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To study the role of diagnostic hysterolaparoscopy in the evaluation of infertility

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Abstract
Introduction: Infertility, affecting 10%-15% of global reproductive-age couples, stands as a complex challenge with profound societal ramifications. This study distinctively focuses on scenarios where male infertility is ruled out, emphasizing on exploration of potential female factors in the infertility.
Methodology: The research was conducted from August 2019 to May 2020, which encompasses a cohort of 45 infertile patients undergoing Diagnostic Hysterolaparoscopy (DHL). Recognized as a gold standard tool amalgamating laparoscopy and hysteroscopy, DHL provides a comprehensive visualization, thus causing early diagnosis of the cause of infertility. The study methodically explores demographic intricacies, socioeconomic parameters, and infertility durations, maintaining a balance between primary and secondary infertility cases.
Results: The investigation delves into common menstrual irregularities, ovarian factors, and discerns correlations, particularly with Anti-Mullerian Hormone (AMH). The study accentuates the pivotal role of DHL in unravelling the intricate etiology of infertility. DHL demonstrates a 95% detection rate of abnormalities, DHL emerges as a highly effective diagnostic tool. The research identifies a spectrum of causative factors, with a notable prevalence of ovarian pathologies. Post-DHL intervention, a substantial 28.9% conception rate is observed, coupled with tailored interventions significantly ameliorating patient outcomes.
Conclusion: Diagnostic Hysterolaparoscopy stands out as a cost-effective and efficacious diagnostic modality, significantly increasing the fertility rate within six months post-procedure. This research advocates the application of DHL in both primary and secondary infertility cases, underscoring its pivotal role in the comprehensive and management of infertility.

Keywords: Primary infertility, secondary infertility, diagnostic hysterolaparoscopy, hysteroscopy, laparoscopy, chromopertubation

Introduction
Infertility, a complex health issue with far-reaching social and economic implications, extends beyond its physical dimensions, profoundly impacting individuals worldwide [1]. Defined by the World Health Organization as the inability to achieve a clinical pregnancy after 12 months of regular unprotected sexual intercourse [1], infertility affects approximately 10%–15% of reproductive-age couples globally [2]. In India, the prevalence ranges from 3.9% to 16.8% [3], highlighting its significant societal impact.
While infertility can be primary (never having conceived) or secondary (failure to conceive after a previous pregnancy), the causes are diverse, with female factors (40%-55%) often taking precedence, followed by male factors (30%-40%) [4]. Despite advancements in understanding, approximately 10% of cases remain unexplained [4]. Lifestyle choices, career ambitions, environmental factors, and delayed marriage contribute to the rising incidence of infertility.
This study specifically addresses situations where male infertility has been ruled out, focusing on exploring female factors as potential causes of infertility [1]. Acknowledging infertility as a profound life crisis and social stigma, gynecologists face challenges in comprehensive diagnosis [5]. Traditional diagnostic approaches, such as pelvic examination, may not always reveal underlying abnormalities, necessitating advanced diagnostic tools [6].
Diagnostic Hysterolaparoscopy (DHL) has emerged as a gold standard tool, combining laparoscopy and hysteroscopy [7]. Laparoscopy provides a panoramic and magnified view of reproductive organs, aiding in diagnosis, therapy, and the confirmation of clinical impressions [7]. Hysteroscopy complements this by offering a safe and effective diagnostic and therapeutic alternative, allowing procedures like septal resection and polypectomy [8].

The combined approach of Hysterolaparoscopy, often referred to as the "Third eye of the Gynecologist", proves to be a safe and reliable method for infertility evaluation, with the added advantage of simultaneous therapeutic interventions [1].

This study endeavors to conduct a thorough investigation into infertility using Hysterolaparoscopy, aiming to establish a diagnosis and subsequent treatment [5]. By bridging gaps in understanding the complexities of female infertility, our research aims to contribute valuable insights for both clinicians and individuals navigating the challenges of infertility [1]. Our primary question is whether Diagnostic Hysterolaparoscopy, as a comprehensive tool, can effectively diagnose and address female infertility in cases where male factors have been ruled out, thereby enhancing the overall management of infertility [1].

Materials and Methods

Study Design: A Descriptive study was conducted to investigate the role of Diagnostic Hysterolaparoscopy in evaluating infertility patients in the Obstetrics and Gynaecology department.

Duration of Study: The study spanned from August 2019 to May 2020.

Study Setting: The study was conducted at multiple healthcare facilities.

Sample Size Calculation: The sample size (n=45) was determined using the formula $N = Z^2a \times P \times (1-Q) / d^2$, with assumptions based on Z (1.96), P (0.03), and d (0.05) [1].

Inclusion Criteria

1. Women with primary infertility.
2. Women with secondary infertility.
3. Absent male factor infertility.

Exclusion Criteria

1. Active pelvic infections.
2. Premature ovarian failure.
3. Medical or surgical disorders contraindicated for surgery or general anaesthesia.

Methods: This descriptive study included 45 infertile patients aged 20-40 years who met the inclusion criteria. Informed written consent and institutional ethics review committee approval were obtained. Preliminary studies evaluated male partners through semen analysis and VDRL. Female partners underwent a detailed evaluation, including history, physical examination, and basic blood investigations. Ultrasonography and the option of HSG and/or DHL were offered after explaining the pros and cons.

Investigations

Routine investigations

- Complete blood count with ESR.
- Fasting blood sugar.
- Blood grouping & Rh typing.
- Viral markers.
- VDRL.
- Urine routine/microscopy.
- Chest X-ray – PA view.
- Hormonal assay (TSH, FSH, LH, Serum Prolactin, AMH where required).

Ultrasound examination

- Transabdominal Ultrasound (3-5 MHZ).
- Transvaginal Ultrasound (5-7.5 MHZ).

Ultrasound machine E Saote was used to perform USG of lower abdomen in 2-Dimensions in all participants. Complete ultrasonography of lower abdomen was done to look for any pathology. Transvaginal sonography where ever required was done.

Diagnostic Hysterolaparoscopy (DHL)

The Diagnostic Hysterolaparoscopy (DHL) procedure commenced in the post-menstrual period (days 6-11). After obtaining consent, the patient underwent admission on the procedure day, followed by a pre-anaesthetic check-up.

Hysteroscopy: Under general anaesthesia, a 4mm Karl Storz Diagnostic Hysteroscope was utilized with a 30° deflection angle. Abnormalities in the vagina, ectocervix, endocervical canal, uterine cavity, and tubal ostia were examined. Operative hysteroscopes (4 mm and 2.9 mm) were used for interventions, including endometrial biopsy.

Laparoscopy: Pneumoperitoneum was created, and a 10mm Karl Storz laparoscope with a 30° deflection angle was employed. Structures such as the fallopian tube, ovaries, pelvic peritoneum, pouch of Douglas, and pelvic cavity were meticulously examined. Uterus, cul-de-sac, and ovaries were assessed for shape, size, surface, and anomalies. Chromopertubation was performed to check tubal patency by injecting methylene blue dye, visualizing spillage from the fimbrial end.

In addition to diagnosis, DHL offers therapeutic benefits, allowing concurrent procedures like fimbrioplasty, tubal cannulation, polypectomy, myomectomy, septal resection, and adhesiolysis.

Specimen and Complications: Specimens for histopathology, AFB stain, culture, or PCR were sent and findings were noted. Any complications during the procedure or postoperative period were documented. Postoperatively, patients were assessed for vital signs and discharged based on Modified Aldrette Scoring System criteria.

Data Analysis: Data was described in terms of Range, Mean, Standard Deviation (+/- SD), Median, Frequencies (number of cases) and relative frequencies (Percentages) as appropriate. All statistical calculations were done using SPSS 21 (Statistical Package for the Social Science) version statistical program for Microsoft Windows.

Observation and Results

The study included 45 infertile patients aged 20-40 years, meeting the inclusion criteria of primary or secondary infertility with absent male factor infertility. The demographic profile revealed a majority residing in urban areas (58.3% for primary and 57.1% for secondary infertility). Occupationally, working women constituted 62.5% in the primary infertility group and 66.7% in the secondary infertility group. The socioeconomic status predominantly belonged to the upper-middle class (68.9%), with variations observed between primary (58.3%) and secondary (80.9%) infertility. All patients were literate, with educational levels ranging from graduate to postgraduate. The distribution showed variations between primary and secondary

infertility groups (Table 1).

Out of the total cases (n=45), primary infertility cases were higher at 53.3%. The duration of infertility varied, with 45.8% of primary infertility cases having a duration of 1-2 years, while secondary infertility cases peaked at 2-4 years (42.9%). Menstrual cycle abnormalities were prevalent in 75.6% of cases, with Dysmenorrhea and Oligomenorrhea being the most common. Thyroid disorders indicated that 88.9% were Euthyroid, and 11.1% had Hypothyroidism. Prolactin disorders revealed that 95.6% had normal serum prolactin levels, while 4.4% had Hyperprolactinemia. The majority of patients had a normal BMI (57.8%) (Table 2).

Diagnostic Hysterolaparoscopy (DHL) was chosen by almost 50% of patients as a painless and confirmatory procedure. HSG was done in 37.8% of cases, with findings corresponding to Chromopertubation (CPT) in 37.8% of cases. Endometrial polyp was the most common abnormality in both primary and secondary infertility groups during hysteroscopy. Laparoscopic findings showed ovarian factors as the most common abnormality (62.2%). No significant differences were found between hysteroscopic and laparoscopic parameters in primary and secondary infertility groups. Out of 45 patients undergoing Chromopertubation, 80% had bilateral spill, and 6.7% had bilateral block. Variations were observed between primary and secondary infertility groups (Table 3).

Combined Hysterolaparoscopy demonstrated a better detection rate of abnormalities (95.5%) than hysteroscopy alone (37.7%) or laparoscopy alone (82.2%) (Table 4).

Following Diagnostic Hysterolaparoscopy, the conception rate was 28.9%. Various modalities, including Ovulation Induction with Timely Intercourse, Timely Intercourse only, Ovulation Induction with IUI, and referral for IVF, were employed in 35.6%, 28.9%, 26.7%, and 8.9% of cases, respectively. Significant correlations were observed between Anti-Mullerian Hormone (AMH) and ovarian PCO, indicating higher AMH in patients with ovarian PCO. Additionally, a significant correlation was noted between AMH and Endometriosis, with lower AMH in patients with Endometriosis. The cause of infertility was predominantly single-factorial (51.1%) compared to multifactorial (46.7%), with only 2.2% of cases classified as unexplained infertility. In primary infertility, multifactorial causes accounted for 58.3%, while in secondary infertility, single-factor causes accounted for 61.9% (Table 5).

These results collectively emphasize the role of Diagnostic Hysterolaparoscopy in providing comprehensive insights into the etiological factors of infertility, enabling tailored interventions for improved patient outcomes.

Table 1: Demographic Characteristics

Age Group (years)	**Total Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
20-25	9 (20%)	7 (29.2%)	2 (9.5%)
26-30	20 (44.4%)	11 (45.8%)	9 (42.8%)
31-35	13 (28.9%)	5 (20.8%)	8 (38.1%)
36-40	3 (6.7%)	1 (4.2%)	2 (9.5%)
Total	45	24	21
Socioeconomic Status	**No. of Cases**	**PI**	**SI**
Lower	0 (0%)	0 (0%)	0 (0%)
Lower middle	8 (17.8%)	4 (16.67%)	4 (19.1%)
Upper middle	31 (68.9%)	14 (58.3%)	17 (80.9%)
Upper	6 (13.3%)	6 (25%)	0 (0%)
Total	45	24	21
Type of Infertility	**No. of Cases**	**Percentage**	
PI	24	53.30%	
SI	21	46.70%	
Total	45	100.00%	

Table 2: Duration of Infertility, Menstrual Cycle Abnormalities, Serum Thyroid Levels, Serum Prolactin Levels, and BMI Group

Duration of Infertility (Years)	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
1-2 yrs	19 (42.2%)	11 (45.8%)	8 (38.1%)
2-4 yrs	18 (40%)	9 (37.5%)	9 (42.9%)
4-6 yrs	7 (15.6%)	3 (12.5%)	4 (19%)
> 6 yrs	1 (2.2%)	1 (4.2%)	0 (0%)
Total	45	24	21
Menstrual Cycle Abnormalities	**No. of Cases**	**Percentage**	
Normal	11	24.40%	
Oligomenorrhea	9	75.60%	
Menorrhagia	6		
Intermenstrual bleed	3		
Dysmenorrhea	10		
Dyspareunia	6		
Total	45	100.00%	
Serum Thyroid Levels	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
Euthyroid	40 (88.9%)	22 (91.7%)	18 (85.7%)
Hypothyroid	5 (11.1%)	2 (8.3%)	3 (14.3%)
Hyperthyroid	0 (0%)	0	0
Total	45	24	21
Serum Prolactin Levels	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
Normal	43 (95.6%)	22 (91.7%)	21 (100%)

Hyperprolactinemia	2 (4.4%)	2 (8.3%)	0 (0%)
Total	45	24	21
BMI Group	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
Underweight (< 18.5)	1 (2.2%)	0 (0%)	1 (4.7%)
Normal (18.5-24.9)	26 (57.8%)	14 (58.3%)	12 (57.2%)
Overweight (24.9-29.9)	13 (28.9%)	7 (29.2%)	6 (28.6%)
Obese (>30)	5 (11.1%)	3 (12.5%)	2 (9.5%)
Total	45	24	21

Table 3: Diagnostic Modalities Results (HSG, Hysteroscopy, Laparoscopy and CPT)

HSG Results	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**		
B/L Spill	15 (65.2%)	7 (58.3%)	8 (72.8%)		
B/L Block	6 (26.1%)	5 (41.7%)	1 (9.1%)		
U/L Block	2 (8.7%)	0 (0%)	2 (18.1%)		
Total	23	12	11		
Hysteroscopy Results	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**	**Chi-square Value**	**P-Value**
Normal	28 (62.2%)	13 (54.2%)	15 (71.4%)	1.42	0.233
Cervical Stenosis	4 (8.9%)	4 (16.7%)	0 (0%)	3.841	0.111
Endocervical Polyp	3 (6.7%)	1 (4.2%)	2 (9.5%)	0.517	0.472
Uterine Anomaly	1 (2.2%)	0 (0%)	1 (4.7%)	1.169	0.28
Endometrial Polyp	6 (13.3%)	4 (16.7%)	2 (9.5%)	0.495	0.482
Cornual Block	4 (8.9%)	3 (12.5%)	1 (4.7%)	0.828	0.363
Total	45	24	21		
Laparoscopy	**No. of cases**	**PI**	**SI**	**Chi-square value**	**P-Value**
Normal	8 (17.80%)	4 (16.7%)	4 (19%)	0	1
Uterine pathology (n=6, 13.3%)					
-Fibroid	5 (11.10%)	1 (4.2%)	4 (19%)	2.511	0.169
-Anomaly	1 (2.20%)	0 (0%)	1 (4.8%)	1.169	0.28
Tubal pathology (n=11, 24.4%)					
-PID	6 (13.30%)	3 (12.5%)	3 (14.3%)	0	1
-Tubal block (U/L, B/L)	5 (11.10%)	3 (12.5%)	2 (9.5%)	0.1	0.751
Ovarian pathology (n=28, 62.2%)					
-PCO	6 (13.30%)	4 (16.7%)	2 (9.5%)	0.495	0.482
-Dermoid cyst	6 (13.30%)	2 (8.3%)	4 (19%)	1.113	0.292
-Serous cyst	4 (8.90%)	3 (12.5%)	1 (4.8%)	0.828	0.363
Endometriosis	12 (26.70%)	9 (37.5%)	3 (14.3%)	3.086	0.101
Tubo-ovarian pathology (n=3, 6.7%)	3 (6.70%)	1 (4.2%)	2 (9.5%)	0.517	0.472
CPT	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**		
B/L SPILL PRESENT	36 (80%)	17 (70.8%)	19 (90.4%)		
B/L SPILL ABSENT	3 (6.7%)	2 (12.5%)	1 (4.8%)		
U/L SPILL PRESENT	6 (13.3%)	5 (20.8%)	1 (4.8%)		

Table 4: Combined Diagnostic Modalities

Diagnostic Modality	**Normal**			**Abnormal**		
	Total	**PI**	**SI**	**Total**	**PI**	**SI**
Hysteroscopy alone	28 (62.2%)	13 (46.4%)	15 (53.6%)	17 (37.7%)	11 (64.7%)	6 (35.3%)
Laparoscopy alone	8 (17.7%)	4 (50%)	4 (50%)	37 (82.2%)	20 (54%)	17 (46%)
Combined Hysterolaparoscopy	2 (4.4%)	1 (50%)	1 (50%)	43 (95.5%)	23 (53.5%)	20 (46.5%)
Total	45	24	21	97	54	43

Table 5: Cause of infertility, Follow-up and Outcome

Cause of Infertility	**Primary Infertility (PI)**	**Secondary Infertility (SI)**	**Total**
Single	10 (41.7%)	13 (61.9%)	23 (51.1%)
Multifactor	14 (58.3%)	7 (33.3%)	21 (46.7%)
Unexplained	0 (0%)	1 (4.8%)	1 (2.2%)
Total	24	21	45
Follow-Up	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
TI	13 (28.9%)	6 (25%)	7 (33.4%)
OI with TI	16 (35.6%)	8 (33.3%)	8 (38%)
OI with IUI	12 (26.7%)	6 (25%)	6 (28.6%)
Referred for IVF	4 (8.8%)	4 (16.7%)	0
Total	45	24	21
Outcome	**No. of Cases**	**Primary Infertility (PI)**	**Secondary Infertility (SI)**
Conceived	13 (28.9%)	8 (33.3%)	5 (23.8%)
Not Conceived	32 (71.1%)	16 (66.7%)	16 (76.2%)
Total	45	24	21

Discussion

The study was conducted on 45 infertile patients who were admitted under Obstetrics and Gynaecology department. The aim was to diagnose the cause of infertility by Diagnostic Hysterolaparoscopy and treat the cause wherever possible.

The age distribution revealed a notable concentration of primary infertility patients (45.8%) in the 26-30 age group, aligning with Nanaware *et al.* [9] findings. Similarly, the most prevalent age group for secondary infertility was 26-30 years, consistent with Shah *et al.* [10] and Haider *et al.* [11]. A comparative overview in Table 6 illustrates the concordance of age distribution patterns across various studies. The socioeconomic status, the majority of cases in our study belonged to the upper-middle class, with 58.3% and 80.9% of patients in the primary and secondary infertility groups, respectively. Examining the type of infertility, our study exhibited a balanced distribution, with 53.3% primary infertility cases and 46.7% secondary infertility cases. This aligns closely with the proportions observed in studies by Zhang *et al.* [12], Shah *et al.* [10], Chanu *et al.* [13], and Kale *et al.* [7], as summarized in Table 6.

In terms of body mass index (BMI), the majority of patients in both primary (58.3%) and secondary (57.2%) infertility groups fell within the normal BMI range [13]. These percentages are comparable to the findings of Chanu *et al.* [13], who reported normal BMI rates of 77.3% in primary infertility and 63.5% in secondary infertility.

Examining the distribution of infertility types in our study, 53.3% of cases were attributed to primary infertility, while 46.7% were classified as secondary infertility. These figures closely align with the findings of previous studies, including Kale *et al.* [7] (60% primary, 40% secondary), Chanu *et al.* [13] (58.3% primary, 41.7% secondary), Shah *et al.* [10] (60% primary, 40% secondary), and Zhang *et al.* [12] (53.8% primary, 46.2% secondary), (Table 7).

Regarding the duration of infertility, our study identified that 45.8% of primary infertility cases had a duration of 1-2 years, while the majority of secondary infertility cases (42.9%) experienced infertility for 2-4 years.

Common menstrual abnormalities in our study included Dysmenorrhea, Oligomenorrhea, and Menorrhagia, aligning with observations made by Mali *et al.* [14]. This consistent pattern enhances our understanding of the prevalence of these abnormalities in the context of infertility (Table 7).

In almost 50% of the cases, patient directly opted for Diagnostic Hysterolaproscopy (instead of HSG) considering it as definitive procedure. In both our and Rizvi *et al.* [15] study groups, percentage of cases having bilateral block in primary infertility group on HSG were comparable. Rizvi *et al.* [15] study group had 39% bilateral block in primary infertility groups whereas in our study, it was 41.7%.

The prevalence of normal hysteroscopic findings in the secondary infertility group in our study aligns closely with the observations in Sharma *et al.* [1] and Nanaware *et al.* [9]. Specifically, our study revealed that 50% of patients in the secondary infertility group exhibited normal findings, whereas Rathore *et al.* [14], Chanu *et al.* [13], Mehta *et al.* [16], and Sharma *et al.* [1] reported a higher incidence, ranging from 81% to 92% of normal findings.

Cervical stenosis, a condition detected in 16.7% of primary infertility patients in our study, was notably rare, with only a 1.1% incidence reported in the study by Chanu *et al.* [13]. Endocervical polyps were identified in 4.2% and 9.5% of primary and secondary infertility groups, respectively, in our investigation. Notably, the occurrence of uterine anomalies in the secondary infertility group was 4.7% in our study, contrasting with the absence of anomalies reported in the secondary infertility groups of Nanaware *et al.* [9] and Sharma *et al.* [1].

Furthermore, the prevalence of endometrial polyps was higher in the primary infertility group in our study, although the incidence was comparable between primary and secondary infertility groups in studies by Sharma *et al.* [1], Mehta *et al.* [16], Ramesh B *et al.* [8], and Begum *et al.* [17]. Additionally, the incidence of cornual block in the secondary infertility group was 4.7%, resembling findings in studies by Ramesh *et al.* [8], Sharma *et al.* [1], and Madhuri *et al.* [6] (Table 8).

Our current investigation revealed normal laparoscopic findings in 16.7% of primary and 19% of secondary infertility cases, aligning closely with Nanaware *et al.* [9]. In contrast, Madhuri *et al.* [6], Chanu *et al.* [13], and Sharma *et al.* [13] reported higher percentages of normal laparoscopic findings, ranging from 30% to 62.5% in primary infertility and 33.6% to 52.8% in secondary infertility groups. The incidence of fibroid uterus detected through laparoscopy in primary infertility cases matched with Nanaware *et al.* [9] (4.2% vs. 2.9%), while in secondary infertility, our findings were consistent with Zhang *et al.* [12]. No uterine anomalies were observed in the primary infertility group of our study, but 4.8% were identified in the secondary infertility group, akin to findings in the study by Shobha D *et al.* [18].

Pelvic inflammatory disease (PID) was identified as a cause of infertility in 12.5% of primary and 14.3% of secondary infertility cases in our study, representing a lower prevalence compared to Zhang *et al.* [12] and Chanu *et al.* [13]. Tubal block was found in 9.5% of secondary infertility cases, closely resembling the 7.7% reported in the study by Puri *et al.* [19]. The incidence of polycystic ovary syndrome (PCOS) in our study was 16.7% in primary and 9.5% in secondary infertility cases, consistent with the findings of Puri *et al.* [19], although Mohapatra P *et al.* [20] reported a nearly twofold higher incidence. Dermoid cysts were identified in 8.3% and 19% of primary and secondary infertility cases, respectively, aligning with Chimote *et al.* [6]. Serous cysts were found in 12.5% and 4.8% of primary and secondary infertility cases, respectively, closely corresponding to the percentages reported by Puri *et al.* [19]. Endometriosis was prevalent in 37.5% of primary infertility cases, comparable to the rates observed by Chimote *et al.* [6] and Zhang *et al.* [12], while in secondary infertility, our findings matched closely with Nanaware *et al.* [9]. Tubo-ovarian pathology was present in 4.2% and 9.5% of primary and secondary infertility cases, respectively, in concordance with Sharma *et al.* [1] (Table 9).

In our current investigation, bilateral positive spill was observed in 70.8% of primary and 90.4% of secondary infertility cases, consistent with Mehta *et al.* [16]. Notably, Mehta *et al.* [16] reported a higher proportion in primary infertility (81%) compared to secondary infertility (78%). The incidence of bilateral negative spill (bilateral block) in our study was 12.5% in primary and 4.8% in secondary infertility, indicating a reverse pattern compared to Rathore *et al.* [21]. Unilateral block was identified in 20.8% of primary and 4.8% of secondary infertility cases, aligning with findings from Chanu *et al.* [13] and Ramesh B *et al.* [8].

Within our study group, the predominant cause of infertility was single factorial (51.1%), surpassing multifactorial causes (46.7%), with only 2.2% classified as unexplained infertility. This distribution was consistent in primary infertility, where multifactorial and single-factor causes accounted for 58.3% and 41.7%, respectively. In secondary infertility, single and

multifactorial causes were predominant, constituting 61.9% and 33.3%, respectively (Table 10).

In our study, Diagnostic Hysterolaparoscopy (DHL) proved highly effective, providing a conclusive cause of infertility in approximately 95% of cases. This comprehensive diagnostic approach surpassed the individual contributions of hysteroscopy or laparoscopy alone, echoing the findings of Sharma *et al.* [1], who achieved a diagnostic success rate of 91.7%. Following DHL, personalized modalities for conception were implemented for the patients. Comparing this to the outcomes reported by Puri S *et al.* [19], where 28.2% of patients conceived and 71.8% did not, our study exhibited a comparable trend, with a conception rate of 28.9% and a non-conception rate of 71.1%.

Table 6: Comparison of present study age-distribution and socio-economic status with literature

Age distribution				
Study	**Year**	**No. of cases**	**PI (% of cases)**	**SI (% of cases)**
Nanaware *et al.* [9]	2016	85	26-30 (35.8%)	31-35 (38.3%)
Shah *et al.* [10]	2017	50	21-25 (66.6%)	26-30 (70%)
Haider *et al.* [11]	2010	30	18-25 (55.5%)	26-33 (66%)
Present study	2020	45	26-30 (45.8%)	26-30 (42.8%)
Socio-economic Status				
Study	**Year**		**PI**	**SI**
Kale PS *et al.* [7]	2018		60%	40%
Chanu *et al.* [13]	2018		58.3%	41.7%
Shah *et al.* [10]	2017		60%	40%
Zhang *et al.* [12]	2014		53.8%	46.2%
Present study	2020		53.3%	46.7%

Table 7: Comparison of menstrual cycle abnormalities and BMI with Mali K. *et al.* and Chanu *et al.* with present study

Menstrual Cycle	**Mali K *et al.* [5] (2016)**	**Present Study (2020)**
Normal	46%	24.40%
Oligomenorrhea	26%	20%
Menorrhagia	8%	13.30%
Intermenstrual Bleeding	-	6.60%
Dysmenorrhea	14%	22.20%
Dyspareunia	-	13.30%
Hypomenorrhea	6%	-
BMI	**Chanu *et al.* [13] (2018)**	**Present Study (2020)**
	PI	**SI**
Underweight	2.30%	1.60%
Normal	77.30%	63.50%
Overweight	7.90%	14.80%
Obese	12.50%	20.60%

Table 8: Hysteroscopic Findings in literature and present study

Study	**Year**		**Normal**	**Cervical stenosis**	**Endocervical polyp**	**Uterine anomaly**	**Endometrial polyp**	**Cornual block**
Rathore L *et al.* [14]	2019	PI	83%	-	-	6.4%	5.6%	-
		SI	78%	-	-	20.8%	11.3%	-
Madhuri N *et al.* [22]	2019	PI	74%	-	-	7%	8%	1.5%
		SI	55%	-	-	9%	18%	4%
Gandotra N *et al.* [23]	2019	PI	-	-	-	3%	7.5%	11.9%
		SI	-	-	-	6.1%	6.1%	12.1%
Chanu E *et al.* [13]	2018	PI	92%	1.1%	-	0%	2.3%	-
		SI	85.7%	0%	-	6.4%	1.8%	-
Nanaware *et al.* [9]	2016	PI	70.1%	-	-	7.5%	2.9%	4.5%
		SI	66.7%	-	-	0%	5.6%	0%
Sharma *et al.* [1]	2016	PI	81.2%	-	-	6.2%	6.7%	0%
		SI	72.2%	-	-	0%	8.3%	5.6%
Mehta *et al.* [16]	2016	PI	83%	-	-	9%	5%	-
		SI	78%	-	-	12%	5%	-
Ramesh B *et al.* [8]	2016	PI	-	-	-	16%	12.8%	6.4%
		SI	-	-	-	15.3%	12.3%	4.6%
Begum J *et al.* [17]	2015	PI	-	-	-	53.3%	26.6%	20%
		SI	-	-	-	38.4%	23%	30.7%
Present study	2020	PI	54.2%	16.7%	4.2%	0%	16.7%	12.5%
		SI	71.4%	0%	9.5%	4.7%	9.5%	4.7%

Table 9: Laparoscopic findings

Study	Year		Normal	Fibroid	Uterine Anomaly	PID	Tubal block	PCO	Dermoid cyst	Serous cyst	Endometriosis	To Pathology
Madhuri N *et al.* [22]	2019	PI	35%	14%	3%	-	-	6.7%	-	13.5%	19%	-
		SI	30%	9%	0%	-	-	0%	-	0%	18%	-
Chanu *et al.* [13]	2018	PI	62.5%	7.9%	2.3%	37.5%	-	-	-	-	9%	-
		SI	52.8%	4.8%	0%	38.1%	-	-	-	-	9.6%	-
Nanaware *et al.* [9]	2016	PI	16.4%	2.9%	4.5%	-	-	10.4%	-	-	5.9%	-
		SI	16.7%	0%	0%	-	-	11.1%	-	-	11.1%	-
Sharma *et al.* [1]	2016	PI	40.6%	0%	4.7%	3.1%	3.1%	23.4%	-	0%	9.4%	4.7%
		SI	33.3%	8.3%	0%	2.8%	19.5%	0%	-	2.8%	2.8%	11.1%
Mohapatra P *et al.* [20]	2015	PI	-	10%	10%	1.7%	6.7%	25%	-	3.3%	16.5%	-
		SI	-	15%	0%	7.5%	17.5%	20%	-	2.5%	10%	-
Chimote A *et al.* [6]	2015	PI	13%	2%	7%	-	4%	26%	7%	-	33%	-
		SI	11%	6%	6%	-	12%	12%	1.6%	-	29%	-
Puri S *et al.* [19]	2015	PI	-	-	-	4.1%	29.2%	22%	-	12.5%	8.3%	4.1%
		SI	-	-	-	7.7%	7.7%	11.5%	-	7.7%	26.9%	3.8%
Zhang E *et al.* [12]	2014	PI	7%	12.7%	-	59.2%	-	5.6%	-	-	35.2%	-
		SI	14.8%	18%	-	59%	-	4.3%	-	-	22.9%	-
Shobha D *et al.* [18]	2014	PI	40.5%	10.1%	3.8%	3.8%	2.5%	18.9%	-	3.8%	6.3%	-
		SI	0%	9.5%	4.8%	19%	0%	0%	-	9.5%	0%	-
Present study	2020	PI	16.7%	4.2%	0%	12.5%	12.5%	16.7%	8.3%	12.5%	37.5%	4.2%
		SI	19%	19%	4.8%	14.3%	9.5%	9.5%	19%	4.8%	14.3%	9.5%

Table 10: Chromopertubation Findings

Study	Year	Bilateral spill +ve		Bilateral spill -ve		Unilateral spill +ve	
		PI	SI	PI	SI	PI	SI
Rathore L *et al.* [14]	2019	84.4%	56.7%	6.4%	26.4%	8.8%	16.9%
Madhuri N *et al.* [22]	2019	79%	66%	8%	9%	11%	23%
Gandotra N *et al.* [23]	2019	94%	66.7%	6%	21.2%	0%	12.1%
Chanu *et al.* [13]	2018	37.4%	54%	41%	33.3%	21.6%	12.7%
Nanaware *et al.* [9]	2016	77.6%	61.1%	8.9%	11.1%	13.4%	16.7%
Mehta *et al.* [16]	2016	81%	78%	9%	12%	10%	10%
Ramesh B *et al.* [8]	2016	72%	73.8%	13.6%	13.9%	14.4%	12.3%
Begum J *et al.* [17]	2015	59.2%	61.8%	29.5%	25.5%	11.3%	12.7%
Nayak *et al.* [24]	2013	81%	77%	9%	13%	10%	10%
Present study	2020	70.8%	90.4%	12.5%	4.8%	20.8%	4.8%

Conclusion

Following Diagnostic Hysterolaparoscopy (DHL) in 45 patients within the Obstetrics and Gynaecology department, key observations were made. Primary infertility cases slightly outnumbered secondary infertility (24 vs. 21), with the majority falling in the 26-30 age group (20/45) and upper middle-class bracket (31/45). The most common durations were 1-2 years for primary infertility (11/24) and 2-4 years for secondary infertility (9/21), often associated with prior abortion or ectopic pregnancy. Dysmenorrhea prevailed among menstrual abnormalities. Medical disorders like hypothyroidism (5/45) and hyperprolactinemia (2/45) were rare. Normal BMI was predominant (26/45), and nearly 50% opted for DHL over HSG. Notable hysteroscopic findings included endometrial polyps (6/45). Laparoscopy revealed ovarian pathology in most cases (28/45). Chromopertubation confirmed bilateral spill in 36 patients. Comparing HSG and Chromopertubation, congruent findings were noted in 17 cases. In primary infertility, multifactorial causes were common (14/24), while secondary infertility often had a single cause (13/21).

Combined Hysterolaparoscopy detected abnormalities in 43 cases, surpassing individual procedures. The study identified a positive correlation between Anti-Mullerian Hormone (AMH) and Antral Follicle Count (AFC). Post-surgery, ovulation induction and timed intercourse were common, with 13 intrauterine pregnancies recorded. Significant correlations were found between ovarian polycystic morphology, AMH values, and Endometriosis. The study concludes that Hysterolaparoscopy effectively diagnoses and treats causes in almost 95% of cases, recommending its use as a standalone diagnostic procedure for both primary and secondary infertility.

Post DHL, the fertility rate is notably high in the first six months. The procedure's direct visualization of the reproductive system provides confidence in treatment decisions. Additionally, DHL proves economical compared to medical therapy without a known cause. Hence, we should keep a low threshold in offering DHL to both primary and secondary infertility groups.

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