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Original article

Role of Diagnostic Hysterolaparoscopy in Evaluation of Female Infertility at the National Center for Diagnosis and Treatment of Infertility-al Jabal AL Akhdar

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Abstract
Infertility, affecting 10–15% of reproductive-age couples, has emerged as a pressing medical and social challenge. This cross-sectional study evaluated the diagnostic value of hysterolaparoscopy (HL) in the assessment of female infertility at the National Center for Diagnosis and Treatment of Infertility, Al Jabal Al Akhdar. This is a prospective interventional study that enrolled 165 women with a history of primary or secondary infertility at national center for Diagnosis and Treatment of Infertility-AL Jabal AL Akhdar in the period from July 2025 to Dec 2025. Those with a history of active pelvic infection or contraindication of anesthesia were excluded. Of the 165 women evaluated, 91 (55.15%) were diagnosed with primary infertility. Laparoscopic examination identified abnormalities in 49.09% of cases, with tubal obstruction (18.79%), peritubal adhesions (12.37%), and endometriosis (11.52%) being the most prevalent findings. Hysteroscopic assessment most commonly revealed endometrial polyps as the leading intrauterine abnormality. Diagnostic HL is an effective, safe diagnostic tool when performed by experienced hands for diagnosing and treating pelvic pathologies, such as adnexal adhesions, endometriosis, and uterine septum, which are usually missed by other diagnostic modalities.
Keywords. Diagnostic Hysterolaparoscopy, Female Infertility, Al Jabal AL Akhdar.

Introduction

Infertility is estimated to affect between 10% and 15% of couples in their reproductive years [1]. It is clinically defined as the inability to achieve pregnancy after one year of regular, unprotected sexual activity. The condition is further classified into primary infertility (PI), referring to cases where the woman has never conceived, and secondary infertility (SI), where the couple experiences difficulty conceiving following at least one prior pregnancy, regardless of outcome [2]. In most cases, couples are advised to begin infertility evaluation after twelve months of trying to conceive. However, if the female partner is older than 35 years, investigation is typically recommended after six months of unsuccessful attempts. In situations where there is a known or suspected underlying issue, such as irregular cycles or a history of pelvic surgery or infection, immediate evaluation is indicated [3].

The conventional infertility assessment involves several components. These include tests for ovulation, semen analysis, and assessment of tubal patency. The latter is commonly evaluated through hysterosalpingography (HSG) or sonohysterography, along with transvaginal sonography (TVS). Typically, diagnostic laparoscopy and hysteroscopy are not part of the initial work-up but are reserved for further investigation in unresolved or complex cases. Laparoscopy is particularly useful in identifying conditions such as peritubal adhesions and endometriosis that may contribute to infertility [4,5]. A comprehensive meta-analysis involving 20 separate studies compared the effectiveness of HSG and laparoscopy in evaluating tubal patency and peritubal adhesions. The findings indicated that HSG has low sensitivity, making it less reliable for identifying tubal patency. However, due to its high specificity, it remains useful in confirming the presence of obstruction. For cases involving peritubal pathology or suspected endometriosis, laparoscopy is considered superior. Even in instances where HSG yields normal results, laparoscopy detects abnormalities in 35% to 68% of women [6-12].

Hysteroscopy, in contrast, remains the most accurate endoscopic method for direct visualization of the uterine cavity. It plays a critical role in identifying common intrauterine abnormalities, including endometrial polyps, submucosal fibroids, uterine septum, and intrauterine adhesions. These abnormalities are found in approximately 10% to 15% of women seeking infertility treatment [13]. This work assessed the diagnostic value of combined hysterolaparoscopy (HL) in women with infertility. The study also sought to determine the frequency and types of anatomical and pathological abnormalities within the female reproductive system that may be responsible for infertility.

Methods

Study design and setting

This is a prospective interventional study that enrolled 165 women with a history of either PI or SI. The study took place at the National Center for Diagnosis and Treatment of Infertility – Al Jabal Al Akhdar between July 2025 and Dec 2025. Women with active pelvic infections or any contraindications to anesthesia were excluded.

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Data collection procedure
A comprehensive medical history was obtained for all participants. This was followed by a detailed clinical examination and confirmation of a normal fertility status in the male partner. Women who met the inclusion criteria were given full information about the study, and written informed consent was collected before any procedures were performed.

Preoperative assessment
Upon admission, demographic information such as age, level of education, and socioeconomic status was recorded. Standard preoperative investigations were carried out to determine each patient's fitness for surgery. HL was scheduled during the preovulatory phase, typically between days 5 and 10 of the menstrual cycle, after consent was obtained. All procedures were conducted under general anesthesia.
Hysteroscopy was performed first. The endocervical canal was assessed for the presence of any polyps or abnormal growths. The uterine cavity was inspected for congenital anomalies such as septum, malformations, fibrous bands, polyps, and myomas. The endometrial surface was evaluated for color, thickness, and general appearance. The bilateral tubal ostia were visualized.

Laparoscopic Evaluation
Laparoscopy was carried out via a 30-degree angled telescope with a fiber-optic light source. A panoramic view of the abdominal cavity was obtained. A general evaluation of the peritoneal cavity, especially the lower abdomen and pelvic area, was conducted to detect any visible abnormalities such as adhesions or endometriosis. The uterus was examined for its size and shape. Any congenital anomalies like arcuate uterus, bicornuate uterus, or rudimentary uterine horn were noted. If adhesions were present between the uterus, adnexa, omentum, or other structures, these were recorded. The fallopian tubes were assessed for tortuosity and any pathological changes. If the anatomy was distorted, the round ligament was first identified to help trace the course of the tubes. Ovaries were examined for their size, shape, surface features, color, the presence of cysts, and their relationship to the fallopian tubes. The pelvic peritoneum, including the pouch of Douglas, was inspected for signs of endometriosis or pelvic inflammation.

Chromopertubation
Tubal patency was tested via chromopertubation. A Leech Wilkinson cannula was inserted into the cervix, and 2 ml of methylene blue dye diluted in 18 ml normal saline was injected via a syringe. Dye spillage from the fimbriated end of the tubes was observed to assess tubal openness. Surgical interventions were performed when required during the same session. Hysteroscopic procedures included intrauterine adhesiolysis, hysteroscopic polypectomy, septal resection, and endometrial curettage. Laparoscopic procedures included ovarian drilling, excision of ovarian cysts, and cauterization of endometriotic lesions.

Results
In this prospective investigation exploring the diagnostic utility of laparoscopy and hysteroscopy in 165 women presenting with infertility, comparisons were drawn between those with PI (n = 91) and SI (n = 74). Baseline demographic characteristics and procedural findings were examined across groups. Demographic profiles were generally similar, whereas imaging and endoscopic results revealed variable patterns in pathology and management. The observed complication rate was minimal, supporting the procedural safety. Key findings from each stage of evaluation are presented below. The overall mean age of participants was 34.15 ± 4.95 years. Women in the PI group had a mean age of 33.54 ± 4.84 years, while those with SI averaged 34.91 ± 5.01 years. Although the SI group was slightly older, both groups exhibited comparability in age (P = 0.078). The overall mean body mass index (BMI) was 30.11 ± 4.97 kg/m². The BMI in the PI group was 29.59 ± 5.08 kg/m² as opposed to 30.74 ± 4.79 kg/m² in the secondary group, demonstrating comparable distributions between cohorts (P = 0.140).

Table 1. Baseline Characteristics

Characteristic	Total (N=165)	Primary Infertility (N=91)	Secondary Infertility (N=74)	P
Age (years)	34.15 ± 4.95	33.54 ± 4.84	34.91 ± 5.01	0.078
Body mass index (kg/m²)	30.11 ± 4.97	29.59 ± 5.08	30.74 ± 4.79	0.140

Data Presented as Mean ± Standard Deviation. An Independent Samples T-Test Was Used. P<0.05 Is Considered Statistically Significant. Abbreviations: - Standard Deviation; P - P-Value.

Transvaginal ultrasonographic findings showed normal results in 39.39% of all cases. The most frequent abnormality was endometrial polyps, seen in 38.18% of women. These polyps were more frequently observed in the PI group (45.05%) as opposed to the SI group (29.73%), without reaching statistical significance (x^2 = 3.44, P = 0.064). Niches were exclusively identified in the SI group (21.62%), representing a statistically significant distinction (P < 0.001). Other ultrasound findings, such as polycystic ovaries (6.06%) and ovarian cysts (4.85%), occurred at similar frequencies across both groups.

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Table 2. Incidence of Transvaginal Ultrasound Findings

Finding	Total (N=165)	Primary Infertility (N=91)	Secondary Infertility (N=74)	X^2	P
Normal finding	65 (39.39)	36 (39.56)	29 (39.19)	0.00	>0.99
Endometrial polyp	63 (38.18)	41 (45.05)	22 (29.73)	3.44	0.064
Uterine fibroid	5 (3.03)	5 (5.49)	0 (0.00)	-	0.065
Two endometrial cavities	6 (3.64)	3 (3.30)	3 (4.05)	-	>.99
Niche	16 (9.70)	0 (0.00)	16 (21.62)	-	<0.001
Chocolate cyst	2 (1.21)	1 (1.10)	1 (1.35)	-	>0.99
Evidence of adhesion (sliding sign)	2 (1.21)	0 (0.00)	2 (2.70)	-	0.200
Hydrosalpinx	1 (0.61)	1 (1.10)	0 (0.00)	-	>0.99
PCO	10 (6.06)	5 (5.49)	5 (6.76)	0.00	0.992
Ovarian cyst	8 (4.85)	4 (4.40)	4 (5.41)	-	>0.99
Cervical polyp	1 (0.61)	1 (1.10)	0 (0.00)	-	>0.99
Nabothian cyst	1 (0.61)	1 (1.10)	0 (0.00)	-	>0.99

Data presented as a number (percentage). Chi-square test for independence was used where expected frequencies ≥5; Fisher's exact test was used otherwise. P<0.05 is considered statistically significant. Abbreviations: n - number; % - percentage; X^2 - Chi-square statistic; P - p-value; PCO - polycystic ovaries.

Abnormal laparoscopic results were present in around half of the population, with a normal pelvis observed in 50.91%. Tubal obstruction occurred in 18.79% of women, and peritubal adhesions were more common in SI (18.92%) than primary (7.69%), verging on significance (X^2 = 3.68, P = 0.055). Endometriosis affected 11.52% of women, while polycystic ovaries and pelvic inflammatory disease were reported in 8.48% and 4.24%, respectively, with no significant intergroup differences.

Table 3. Incidence of Abnormal Laparoscopic Findings

Finding	Total (N=165)	Primary Infertility (N=91)	Secondary Infertility (N=74)	X^2	P
Normal finding	84 (50.91)	47 (51.65)	37 (50.00)	0.00	0.957
One or both tubes are blocked	31 (18.79)	18 (19.78)	13 (17.57)	0.03	0.872
Hydrosalpinx	4 (2.42)	1 (1.10)	3 (4.05)	-	0.327
Peritubal cyst	5 (3.03)	1 (1.10)	4 (5.41)	-	0.175
Peritubal adhesion	21 (12.73)	7 (7.69)	14 (18.92)	3.68	0.055
Bicornuate uterus	1 (0.61)	0 (0.00)	1 (1.35)	-	0.448
Uterine fibroid	5 (3.03)	5 (5.49)	0 (0.00)	-	0.065
Ovarian cyst	7 (4.24)	4 (4.40)	3 (4.05)	-	>0.99
Endometriosis	19 (11.52)	10 (10.99)	9 (12.16)	0.00	>0.99
PCO	14 (8.48)	8 (8.79)	6 (8.11)	0.00	>0.99
Frozen pelvis	5 (3.03)	1 (1.10)	4 (5.41)	-	0.175
PID	7 (4.24)	3 (3.30)	4 (5.41)	-	0.702

Data presented as a number (percentage). Chi-square test for independence was used where expected frequencies ≥5; Fisher's exact test was used otherwise. P<0.05 is considered statistically significant. Abbreviations: n - number; % - percentage; X^2 - Chi-square statistic; P - p-value; PCO - polycystic ovaries; PID - pelvic inflammatory disease.

Hysteroscopic examination revealed that 33.94% of subjects had normal uterine cavities. Endometrial polyps were the most common anomaly (32.12%), with a higher prevalence in PI (37.36%) than secondary (25.68%), but not substantially (X^2 = 2.05, P = 0.152). Cesarean section niches were only found in SI (14.86%), indicating a significant result (P < 0.001). Uterine septa were found in 9.70% of instances, but other anomalies, such as cervical stenosis (4.85%), had no significant differences.

Table 4. Incidence of Hysteroscopic Findings

Finding	Total (N=165)	Primary Infertility (N=91)	Secondary Infertility (N=74)	X^2	P
Normal cavity	56 (33.94)	31 (34.07)	25 (33.78)	0.00	>0.99
Endometritis	29 (17.58)	18 (19.78)	11 (14.86)	0.38	0.536
Cervicitis	0 (0.00)	0 (0.00)	0 (0.00)	-	-
CS niche	11 (6.67)	0 (0.00)	11 (14.86)	-	<0.001
Endometrial polyp	53 (32.12)	34 (37.36)	19 (25.68)	2.05	0.152
Cervical polyp	8 (4.85)	5 (5.49)	3 (4.05)	-	0.732
Intrauterine synechia	2 (1.21)	1 (1.10)	1 (1.35)	-	>0.99
Uterine septum	16 (9.70)	11 (12.09)	5 (6.76)	0.79	0.375
T-shaped cavity	4 (2.42)	1 (1.10)	3 (4.05)	-	0.327
Bicornuate uterus	1 (0.61)	0 (0.00)	1 (1.35)	-	0.448

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Submucous myoma	0 (0.00)	0 (0.00)	0 (0.00)	-	-
Foreign body	1 (0.61)	0 (0.00)	1 (1.35)	-	0.448
Cervical stenosis	8 (4.85)	7 (7.69)	1 (1.35)	-	0.075
Ostial micropolyp	2 (1.21)	1 (1.10)	1 (1.35)	-	>0.99
Malignancy	0 (0.00)	0 (0.00)	0 (0.00)	-	-
Short cervical canal	1 (0.61)	1 (1.10)	0 (0.00)	-	>0.99

Data presented as a number (percentage). Chi-square test for independence was used where expected frequencies ≥5; Fisher's exact test was used otherwise. P<0.05 is considered statistically significant. Abbreviations: n - number; % - percentage; X^2 - Chi-square statistic; P - p-value; CS - cesarean section.

Adhesiolysis was the most commonly performed procedure during laparoscopy (15.76% overall), with SI (24.32%) outnumbering primary (8.79%; P = 0.012). Ovarian cystectomy and endometrial implant coagulation occurred in around 3.64% of cases, but ovarian drilling was uncommon (2.42%), with no significant group differences for other procedures.

Table 5. Procedures Performed During Laparoscopy in all investigated women

Procedure Performed During Laparoscopy	Primary Infertility (N=91)	Secondary Infertility (N=74)	P
Ovarian cystectomy	3 (3.30)	3 (4.05)	>0.99
Peritubal cyst excision	1 (1.10)	1 (1.35)	>0.99
Myomectomy	0 (0.00)	0 (0.00)	-
Ovarian drilling	1 (1.10)	3 (4.05)	0.327
Adhesiolysis	8 (8.79)	18 (24.32)	0.012
Salpingectomy	1 (1.10)	1 (1.35)	>0.99
Coagulation of the endometrial implant	3 (3.30)	1 (1.35)	0.628

Data presented as a number (percentage). Fisher's exact test is used due to low expected frequencies in most categories. P<0.05 is considered statistically significant. Abbreviations: n - number; % - percentage; P - p-value.

Hysteroscopic procedures were unnecessary in 54.55% of instances. Polypectomy was the most common intervention (33.94%), with PI (38.46%) outnumbering secondary (28.38%), but the difference was not statistically significant (P = 0.232). Septum excision occurred in 9.70% of cases, and metroplasty in 2.42%, with no significant differences between groups.

Table 6. Procedures Performed During Hysteroscopy in all investigated women

Procedure Performed at Hysteroscopy	Primary Infertility (N=91)	Secondary Infertility (N=74)	P
No procedure performed	45 (49.45)	44 (59.46)	0.260
Polypectomy	35 (38.46)	21 (28.38)	0.232
Septum resection	11 (12.09)	5 (6.76)	0.375
Metroplasty	1 (1.10)	3 (4.05)	0.327
Removal of a foreign body	0 (0.00)	1 (1.35)	0.448
Fibroid resection	0 (0.00)	0 (0.00)	-
Resection of intrauterine synechia	1 (1.10)	1 (1.35)	0.99

Data presented as a number (percentage). Chi-square test for independence used where expected frequencies ≥5; Fisher's exact test used otherwise. P<0.05 is considered statistically significant. Abbreviations: n - number; % - percentage; P - p-value.

Complications occurred infrequently, affecting fewer than 7% of the population. The most prevalent condition was surgical emphysema (1.82%), followed by gaseous distention (1.21%), with bleeding, uterine perforation, bladder damage, and pelvic hematoma occurring in 0.61% of women. There were no post-anesthesia problems recorded.

Table 7. Complications in all investigated women

Complication	No. of Women n	Percentage (%)
Bleeding	1	0.61
Uterine perforation	1	0.61
Gaseous distension	2	1.21
Surgical emphysema	3	1.82
Bladder injury	1	0.61
Pelvic hematoma	1	0.61
Post-anesthesia complication	0	0.00

Data presented as number (percentage). No statistical test performed as this is descriptive data without group comparison. Abbreviations: n - number; No. - number.

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Discussion

Tubal and peritoneal abnormalities remain a principal factor in the etiology of infertility, accounting for approximately 30–35% of diagnoses among infertile couples [14]. Diagnostic laparoscopy provides direct visualization of pelvic structures and remains the most reliable technique for detecting tubal and peritoneal pathologies that can compromise fertility. However, HSG cannot identify pelvic adhesions and endometriotic implants, thus limiting its diagnostic utility in this context (15-17). Historically, laparoscopy was regarded as an essential step in the infertility workup, particularly for ruling out endometriosis and peritubal adhesions, even in cases where HSG demonstrated bilateral tubal patency with free spill of contrast.[18]

With regard to uterine assessment, hysteroscopy offers superior sensitivity in identifying intrauterine pathology and may be beneficial in women with unexplained infertility, particularly for detecting conditions that are often missed by other imaging modalities.[19]

In the current work involving 165 women with infertility, PI was present in 91 women and SI in 74. Abnormalities detected via hysteroscopy were more frequent (66.06%) than those identified through laparoscopy (49.09%). The incidence of abnormal hysteroscopic findings was nearly identical between the two groups, 65.93% in the PI cohort and 66.22% in the SI cohort. Similarly, laparoscopic abnormalities were identified in 48.35% of the PI group and 50% of the SI group, indicating comparable detection rates across both populations.

Comparable findings have been reported by Bano and co-authors, who observed abnormal laparoscopic results in 66% of cases and abnormal hysteroscopic findings in 46% [20]. Gad and co-authors reported abnormal laparoscopy in 62.9% of women with PI and 54.8% with SI, while hysteroscopic abnormalities were noted in 49.5% and 35.4% of the respective groups [21]. Kabadi and co-authors found abnormal findings in 52% of laparoscopies and 31% of hysteroscopies [22]. Similarly, Vaid and co-authors reported abnormal laparoscopy and hysteroscopy rates of 62% and 32%, respectively. Nigam and co-authors reported comparable laparoscopic findings but a lower hysteroscopy abnormality rate of 13%. Nayak and co-authors recorded abnormal laparoscopy in 33% and abnormal hysteroscopy in 20% of their study population [23-25].

Such variation across studies may be attributed to differences in sample characteristics (e.g., proportions of PI vs. SI) and the local prevalence of pelvic infections, prior surgeries, or tuberculosis-related pathology.

In the current study, tubal obstruction, peritubal adhesions, and endometriosis were the most commonly observed laparoscopic abnormalities, occurring in 18.79%, 12.73%, and 11.52% of cases, respectively. The prevalence of tubal obstruction and endometriosis was similar across both infertility types. However, peritubal adhesions were more commonly observed in the SI group (18.92%) as opposed to the PI group (7.69%), possibly due to a higher incidence of prior cesarean sections in this subgroup.

These findings are in agreement with those of Gad and co-authors, who reported pelvic adhesions and endometriosis in 41% and 30% of cases, respectively [21]. Similarly, Anusha and co-authors identified unilateral tubal obstruction in 19.3% and bilateral tubal blockage in 36.6% of women.[26]

Ovarian abnormalities were noted in approximately 12.72% of participants in this study. This finding aligns with Gad and co-authors, who reported a rate of 16% [21]. Madhuri N and co-authors observed ovarian pathology in 23% of PI cases and 9% of SI cases. Ramesh B found a prevalence of 18% in the PI group, while Kabadi and Nayak reported 15% and 8%, respectively [27-28,22,25].

The incidence of uterine fibroids and hydrosalpinx was 3.03% and 2.42%, respectively. These rates are lower than those reported by Virupakshi and co-authors, who found fibroids in 13.3% and hydrosalpinx in 5% of their study population [29].

Among hysteroscopic findings, endometrial polyps were the most frequently identified abnormality, affecting 32.12% of participants. Similar findings have been reported by Zhang and co-authors, Nayak and co-authors, and Elbareg and co-authors [30,25,31]. The second most common hysteroscopic abnormality was endometritis, which was diagnosed in 17.58% of women. Diagnosis in this study was established through endometrial biopsy. Romero and co-authors reported chronic endometritis in 15% of women undergoing in vitro fertilization, with a prevalence as high as 42% in those with recurrent implantation failure [32]. Zolghadri and co-authors hysteroscopic evidence of chronic endometritis in 57.8% of women with ≥3 recurrent pregnancy losses [33].

Uterine septum was identified in 9.70% of cases in this study, and it was more frequently seen in the PI group. Virupakshi and co-authors reported an incidence of 5.6%, while Nayak and co-authors documented a rate of 10% [29,25]. Cesarean scar niches were detected in 6.67% of the study population. This is consistent with the findings of Basma and co-authors, who reported a similar incidence of 8.3% [34].

Conclusion

A thorough assessment of infertility can be conducted safely and effectively via diagnostic HL. Many correctable pathologies in pelvis may be unfortunately missed by routine pelvic examination and imaging.

When performed by skilled professionals, particularly in women with regular ovulation, normal HSG results, and a standard semen analysis, it can be regarded as a conclusive method for assessing female infertility.

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Conflict of interest. Nil

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