

## Role of Laparoscopy in Diagnosis of Tuboperitoneal and Pelvic Factors of Female Infertility

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### ABSTRACT

**Background:** Many occurrences of female infertility are caused by the tubal and peritoneal causes. To decide on an infertility care strategy, these aspects must be evaluated. So we aimed to assess how the diagnostic laparoscopy can be used in the endoscopic gynecology unit, to assess the tubal factor in infertile women and to explain the tubo-peritoneal findings from laparoscopy in a subset of infertile patients. **Methods:** The study includes 60 patients with primary or secondary infertility. Laparoscopic evaluation will be performed in the follicular phase of menstrual cycle. **Results:** Tubal pathology was detected in 64.7% cases of primary infertility and 68.7% cases of secondary infertility. Among those who had tubal pathology, nonspecific pelvic inflammatory disease was noted in 44.1% and genital tuberculosis was diagnosed in 2.9% cases. **Conclusion:** Use of laparoscopy and chromoperturbation test should be recommended as a first step in the investigation of infertile women with tubal factor.

**Keywords:** Laparoscopy; Tuboperitoneal, Pelvic factors; Infertility.

### INTRODUCTION

One of the most significant advancements in surgery over the last 25 years has been the creation of surgical laparoscopy [1]. From a diagnostic study, its use has advanced into the field of operative surgery [2]. Uterine fibroids, endometriosis, persistent pelvic pain, benign ovarian/adnexal masses, and hysterectomy for benign disorders are among the benign gynecological conditions that it is used to treat [3]. Investigating tubal factor infertility involves the use of diagnostic laparoscopy. 25–35% of female infertility is caused by tubal illness [4]. The two most common causes of tubal factor infertility are acute salpingitis and pelvic inflammatory illness. According to Egbe et al. [5], the incidence of tubal damage is roughly 12% following a single pelvic infection episode, 23% following two episodes, and 54% following three episodes.

According to Akintobi et al. [6] and Akhtar et al. [7], tubal injury can affect the proximal, distal, or complete tube and can be either temporary (obstruction) or permanent (occlusion). Numerous pathologic events, including inflammation, endometriosis, and surgical trauma, can result in

peritubal, distal, and proximal damage [8]. Peritubal adhesions interfere with or stop the ovum's normal capture and transport, as well as change the normal anatomic interaction between the ovary and fimbriae [9]. Laparoscopy or hysterosalpingography can be used to diagnose peritubal adhesion. Because laparoscopy provides a direct view of pelvic abnormalities and can be performed in a single session, it is regarded as the ideal approach due to the high rates of false-positive and false-negative results with hysterosalpingography [10]. The results of the laparoscopy decide the course of treatment. About 10% to 15% of couples who are of reproductive age have infertility. One of the medical fields that is changing the fastest is the diagnosis and treatment of this illness. Experience has demonstrated that conventional pelvic exams and standard diagnostic techniques often fail to adequately assess the bulk of pelvic pathologies in infertile women [11].

An artificial pneumoperitoneum is created during the laparoscopic surgery, and an endoscope is used to view the abdominal cavity [12]. Typically performed as a day case, diagnostic laparoscopy is typically performed under general anesthesia in an

operating room. Approximately 20 to 30 minutes are needed to finish the operation. For several decades, the laparoscopic technique has been widely used in gynecology, even in developing nations [13].

Any anatomical defect or history of pelvic inflammatory disease (PID), tubal surgery, ruptured appendix, ovarian surgery, or septic abortion strongly suggests the possibility of tubal disease. Other tubo-peritoneal factors of infertility include blocked fallopian tubes, partially blocked fallopian tubes, blocked fallopian tubes, fallopian scarring, and other types of damage to the fallopian tubes [3]. Chlamydia and Nisseria gonorrhoea are the most common causes of tubal infertility; they create pelvi-peritoneal adhesion and are the most common cause of tubal disease. Sperm transport to the distal part of the fallopian tube, where fertilization typically takes place, is inhibited by proximal tubal blockage [5].

Newer surgical and diagnostic techniques have opened the door for more understanding of this issue in the age of scientific and technological growth. In recent years, laparoscopy has become a reliable technique for diagnosing, analyzing, and treating infertility [14].

The goal of this research is to enhance the techniques for diagnosing pelvic and tubo-peritoneal causes of female infertility.

#### METHODS

This six-month study involved 60 instances of primary and secondary infertility at Zagazig University's Obstetrics & Gynecology Department, Faculty of Medicine, with 10 cases every month. The Zagazig University Faculty of Medicine's Ethics Committee gave its approval to the study (ZU-IRB #9515/12-09-2022). An informed consent was obtained from all patients

#### Inclusion criteria

- > Age 42 years old
- Normal semen parameters of the partner
- Patients with primary or secondary infertility.
- Use LH kits and transvaginal ultrasonography to confirm ovulation for folliculometry.
- Prior history of pelvic surgery, hysterosalpingography (HSG), D&C, and menstrual management.
- Previous ectopic pregnancy surgery history.
- Completed treatment of tuberculosis.

#### Exclusion criteria

- Age more than 42 years.

- Patients who had medical disorders and contraindication for laparoscopy.
- Male factor i.e severe oligospermia.
- Increased FSH & LH (Premature ovarian failure).
- Patients with pelviabdominal swellings.
- Patients with missed period or amenorrhea.

*All patients were subjected in the following:*

1. A thorough history that covers complaints, the present, the past, and family history.
2. A comprehensive clinical examination that includes auscultation, percussion, palpation, and inspection for a general or local gynecological examination.
3. A comprehensive laboratory analysis that includes CBC, bleeding profile, and liver and kidney functions.
4. FSH, LH, and AMH.
5. To rule out PCO and uterine anomalies, use TVS.
6. A laparoscopic examination will be conducted during the menstrual cycle's follicular phase.

**Procedure:** Under general anesthesia, CO<sub>2</sub> was used to dilate the abdomen, a sub-umbilical port was utilized to introduce a 10mm telescope, and two additional ports were used for accessories. Prior to that, pertinent investigations were conducted for the elimination of other causes, including a general and vaginal examination.

#### Statistical analysis:

All data were collected, tabulated and statistically analyzed using IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp. The following tests were used: t test, Mann-Whitney u test, Fisher exact test, Chi-square test, logistic regression and Hosmer and Lemeshow test.

#### RESULTS

16 (26.7%) cases of primary infertility and 44 (73.3%) cases of secondary infertility were reported. Women between the ages of 21 and 25 made up 18% of the total. Of the ladies, 36% were between the ages of 26 and 30. Of the ladies, 34% were between the ages of 31 and 35. Twelve percent of women were between the ages of thirty-six and forty. Although 32% of cases had been infertile for 6–10 years, 64% of women had been infertile for 1–5 years. While 14% of women experienced irregular cycles, 86% of women experienced normal menstruation.

Eleven cases (18.3%) had normal pelvic organs, sixteen cases (26.7%) had chronic pelvic inflammatory disease/adhesions, twelve cases

(20%) had endometriosis, one case (1.7%) had congenital uterine anomalies, twenty cases (33.3%) had fibroids, and eleven cases (18.3%) had polycystic ovaries.

In 64.7% of initial infertility cases and 68.7% of secondary infertility cases, tubal pathology was found. Of the patients with tubal pathology, 2.9% had genital TB and 44.1% had nonspecific pelvic inflammatory illness.

In 43.2% of secondary infertility cases and 68.8% of initial infertility cases, tubal pathology was found. Of individuals with tubal pathology, 2.3% were diagnosed with genital TB and 29.5% with nonspecific pelvic inflammatory disease.

Fifty percent of initial infertility patients and sixty-three percent of secondary infertility patients experienced no issues. The most frequent side effects included nausea, vomiting and pyrexia.

**Table (1)** Demographic Data

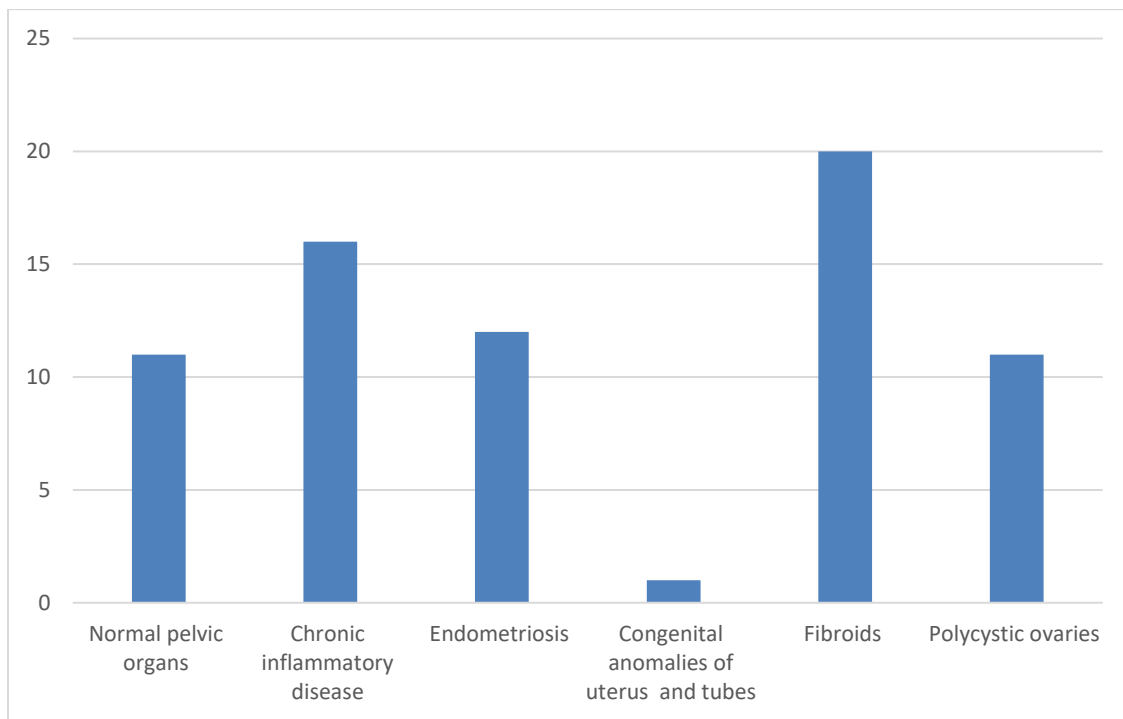
Age in years	Primary infertility	Secondary infertility	No.	Total %
21-25	2	11	13	18
26-30	7	13	20	36
31-35	5	14	19	34
36-40	2	6	8	12
Total	16	44	60	100
BMI	27.3±4.1	27.6±4.2		

**Table (2):** Details of tubal pathology detected in cases of primary and secondary infertility

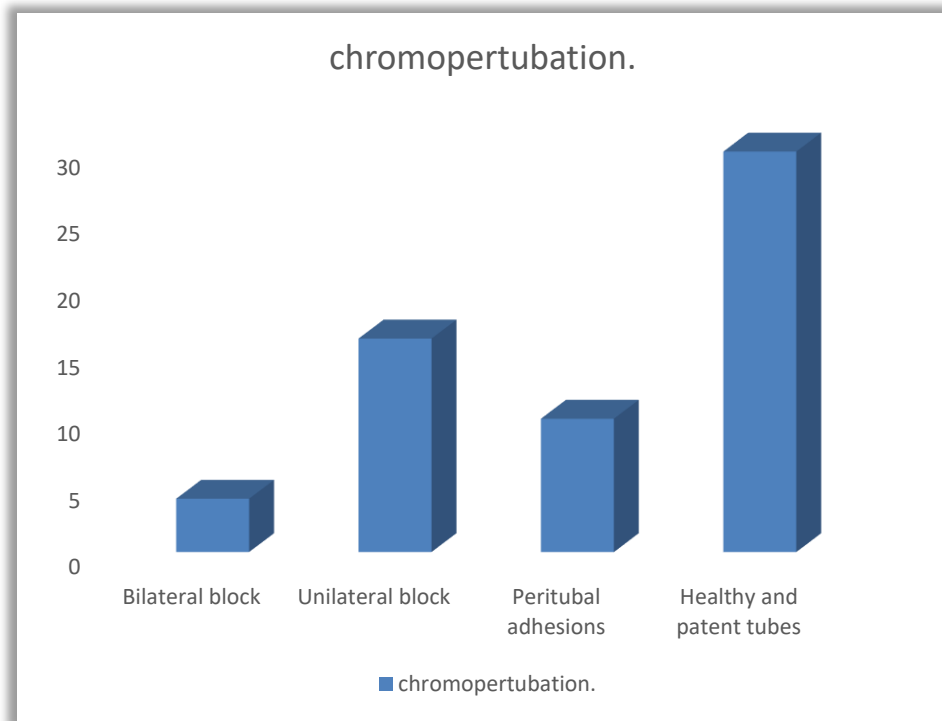
Tubal pathology (n=30)	Primary Infertility (n=16)		Secondary infertility (n=44)		Total (n=60)	
	N	%	N	%	N	%
Non-specific pelvic inflammatory disease	8	50	13	29.5	21	35
Tuberculous Salpingitis	0	0	1	2.3	1	2
Endometriosis	3	18.8	5	11.4	8	13.3
Congenital anomalies	0	0	0	0	0	0
Ectopic Pregnancy	0	0	0	0	0	0
Total	11	68.8	19	43.2	30	50

**Table (3):** Complications of laparoscopy

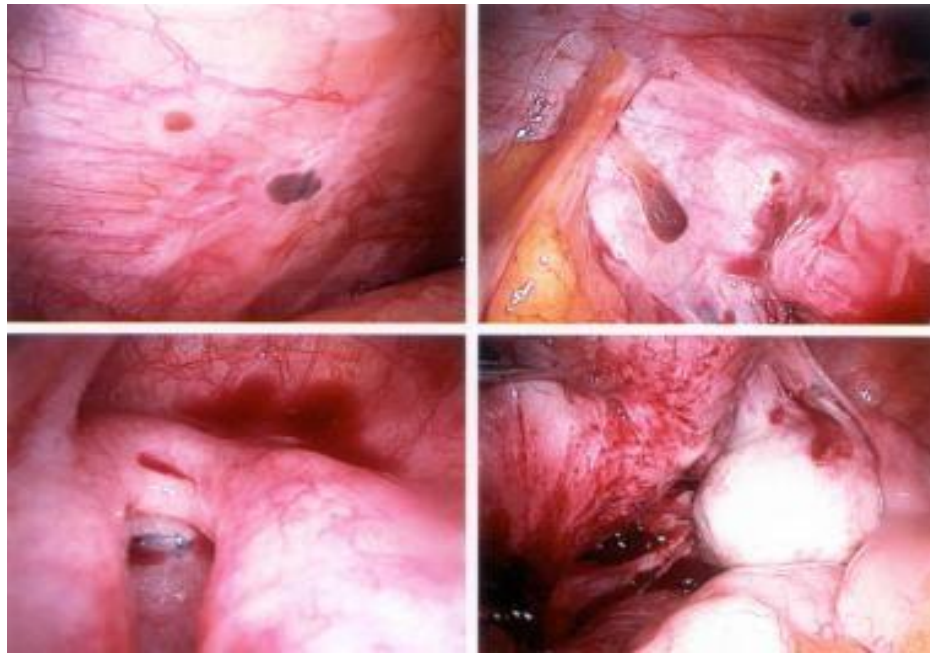
Complications of laparoscopy (n=60)	Primary infertility (n=16)		Secondary infertility (n=44)	
	N	%	N	%
Pyrexia	2	12.5	4	9
Nausea and Vomiting	4	25	8	18.4
No complications	8	50	28	63.6



**Figure (1) Histogram showing Findings of diagnostic laparoscopy in our study population.**



**Figure (2): Histogram showing chromopertubation in our study population.**



**Figure (3):** Endometriosis. Red lesions on various organs.



**Figure (4):** TB.

### DISCUSSION

A significant amount of female factor infertility is caused by tubal factor infertility. The two most common causes of tubal factor infertility are acute salpingitis and pelvic inflammatory illness. After a pelvic infection episode, the incidence of tubal damage is roughly 12%, 23% after two episodes, and 54% after three episodes [15].

Many pathologic events, including inflammation, endometriosis, and surgical trauma, can result in peritubal, distal, and proximal damage. One of the main causes of female infertility in developing nations like Bangladesh, Pakistan, India, and Nepal is genital TB. It is one of the main reasons why infertility results from severe tubal illness. In contrast to pulmonary tuberculosis, GTB is typically asymptomatic or presents with a variety of clinical

manifestations, making clinical diagnosis challenging [16].

The best way for diagnosing genital tuberculosis in infertile women is a combination of clinical and laparoscopic diagnosis, endometrial histopathology studies, acid-fast bacillus culture, and polymerase chain reaction testing. [17]. Fertility is decreased when fallopian tube functions are compromised by tubal disease. Fertility is dependent on the severity of tubal disease. To decide on an infertility treatment strategy, the fallopian tube must be evaluated. Although hysterosalpingography (HSG) is frequently used as a first-line method to evaluate tubal patency and the existence of adhesions, HSG is not always effective in identifying tubal disease. [16].

Most people agree that the gold standard test for determining tubal patency is laparoscopy and chromopertubation. It also enables evaluation for endometriosis, adhesions, and peritubal illness. Because of this, NICE (UK) has recommended that women who are suspected of having comorbidities (such as endometriosis and pelvic inflammatory disease) have a laparoscopy so that both pelvic and tubal pathology can be evaluated. [15].

Our study's objectives were to report the tuboperitoneal findings in a subset of infertile patients using laparoscopy and to assess the use of diagnostic laparoscopy in assessing the tubal factor in infertile women in the endoscopic gynecology unit. During the six-month study period, ten cases per month of 60 cases with primary and secondary infertility were examined in the Obstetrics & Gynecology Department of Zagazig University's Faculty of Medicine.

There were 16 (26.7%) cases of primary infertility and 44 (73.3%) cases of secondary infertility in the current study. Women between the ages of 21 and 25 made up 18% of the total. Of the ladies, 36% were between the ages of 26 and 30. Of the ladies, 34% were between the ages of 21 and 35. Twelve percent of women were between the ages of thirty-six and forty.

Shetty et al. [18] showed that 16 (32%) of the cases were secondary infertility and 34 (68%) were primary infertility. Eighty-eight percent of the women were between the ages of 21 and 35. Although 32% of cases had been infertile for 6–10 years, 64% of women had been infertile for 1–5 years. While 14% of women experienced irregular cycles, 86% of women experienced normal menstruation.

74.53% of infertile patients had primary infertility and 25.47% had secondary infertility, based on the criteria used in the Al-Wazzan et al. [19] study to select infertile patients for diagnostic laparoscopy. The results of Krishna et al. [20], where 70.44% of infertile women had primary infertility and 29.55% had secondary infertility, the Cairo study by EL-Tabbakh et al. [21] where primary and secondary infertility affected 70.7% and 29.3% of the couples, and the laparoscopic study by Mehmood et al. [22], where 72.19% of infertile women had primary infertility and 27.81% had secondary infertility, are all very similar. According to our research, 32% of cases had been infertile for 6–10 years, while 64% of women had been infertile for 1–5 years. While

14% of women experienced irregular cycles, 86% of women experienced normal menstruation.

Shetty et al. [18] revealed that 16 (32%) of the cases were secondary infertility and 34 (68%) were primary infertility. Eighty-eight percent of the women were between the ages of 21 and 35. Although 32% of cases had been infertile for 6–10 years, 64% of women had been infertile for 1–5 years. While 14% of women experienced irregular cycles, 86% of women experienced normal menstruation. Kanal & Sharma [23] in their study, reported tubal blockage in 42.5% of primary infertility.

Al-Wazzan et al. [19] showed that pelvic abnormalities were diagnosed in the study in 87.27% of infertility cases which is higher than other studies where seen in 61.03% in Bitzer & Korber et al. [24], 62% in Ayida et al. [25] and 58.58% in Mehmood et al. [22].

The design of the majority of other research, which only include infertility that cannot be explained, explains this. Al-Wazzan et al. [19] found that 73.51% of primary infertility cases and 26.49% of secondary infertility cases had pelvic abnormalities. This is almost identical to the findings of Mehmood et al. [22], who found that 73.73% of primary infertility cases and 26.26% of secondary infertility cases had pelvic abnormalities. However, Bitzer & Korber et al. [24] found the same percentage of abnormal findings in primary and secondary infertility. According to Hovav et al. [26], the good results for secondary infertility were noticeably greater than those for primary infertility. This study demonstrated that diagnostic laparoscopy identified normal pelvic organs in 11 instances (18.3%), endometriosis in 12 cases (20%), fibroids in 20 cases (33.3%), polycystic ovaries in 11 cases (18.3%), and chronic pelvic inflammatory disease/adhesions in 16 cases (26.7%).

According to Shetty et al. [18], diagnostic laparoscopy showed that 8 (16%) of the cases had normal pelvic organs, 3 (6%) had chronic pelvic inflammatory disease, 12 (24%) had endometriosis, and 1 (2%), had congenital uterine defects. Al-Wazzan et al. [19] illustrated that during evaluation of infertility causes in study, the ovarian factor (66.83%) was the most common cause followed by tubal factor (22.03%) which differ from Mehmood et al. [22] and Usmani et al. [27] While the ovarian component was observed in 32.83% and 26.08% of cases, respectively, while the tubal factor was the most frequent cause, accounting for 35.85% and

37.6% of instances. These discrepancies can be explained by the lower frequency of STDs and the omission of diagnostic curettage as a standard inquiry performed by various categories of health staff during the evaluation of infertile patients in Mehmood et al. [22].

In terms of chromopertubation results, our study revealed that there were four (6.7%) bilateral blocks, sixteen (26.6%) unilateral blocks, ten (16.7%) peritubal adhesions (spill observed), and thirty (50%), healthy and patent tubes.

According to Shetty et al. [18], 8% of cases had bilateral tubal block, 28% had unilateral block, and in 8% of cases, severe peritubal adhesions were observed even though the tubes were judged to be patent. According to Al-Wazzan et al. [19], there was no discernible difference between the majority of tubal factor instances of primary and secondary infertility that were diagnosed as having bilateral blockage (69.306% and 81.33%, respectively). 57.28% of the women in the Annan et al. [28] group had bilateral tubal obstruction. This is comparable to the Tanaka et al. [29] study, in which bilateral tubal obstruction was present in over 50% of study participants. This result, however, stands in stark contrast to a study conducted in India by Padmawar et al. [30], which found that 23.26% of patients had bilateral tubal obstruction. Similarly, 20% of the population in a Nigerian research by Ugboaja et al. [31] had a bilateral tubal block.

According to the current study, tubal pathology was found in 68.7% of secondary infertility cases and 64.7% of original infertility cases. Of the patients with tubal pathology, 2.9% had genital TB and 44.1% had nonspecific pelvic inflammatory illness. According to Shetty et al. [18], tubal disease was found in 68.7% of secondary infertility cases and 64.7% of basic infertility cases. Of the patients with tubal pathology, 2.9% had genital TB and 44.1% had nonspecific pelvic inflammatory illness. Ikechebelu & Mbamara [32] 39.5% of the women in the study had normal patent tubes, whereas 60.4% had tubal diseases such as unilateral tubal occlusion in 22.1% of the women and bilateral tubal occlusion in 38.3% of the women. In contrast, Aziz et al. [33] found that 2 (16.7%) and 1 (3.1%) of the main and secondary infertility cases, respectively, had pelvic inflammatory illness. In 7 (21.9%) and 6 (33.3%) cases of primary and secondary infertility, respectively, tubal obstruction was the most often observed finding.

In Shetty et al. [18] study, laparoscopy was used to diagnose genital TB in 1 (2%) of the cases. In this example, bilateral tubal obstruction was observed. In their 2008 study, Sharma et al. [34] examined laparoscopic findings in 47.1% of cases of genital TB. Tubercles on the ovary (1.2%) or peritoneum (12.9%), tubovarian masses (7.1%), caseous nodules (5.8%), and encysted ascitis in 7.1% of women were among the different findings on laparoscopy. Women (65.7%) had pelvic adhesions of various severity. The findings on fallopian tubes included the following: 7.1 percent of women had normal-looking tubes, 14.1 percent had inability to see, 3 (3.52%) had tubercles on their tubes, 3 (3.52%) had caseous granuloma, 15 (17.6%) had hydrosalpinx (right tube 11.7%, left tube 5.9%), 3 (3.5%) on their right tubes and 2 (2.35%) on their left tubes, 3 (3.7%) on their right tubes, and 4 (4.7%) in their left tubes with a tobacco pouch appearance in 2 (2.35%) women.

The best approach for diagnosing genital tuberculosis in infertile women is a combination of clinical and laparoscopic diagnosis, endometrial histopathologic studies, acid-fast bacillus culture, and polymerase chain reaction assays. Genital tuberculosis is prevalent in India [35]. Aziz et al. [33] reported endometriosis in 6 (12%) instances and peritubal and periovarian adhesions in 6 (12%) cases, while Shetty et al. [18] discovered endometriosis in 12 (24%) patients and substantial peritubal adhesions in 4 (8%) cases. According to O'Callaghan et al. [36], laparoscopy is still the gold standard for diagnosis, and surgical removal should be the primary line of treatment at that point. The fecundity rate of untreated endometriosis patients is lower than that of healthy couples, even though a direct link between the condition and infertility has not been proven by Endometriosis et al. [37].

In their comparison of laparoscopy and hysterosalpingography, Robabeh et al. [38] came to the conclusion that while laparoscopy is the gold standard for infertility workups, HSG can be done first, and laparoscopy should only be used in cases suspected of having etiologies other than intratubal, like endometriosis and peritubal adhesions.

Al-Wazzan et al. [19] indicated that the prevalence of pelvic endometriosis (4.46%) was lower than in previous studies (16.16% by Mehmood et al. [22], 5.35% by Usmani et al. [27]). This was because of variations in racial and environmental factors, as well as the practice of refraining from sexual activity during the menstrual cycle. However, its

prevalence is higher than that of Otolorin et al. [39] (1.8%), which might be because mild instances were harder to diagnose when laparoscopy was first used in 1987. The low incidence of sexually transmitted infections in our area may be the reason why the prevalence of pelvic inflammatory illness (2.85%) and pelvic adhesion (2.1%) in the Al-Wazzan et al. [19] study was lower than in other studies Otolorin et al. [39] and ASHRAF et al. [40]. The difference in racial and environmental factors between the studies may have contributed to the significantly lower rate of uterine fibroids (1.73%) in infertility patients in Wazzan et al. [19] compared to 7.14% in other studies [27] and 15.15% in other studies [22, 39].

Similar to Usmani et al. [27], who found that polycystic ovaries accounted for all instances, Wazzan et al. [19] found that polycystic ovaries were present in 97.22% of cases among ovarian factors of infertility. 74.43% of patients had bilateral tubal obstruction, which is greater than the 50.94% of instances reported by Vasiljević et al. [41] and lower than the 78.57% reported by Otolorin et al. [39] among infertile Nigerian women. In contrast to other studies by ASHRAF et al. [40] and Kanal et al. [42], which all indicated that the tubal factor was the significant cause of both primary and secondary infertility, Wazzan et al. [19] found that ovarian factor was the most significant cause of primary infertility (72.38%) among the primary infertility group and tubal factor was the most significant cause of secondary infertility (39.09%) among the secondary infertility group.

The low incidence of pelvic infections in primary infertility and the high incidence of postpartum and postabortal infections as well as pelvic inflammatory disease in secondary infertility may help to explain this. Multiple pelvic abnormalities were observed during laparoscopy, and the correlation between tubal factor and polycystic ovary (PCO) was observed in 39.71% of cases, which is less than the 50% of cases reported by Kousta et al. [43]. According to Wazzan et al. [19], endometriosis, pelvic inflammatory illness, and pelvic adhesion are the main causes of tubal obstruction in patients, however Jamal et al. [44] found that endometriosis, tuberculosis, and pelvic inflammatory disease were the main causes.

Wazzan et al. [19] reported that increased prevalence of pelvic inflammatory illness among

secondary infertility and its later-observed sequelae of pelvic adhesion and tubal obstruction can account for the higher incidence of this condition linked to other abnormalities in secondary infertility. In contrast to other studies where it was observed in 2.9% [41] and 5% [23], all uterine abnormality cases (0.72%) observed on laparoscopy among infertility patients were detected among primary infertility and all with other pelvic abnormality. 50% of primary infertility patients and 63.6% of secondary infertility patients in our study had no problems. The most frequent side effects included nausea, vomiting and pyrexia. According to Shetty et al. [18], 50% of patients with secondary infertility and 52% of initial infertility groups experienced no issues. The most frequent side effects included nausea, vomiting and pyrexia.

**Conclusion:** Laparoscopy can be used to diagnose pelvic and tubo-peritoneal infertility causes. It is advantageous and safe. Therefore, it is advised that we use this new technology more widely in our practice. Investigating infertile women with tubal factor should begin with the use of a chromopertubation test and a laparoscopy.

**Recommendations:** Larger sample sizes will be needed for future research to yield meaningful findings. To validate our findings, more prospective randomized studies ought to be conducted.

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**Competing interests:** The authors declare that they have no competing interest.

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