary and secondary subfertility, who had undergone laparoscopy at Bangladesh Medical College hospital during July 2003 to June 2004 was examined. The number of subfertility visits has increased in the last few years due to awareness for available services and option for resolving subfertility [40]. A prospective study on 100 cases of infertile patients (ages 20 to 40 years) undertaken at BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine

and Metabolic Disorders) during January 2001 to December 2001 showed that for treating infertility, appropriate importance is needed for laparoscopic valuation of pelvic organs [41]. Another study undertaken at BIRDEM (Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders) from January 2001 to December 2001 of 100 cases of infertile patients (ages 20 to 40 years) indicate that laparoscopy examination is an essential technique for assessment of tubal pathology impacting infertility and may perform a vital part in infertility supervision [42]. Results with 900 infertile women aged from 18 to 42 years undergoing infertility evaluation by laparoscopy at a private infertility clinic at Dhaka (from January 2002 and October 2004) show that 607 (67.44%) patients had primary infertility, and 293 (32.56%) had secondary infertility, 610 (67.78%) patients had normal while 390 (31.22%) had abnormalities of uterus. [43]. A study carried out amongst 50 infertile women with both primary and secondary infertility (having menstrual cycles with a duration of 25-45 days) from July 2014 to December 2014 in Shaheed Suhrawardi Medical College Hospital, Dhaka showed that the surgical remedy of minimal or mild endometriosis enhances the natural pregnancy frequency in infertility women [44].

Infertility is a main problem influencing the health of women and life quality directing to social and psychological disruptions as well as causing distress and uncertainty to numerous women. This investigation was implemented to review the various reasons of tubal factor infertility using hysteroscopy followed by diagnostic laparoscopy, and their frequency in patients with primary and secondary infertility.

## 2 II. Materials and Methods

In this investigation, the infertility patients suffering from infertility are enrolled and under treatment at the Gynecology and Obstetrics department, Dhaka Central International Medical College and Hospital (DCIMCH), Dhaka from June 2017 to July 2018. Patients affected by primary and secondary tubal factor infertility are incorporated into this investigation. The participating patients' ages spanned from 20 to 40 years. Detailed medical history is documented, and clinical examination is done before admission. Fundamental examinations are performed for fitness of anesthesia before laparoscopy.

The hysteroscopy scheduling was done with the additional procedure of Laparoscopy. These combined procedures were performed under general anesthesia by an infertility specialist surgeon (the first researcher). Patients chosen for laparoscopy were entered into the program on 18 to 21 days of their menstrual cycle. The hysteroscopy procedure takes place in the following order: The doctor dilates the cervix to allow the hysteroscope to be inserted; The hysteroscope is then inserted through the vagina and cervix to the uterus; Normal saline is injected into the uterus via the hysteroscope, to enlarge it and to clean up any blood or mucus; Afterward, a light glowed via the hysteroscope provides the doctor to see the uterus and the openings of the fallopian tubes through the uterine cavity; At the end if surgery has to be implemented, then miniature equipments are passed in the uterus through the hysteroscope. Hysteroscopy procedure can take time ranging from < 5 minutes to > hour. For laparoscopy, a 10 mm incision was made inside or just underneath the lower edge of the umbilicus. By this incision, the abdominal cavity is expanded with CO<sub>2</sub> gas, and which creates pneumoperitoneum. A trocar was placed in the same area. The cannula of the trocar was kept there while the trocar was taken out. Afterward, a laparoscope was inserted via the cannula. The abdominal cavity and pelvic were assessed in the Trendelenburg posture. A traumatic grasper forceps were utilized with the help of another trocar for superior viewing. If needed, an additional trocar was introduced.

To evaluate tubal patency, methylene blue was injected through another uterine exploiter and outcome of laparoscopy were documented by the infertility expert. For the patients, the diagnostic procedure was followed by therapeutic procedures. After diagnostic procedures Hysteroscopy, laparoscopy, and dye test the following therapeutics were implemented conferring to the patients' situation: (a) patients having PCOS went through Bilateral ovarian drilling, (b) Patients having adhesion had Adhesiolysis, and (c) those who had cysts, went through Cystectomy.

Diagnostic laparoscopy is usually a well-known method to uncover pelvic organ pathologies influencing fertility. The current research was commenced to explore the tubal pathology causing primary and secondary infertility by the laparoscopic test. This research was performed at the Gynecology and Obstetrics department, DCIMCH through June 2017 to July 2018. The information collected from the patients and the findings of laparoscopy were put together in the data sheet which was analyzed using SPSS (version 17.0). The local research Ethical Committee of DCIMCH approved the study protocol. The participants gave their consent before enrollment. Guarantee was given to the participants that their data material would be retained privately.

Demographic features were gathered from the interview utilizing a systematized questionnaire form. Results of hysteroscopy and laparoscopy were documented. The characteristics taken for the demographics are age (20-24, 25-29, 30-34, and 35-39) years. For general examination are the indication (primary, secondary infertility, others), anesthesia (G/A or others). For Hysteroscopy findings the characteristics are uterine cavity (well visualized, Septum, Synechia), right tubal opening (visualized, partially blocked, blocked), left tubal opening (visualized, partially blocked, blocked). In laparoscopy findings the characteristics are Uterus size (N/S normal size), bulky, smaller than normal), Uterus position (A/V (anteverted), R/V (retroverted)), Mobility (mobile, restricted), POD (Pouch of Douglas)(free, obliterated), Tubes appearance (apparently healthy, not visualized, others), Dye test (Lt side -ve, Rt side -ve, Lt side -ve, Rt side +ve, Lt side + ve, Rt side +ve, Lt side + ve, Rt sideve), Ovary appearance

(healthy, polycystic/pearly white appearance, Cyst (chocolate/parovarian)). Also Ovary size (normal, enlarged), Sign of ovulation (present, absent), Therapeutic procedure (bilateral ovarian drilling, adhesiolysis, cystectomy).

### 3 III. Results

The project consisted of 48 infertile patients aged from 20-40 years. The patient age was highest for 25-29 years total 19 (39.6%). As from the result, 17 (35.4%) patients had primary infertility, and 29 (60.4%) patients had secondary infertility. for only 34 of the patients, uterine cavity can be observed. Amongst them, 30 (88.2%) had well visualized uterine cavity while rest of the patients had septum 2 (5.9%) and Synechia 2 (5.9%). Size of the uterus was normal in 35 (72.9%), bulky in 8 (16.7%) and smaller than normal size found in 5 (10.4%) cases. Uterus position was A/V (anteverted) 43 (89.6%) and R/V (retroverted) for 5 (10.4%) cases. For mobility, it was mobile in 46 (95.8%) and restricted in only 2 (4.2%) cases. POD (Pouch of Douglas) was free for 47 (97.9%) while obliterated for only 1 (2.1%) case. Tubes appearance looked healthy in 37 (77.1%), not visualized in 7 (14.6%) while other types were 4 (8.3%) cases. Dye test gave the highest for Left side positive, Right side positive totaling 22 (45.8%) out of 48 patients. Bilateral tubal opening for both the left and the right tube was visualized for 26 (76.5%), partially blocked for 6 (17.6%) and blocked/occlusion for 2 (5.9%) cases. Ovary appeared healthy for 17 (35.4%), polycystic/pearly white appearance for 18 (37.5%), and cyst (chocolate / parovarian) for 13 (27.1%) of cases. The ovary size was normal for 25 (52.1%), enlarged 21 (43.8%), and smaller than normal for 2 (4.2%) of cases. Sign of ovulation present in 32 (66.7%) and absent in 16 (33.3%) of cases. Therapeutic procedures followed were: Bilateral ovarian drilling 28 (58.3%), Adhesiolysis 11 (22.9%), Cystectomy 5 (10.4%), Drilling and Adhesiolysis combined 2 (4.2%), and Cystectomy and Adhesiolysis combined was performed for 2 (4.2%) cases. General anesthesia was given to all patients. With hysteroscopy, complications can happen (< 1% cases): dangers related to anesthesia, infection, heavy bleeding, injury (to the cervix bladder, uterus or bowel), intrauterine scarring, reaction to the substance used to expand the uterus [45][46]. The laparoscopic method gives significant advantages to the patient, e.g., reduced incision size and ordeal with lesser postoperative distress, reduced recovery frequency, and a reduced rate of postoperative wound infections. The laparoscopic method decreases operation of the bowel and peritoneum, causing reduced incidence of postoperative illness. Therefore, intake can be resumed more rapidly than with open surgical techniques, limiting requirements for IV fluid regimes which are associated with tissue edema, modest wound restoration, and lengthier postoperative revival. Secondly, since minor access points are needed for the insertion of laparoscopic trocars, enormous incisions similarly found in open methods are shunned, thus reducing difficulties related to postoperative pain and wound healing. As laparoscopic techniques have evolved, the quantity of port sites needed has been decreased, with single-port surgery currently a feasible possibility. These factors contribute to the lesser occurrence of the wound and systemic infections revealed following laparoscopic surgical procedure. Laparoscopy is beneficial in overweight patients where open methods could be technologically very problematic and for those that are especially invulnerable to wound infections after an operation. Other types of patients to gain assistance from a laparoscopic technique are those having an acute respiratory illness as the postoperative deterioration in respiratory procedure that can happen following large incisions. All these features provided briefer in-patient stay and decreased perioperative illness. Also, many chief procedures that once required prolonged postoperative recovery (e.g., anterior resection of the rectum or radical cystectomy) are currently achieved more by laparoscopic methods to progress patient outcomes. Benefits involve the probability to implement diagnosis and therapy together, and the scope to merge the laparoscopy with the hysteroscopic evaluation of the uterine cavity with an endometrial biopsy, together as a day-care surgical procedure.

Risk factors and disadvantages: Laparoscopic surgery can have hazards related to unique laparoscopic methods or owing to the physiological variations linked to the creation of a pneumoperitoneum. Risk factors include surgery four hour duration, beefy lower limbs, obesity, peripheral vascular disease, hypotension, and steep Trendelenburg positioning [47]. Disadvantages of diagnostic laparoscopy include the need for general anesthesia, patient's anxiety, port infection and the possibility of adhesion formation. In a large Finnish followup study, the complication rate of diagnostic laparoscopy was 0.6 per 1000 procedures [34].

Laparoscopic surgery involves blowing of gas (mostly CO<sub>2</sub>) into the peritoneal cavity producing a pneumoperitoneum, usually at 4-6 liter/min to a pressure of 10-20 mm Hg. This cause an upsurge in intraabdominal pressure. Carbon dioxide is insufflated into the peritoneal cavity. The pneumoperitoneum is sustained through a continuous gas movement of 200-400 ml/min. The elevated intra-abdominal pressure of the pneumoperitoneum, adjustment to the patients' position and consequences of CO<sub>2</sub> absorption trigger alterations in physiology, especially within the respiratory and cardiovascular structure [48]. General anesthesia with endotracheal intubation and regulated ventilation is believed to be the securest method for laparoscopy as it shields the airway, permit control of PaCO<sub>2</sub>, and aids surgical exposure; it is highly recommended for lengthy procedures, or patients with a history of gastroesophageal reflux [49].

The present study showed that laparoscopy is a helpful method for proper evaluation of pelvic organs. It is a vital technique for diagnosing anatomical, and pathological abnormality of inner genital organs in female patients that produces a major part in infertility supervision. Infertile female patient with assumed pelvic organ abnormality should laparoscopy procedure [42]. At present in Bangladesh, laparoscopy is available in many tertiary care centers, and the amount of expense for performing laparoscopy is comparably cheaper compared to developed countries. Laparoscopy ought to be made accessible and inexpensive at various steps of health care

233 services so that infertile couples can benefit from it. Laparoscopy checkup is a vital means for assessment of tubal pathology providing to infertility and could perform an important function in infertility supervision.

2

Characteristics	Category	Frequency (%)
Uterine Cavity (34)	Well Visualized Septum	30 (88.2%)
	Synaechia	2 (5.9%)
Tubal Opening (Right) (34)	Visualized Partially Blocked	26 (76.5%)
	Blocked	6 (17.6%)
Tubal Opening (Left) (34)	Visualized Partially Blocked	26 (76.5%)
	Blocked	6 (17.6%)

Figure 1: Table 2 :

3

Year 2018  
34

Figure 2: Table 3 :

1

Characteristic	Category	Frequency (%)
Age (Years)	20-24	13 (27.1%)
	25-29	19 (39.6%)
	30-34	11 (22.9%)
	35-39	5 (10.4%)
Indication	Primary Subfertility	17 (35.4%)
	Secondary Subfertility	29 (60.4%)
	Others	2 (4.2%)
Characteristic	Category	Frequency (%)
Uterus Size	N/S (Normal Size)	35 (72.9%)
	Bulky	8 (16.7%)
	Smaller than Normal	5 (10.4%)
Uterus Position	A/V (Anteverted) R/V Retroverted)	43 (89.6%) 5 (10.4%)
Mobility	Mobile Restricted	46 (95.8%) 2 (4.2%)
POD (Pouch of Douglas)	Free	47 (97.9%)
Tubes Appearance	Obliterated	1 (2.1%)
	Apparently Healthy	37 (77.1%)
	Not Visualized	7 (14.6%)
	Others	4 (8.3%)
Dye Test	Lt Side -Ve, Rt Side -Ve	6 (12.5%)
	Lt Side -Ve, Rt Side +Ve	8 (16.7%)
	Lt Side + Ve, Rt Side +Ve	22 (45.8%)
	Lt Side + Ve, Rt Side -Ve	12 (25.0%)
Ovary Appearance	Healthy	
	Polycystic / Pearly White Appearance	17 (35.4%) 18 (37.5%)
	Cyst (Chocolate / Parovarian)	13 (27.1%)
	Normal	25 (52.1%)
Ovary Size	Enlarged	21 (43.8%)
	Smaller Than Normal	2 (4.2%)
Sign of Ovulation	Present	32 (66.7%)
	Absent	16 (33.3%)

Figure 3: Table 1 :

4

Characteristic	Category	Frequency (%)
Therapeutic Procedure	Bilateral Ovarian Drilling	28 (58.3%)
	Adhesiolysis	11 (22.9%)
	Cystectomy	5 (10.4%)
	Drilling + Adhesiolysis	2 (4.2%)
	Cystectomy + Adhesiolysis	2 (4.2%)

Figure 4: Table 4 :

	medication needed after surgery, and pos
	avoidance of open abdominal surgery. It
	procedure. However, similar to any other
	procedure, <del>comparable</del> <sup>applicable</sup> .
Variables	P-Value
Correlation of Age and Indication (Primary and Secondary Sub-	0.193
fertility)	
Tubal Opening Left and Tubal Opening Right	0.000
Age and Uterus Size	0.091
Age and Ovary Size	0.034
Age and Ovary Appearance	0.040
Indication and Therapeutic Procedure	0.009
Age and Sign of Ovulation	0.840
Indication and Sign of Ovulation	0.046
Indication and Tubes Appearance	0.888
Indication and Uterus Position	0.006
Indication and Mobility	0.505
Age and Mobility	0.132
Age and Dye Test	0.950
Indication and Dye Test	0.465
Indication and POD	0.394
Age and POD	0.669
Age and Uterine Cavity	0.281
Indication and Uterine Cavity	0.154
Indication and Uterus Position	0.006

The interrelationship between various variables is given in table 5. The tubal opening left, and tubal opening right are highly statistically significant. Also, age and ovary size, age and ovary appearance, indication and therapeutic procedure, indication and sign of ovulation, Indication and Uterus position, Indication and Uterus position are also found to be significant. On the other hand, no significance was found for indication and mobility, age and mobility, age and dye test, Indication and dye test, indication and POD, age and POD, age and uterine cavity, indication and uterine cavity, indication and tubes appearance, age and sign of ovulation, age and uterus size, correlation of age and indication (primary and secondary subfertility).

Figure 5: Table 5 :





## .1 Acknowledgements

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## .2 Conflict of Interest

None.

- [Jose-Miller et al. ()] , A B Jose-Miller , J W Boyden , K A Frey . *Am Fam Physician* 2007. 75 (6) p. . (Infertility.)
- [Fritz and Speroff ()] , M A Fritz , L Speroff . *Clinical Gynecology Endocrinology and Infertility* 2011. p. 1137. (8 th Edition)
- [Hysteroscopy (2018)] , Hysteroscopy . <https://my.clevelandclinic.org/health/treatments/10142-hysteroscopy> 2018. July 18. 2018.
- [ American College of Obstetricians and Gynaecologists. FAQ: Hysteroscopy. [www.acog.org](http://www.acog.org). Accessed (2018)] , American College of Obstetricians and Gynaecologists. *FAQ: Hysteroscopy*. [www.acog.org](http://www.acog.org). Accessed 5/8/2018.
- [Khetmalas and Kathaley ()] ‘A study evaluation of tubal factors of infertility by hysterosal pingography and diagnostic laparoscopy’. S M Khetmalas , M H Kathaley . *MVP Journal of Medical Sciences* 2016. 3 (1) p. .
- [Khetmalas and Kathaley ()] ‘A study evaluation of tubal factors of infertility by hysterosal pingography and diagnostic laparoscopy’. S M Khetmalas , M H Kathaley . *MVP Journal of Medical Sciences* 2016. 3 (1) p. .
- [Templeton and Kerr ()] ‘An assessment of laparoscopy as the primary investigation in the subfertile female’. A Templeton , M C Kerr . *Br J Obstet Gynaecol* 1977. 84 (10) p. .
- [Mehmood ()] ‘An audit of diagnostic laparoscopies for infertility’. S Mehmood . *J Surg Pak* 2003. 8 p. .
- [Hayden and Cowman ()] ‘Anaesthesia for laparoscopic surgery. Continuing Education in Anaesthesia’. P Hayden , S Cowman . *Critical Care & Pain* 2011. 11 (5) p. .
- [Reviews (ed.) ()] *Anatomy and Physiology for Midwives: Medicine, Internal medicine*, C Reviews . Jane Coad Melvyn Dunstall. Churchill Livingstone (ed.) 2016.
- [Maguiness et al. ()] ‘Assessment of the fallopian tube’. S D Maguiness , O Djahanbakhch , J G Grudzinskas . *Obstet Gynecol Surv* 1992. 47 (9) p. .
- [Baumann (209)] L Baumann . *Cosmetic Dermatology: Principles and Practice, Second Edition: Principles & Practice*, 209. McGraw-Hill Education.
- [Cain et al. ()] ‘Chapter 41. Gynecology’. J Cain , W M El Masri , T Gregory , E C Kohn , F C Brunicardi , D K Anderson , T R Billiar , D L Dunn , J G Hunter , J B Matthews . [www.accesssurgery.com](http://www.accesssurgery.com). Accessed 5/8/2018 *Schwartzs Principles of Surgery. 9 th Ed*, R E Pollock (ed.) (New York, McGraw-Hill, USA) 2010.
- [Comparative trial of insufflation, hysterosal pingography and laparoscopy for tubal patency World Health Organization ()] ‘Comparative trial of insufflation, hysterosal pingography and laparoscopy for tubal patency’. *World Health Organization* 1986. 46 p. . (Fertil Steril)
- [Ngowa et al. ()] ‘Comparison of hysterosal pingograms with laparoscopy in the diagnostic of tubal factor of female infertility at the Yaoundé General Hospital, Cameroon’. J D K N Ngowa , J M Kasia , N T Georges , V Nkongo , C Charles Sone , E Fongang . *Pan African Medical Journal* 2015. 22 p. 264.
- [Gharekhanloo and Rastegar ()] ‘Comparison of hysterosal pingography and laparoscopy in evaluation of female infertility’. F Gharekhanloo , F Rastegar . *Medical Research Archives* 2017. 5 (6) p. .
- [Mol et al. ()] ‘Comparison of hysterosal pingography and laparoscopy in predicting fertility outcome’. B W J Mol , J A Collins , E A Burrows , F Van Der Veen , P M M Bossuyt . *Human Reproduction* 1999. 14 (5) p. .
- [Gnoth et al. ()] ‘Definition and prevalence of subfertility and infertility’. C Gnoth , E Godehardt , P Frank-Herrmann . *Hum Reprod* 2005. 20 (5) p. .
- [Dun, E. C. Nezhat, C. H. ()] ‘Diagnosis and management in the era of assisted reproductive technology’. *Obstet Gynecol Clin N Am* Dun, E. C. & Nezhat, C. H (ed.) 2012. 39 p. . (Tubal Factor Infertility)
- [Zakaria et al. ()] ‘Diagnostic and therapeutic role of laparoscopy in the Current Fertility Practice’. R Zakaria , F Dewan , Z Sultana , A Ghani . *J Shaheed Suhrawardy Med Coll* 2013. 5 (2) p. .
- [Collins ()] ‘Diagnostic assessment of the infertile female partner’. J A Collins . *Curr Probl Obstet Gynecol Infert* 1988. 11 (1) p. .
- [Hovav et al. ()] ‘Diagnostic laparoscopy in primary and secondary infertility’. Y Hovav , E Hornstein , M Almagor , C Yaffe . *Journal of Assisted Reproduction and Genetics* 1998. 15 (9) p. .
- [Komori et al. ()] ‘Diagnostic laproscopy in infertility: a retrospective study’. S Komori , Y Fukuda , I Horiuchi , H Tanaka , H Kasumi , M Shigeta . *J Laparoendosc Adv Surg Tech A* 2003. 13 (3) p. .
- [Ried and Stuart ()] ‘Efficacy of traditional chinese herbal medicine in the management of female infertility: a systematic review’. K Ried , K Stuart . *Complementary therapies in medicine* 2011. 19 (6) p. .

- [Bruhat et al. ()] 'Essai de traitement per coelioscopique de la grossesse extra-uterine. A propos de 26 observations'. M A Bruhat , H Manhes , J Choukroun , F Suzanne . *Rev Fr Gynecol Obstet* 1977. 72 p. .
- [Investigation of the infertile couple American Fertility Society ()] 'Investigation of the infertile couple'. *American Fertility Society* 1991. p. . (The AFS Guidelines)
- [Tanahatoo et al. ()] 'Investigation of the infertile couple: should diagnostic laparoscopy be performed in the infertility work up programme in patients undergoing intrauterine insemination?'. S J Tanahatoo , P G Hompes , C B Lambalk . *Hum Reprod* 2003. 18 (1) p. .
- [Perrin and Fletcher ()] 'Laparoscopic abdominal surgery. Continuing education in Anaesthesia'. M Perrin , A Fletcher . *Critical Care & Pain* 2004. 4 (4) p. .
- [Naz et al. ()] 'Laparoscopic evaluation in infertility'. T Naz , L Hassan , Gulmeen , F Nighat , S Sultan . *Journal of the College of Physicians and Surgeons Pakistan* 2009. 19 (11) p. .
- [Maherunnesa et al. ()] 'Laparoscopic evaluation of pelvic organs in case of infertility'. Chowdhury Maherunnesa , T A Jahan , S Begum , N Sultana , S Rumman , U Rahman , S . *Birder Med J* 2013. 3 (2) p. .
- [Maherunnesa Chowdhury ()] 'Laparoscopic evaluation of tubal pathology in cases of infertility'. T A Maherunnesa & Chowdhury . *Ibrahim Med. Coll. J* 2013. 7 (2) p. .
- [Laparoscopy and Hysteroscopy: A Guide for Patients ()] *Laparoscopy and Hysteroscopy: A Guide for Patients*, [www.asrm.org](http://www.asrm.org). Accessed 5/8/2018 2016. (American society for Reproductive Medicine)
- [Himmel et al. ()] 'Management of involuntary childlessness'. W Himmel , E Ittner , M M Kochen , H W Michelmann , B Hinney , M Reuter . *Br J Gen Pract* 1997. 47 (415) p. .
- [Dubuisson et al. ()] 'Myomectomy by laparoscopy: a preliminary report of 43 cases'. J B Dubuisson , F Lecuru , H Foulot , L Mandelbrot , F X Aubriot , M Mouly . *Fertility and Sterility* 1991. 56 (5) p. .
- [Berek et al. ()] 'Novak's Gynecology, 15 th Edition'. J S Berek , R D Rinehart , P A Hillard , E Y Adashi . *Walters Kluwer India Pvt. Ltd, Chapter* 2012. 32 p. 1139.
- [Murphy ()] 'Operative laparoscopy'. A A Murphy . *Fertil Steril* 1987. 47 (1) p. .
- [Glatstein et al. ()] 'Practice patterns among reproductive endocrinologists: the infertility evaluation'. I Z Glatstein , B L Harlow , M D Hornstein . *Fertil Steril* 1997. 67 (3) p. .
- [Alper et al. ()] 'Pregnancy rates after hysterosal pingography with oil and water-soluble contrast media'. M M Alper , P R Garner , J E H Spence , A M Guarrington . *Obstet Gynecol* 1986. 68 (1) p. .
- [Akhtarunnesa et al. ()] 'Role of diagnostic laparoscopy in evaluation of infertile women'. Chowdhury Akhtarunnesa , T A Ara , I Gazi , M L K Biswas , B . *Bangladesh J Obstet Gynaecol* 2013. 28 (2) p. .
- [Bari et al. ()] 'Secondary subfertility among the couple attending selected fertility centre of Dhaka'. S Bari , M S Begum , K Nessa . *Bangladesh. International Journal of Reproduction* 2018. 7 (3) p. . (Contraception, Obstetrics and Gynecology)
- [Padubidri and Daftary (198)] *Shaw's Text Book of Gynecology*, V G Padubidri , S N Daftary . 198. Elsevier India Pvt. Ltd. (14 th Edition)
- [Deeba et al. ()] 'Some epidemiological aspects of subfertile women who underwent laparoscopy'. F Deeba , A B M M Alam , N N Ava , M R Islam , A Matin , R Khan . *Journal of Shaheed Suhrawardy Medical College* 2010. 2 (1) p. .
- [Semm and Mettler ()] 'Technical progress in pelvic surgery via operative laparoscopy'. K Semm , L Mettler . *Am J Obstet Gynecol* 1980. 138 (2) p. .
- [Dutta ()] 'Text Book of Gynecology'. D C Dutta . *New Central Book Agency Pvt. Ltd. Kalkata, India. Chapter* 2014. 10 p. . (6th edition)
- [Collins et al. ()] 'The cost of infertility diagnosis and treatment in Canada in 1995'. J A Collins , D Feeny , J Gunby . *Hum Reprod* 1997. 12 (5) p. .
- [Howkins and Bourne ()] 'The pathology of conception'. & Howkins , Bourne . *Shaw's textbook of gynecology. 13 th Ed*, 2004. Elsevier.
- [Miller et al. ()] 'The pattern of infertility diagnoses in women of advanced reproductive age'. J H Miller , R K Weinberg , N L Canino . *Am J Obstet Gynecol* 1999. 181 (4) p. .
- [Bosteels et al. ()] 'The position of diagnostic laparoscopy in current fertility practice'. J Bosteels , B Van Herendael , S Weyers , T D'hooghe . *Human Reproduction Update* 2007. 13 (5) p. .
- [Gnoth et al. ()] 'Time to pregnancy: results of the German prospective study and impact on the management of infertility'. C Gnoth , D Godehardt , E Godehardt . *Hum Reprod* 2003. 18 (9) p. .