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Original Research Article

A hospital-based study of hysteroscopic and laparoscopic findings in infertility cases among rural and urban female population of southern Rajasthan

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ABSTRACT

Background: Infertility affects millions worldwide and presents significant medical and psychological challenges. This study assesses the diagnostic role of hysteroscopy and laparoscopy in infertile women from rural and urban Southern Rajasthan.
Methods: A hospital-based descriptive study of 130 women aged 21-40 years with infertility (primary or secondary) was conducted. All patients underwent diagnostic hysteroscopy and laparoscopy with Chromopertubation. Data was analyzed using Jamovi software.
Results: 62.5% had primary infertility, 37.5% had secondary. Laparoscopy revealed ovarian pathology in 56.25%, tubal in 48.34%, uterine in 15.62%, and adhesions in 18.75%. Hysteroscopy revealed uterine abnormalities in 12.5%.
Conclusions: Combined hysteroscopy and laparoscopy enhance the diagnosis of female infertility and help guide treatment, "especially in underserved populations".

Keywords: Diagnostic endoscopy, Hysteroscopy, Infertility, Laparoscopy, Reproductive health

INTRODUCTION

Infertility is a condition of global significance, affecting an estimated 60–80 million couples worldwide. The World Health Organization (WHO) defines infertility as the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.[1] It is not only a medical disorder but also a major social and psychological burden, especially in developing countries like India where childbearing is culturally valued. Globally, the prevalence of infertility is estimated to be between 8-12%, with significant regional variation. In India, recent community-based studies estimate the prevalence of primary infertility to range from 3.9% to 16.8%.

The burden of infertility has risen due to various factors such as delayed marriage and conception, increased incidence of polycystic ovarian syndrome (PCOS), obesity, stress, sexually transmitted infections, and lifestyle factors. In many cases, infertility leads to significant psychological stress, marital discord, and social exclusion, especially for women, who are often solely blamed for the couple's inability to conceive.

Infertility is broadly classified into: Primary infertility: When a woman has never conceived despite cohabitation and regular unprotected sexual intercourse for at least one year; Secondary infertility: When a woman has previously conceived but is now unable to conceive again.

The causes of female infertility are diverse and include: 1) Ovulatory dysfunction (25-40%)-common in PCOS, hypothyroidism, hyperprolactinemia. 2) Tubal damage (30–40%)-caused by pelvic inflammatory disease, postabortal or puerperal infections, and genital tuberculosis, 3) Endometriosis (10-15%)-contributes to infertility by causing adhesions and distortion of pelvic anatomy, 4) Uterine factors (10-15%)-fibroids, intrauterine adhesions (Asherman's syndrome), polyps, congenital anomalies like septate or bicornuate uterus, 5) Cervical factors and unexplained infertility (10-20%)-where standard investigations fail to detect any anomaly.

In India, genital tuberculosis remains a significant cause of tubal infertility, especially in rural populations.[2] Pelvic infections following home deliveries, unsafe abortions, or untreated STIs further contribute to tubal and peritoneal pathologies.

Role of endoscopy in infertility evaluation

Conventional imaging like ultrasonography and hysterosalpingography (HSG) can detect gross abnormalities but often miss peritoneal, tubal, and subtle intrauterine pathologies. Hence, hysteroscopy and laparoscopy are considered gold standards in infertility evaluation.

Laparoscopy enables direct visualization of the uterus, ovaries, fallopian tubes, and surrounding structures. It can assess tubal patency using chromopertubation and detect conditions like endometriosis, pelvic adhesions, hydrosalpinx, and congenital anomalies. Additionally, therapeutic interventions like adhesiolysis, ovarian drilling, or cystectomy can be performed in the same sitting.[4]

Hysteroscopy allows inspection of the uterine cavity, endometrial lining, and tubal ostia. It is invaluable in identifying intrauterine adhesions, polyps, submucous fibroids, and septate uterus. It is both diagnostic and therapeutic simple procedures like polypectomy or synechiolysis can be completed simultaneously.[5]

Multiple studies have confirmed the utility of combined hysteroscopy and laparoscopy in women with unexplained infertility or after failed intrauterine insemination (IUI) attempts. The combination increases diagnostic yield and reduces the need for multiple interventions.

Challenges in rural and urban populations

According to the National Family Health Survey (NFHS), while urban women may have greater access to healthcare services, rural women face compounded challenges due to delayed diagnosis, sociocultural stigma, lack of awareness, and limited availability of fertility specialists and equipment.

Need for the present study

Despite increasing availability of diagnostic modalities, many women especially in underserved regions like Southern Rajasthan undergo multiple treatment cycles without definitive diagnosis. A structured, endoscopy-based evaluation helps identify correctable lesions early and guides appropriate management.

This study was undertaken to analyze the laparoscopic and hysteroscopic findings in infertile women presenting at a tertiary care center and to compare the etiological spectrum among rural and urban populations. This may help bridge the diagnostic gap and suggest improved strategies for infertility evaluation and management.

This study aimed to study hysteroscopic and laparoscopic findings in infertile women, to differentiate etiologies among primary and secondary infertility. Also, to compare causes of infertility between rural and urban populations and to assess the utility of diagnostic laparoscopy and hysteroscopy in clinical practice.

METHODS

This was a hospital-based descriptive cross-sectional study conducted at RNT Medical College and Hospital, Udaipur, from December 2023 to December 2024. A total of 130 infertile women aged 21-40 years were included.

Inclusion criteria

The study included women aged 21-40 years diagnosed with either primary or secondary infertility, whose partners had normal semen analysis, and who consented to undergo hysteroscopy and laparoscopy.

Exclusion criteria

Women with male factor infertility, acute pelvic infections, contraindications to laparoscopy or general anesthesia, and those with known genital tuberculosis were excluded from the study.

Procedure

All patients underwent: 1) Baseline investigations: Hemogram, hormonal profile, pelvic ultrasound, 2) HSG: To assess tubal patency, 3) Diagnostic hysteroscopy: To assess uterine cavity, septum, fibroids, adhesions, 4) Diagnostic laparoscopy: For assessment of ovaries, tubes, endometriosis, adhesions and chromopertubation for tubal patency.

Statistical analysis

The sample size was based on convenience sampling of all eligible patients during the study period; no prior statistical calculation was applied.

Descriptive statistics were used for data analysis. Comparisons between rural and urban groups were performed using the Chi-square test, with a p-value <0.05 considered statistically significant. Data analysis was performed using Jamovi statistical software.

RESULTS

Type of infertility

The majority of women (76.15%) presented with primary infertility, suggesting increased awareness and early evaluation for subfertility. Secondary infertility was less common and often linked to previous reproductive tract infections or complications, pointing to undiagnosed pelvic morbidity in the past (Table 1).

Table 1: Type of infertility (n=130).

Type of infertility	Frequency (N)	Percentage (%)
Primary	99	76.15
Secondary	31	23.85

Hysteroscopic observations

Hysteroscopy revealed a normal endometrial cavity in most women, however subtle intrauterine abnormalities were still present in nearly 15%. These included endometrial polyps, adhesions, and uterine septa lesions frequently missed on ultrasound but capable of impairing implantation. A small group also showed inconclusive findings, such as unilateral ostial non-visualization, emphasizing the diagnostic precision hysteroscopy offers over conventional imaging (Table 2).

Laparoscopic findings

Laparoscopy detected pelvic abnormalities in over 40% of cases, highlighting conditions that routine investigations may overlook. Tubal disease was the most common finding, often in asymptomatic women, reflecting a hidden burden of pelvic inflammation. Ovarian abnormalities, especially polycystic ovaries and cysts, were more frequently observed in younger urban women. Uterine surface lesions and undiagnosed endometriosis or pelvic adhesions added to the diagnostic value of laparoscopy in unexplained infertility (Table 3).

Table 2: Hysteroscopic findings (n=130).

Hysteroscopic finding	Frequency (N)	Percentage (%)
Normal uterine cavity	111	85.38
Endometrial polyp	3	2.31
Uterine synechiae (adhesions)	2	1.54
Septate uterus	2	1.54
Other (plaque, unilateral ostia not seen, inconclusive)	12	9.23

Table 3: Laparoscopic findings (n=130).

Laparoscopic finding	Frequency (N)	Percentage (%)
Ovarian pathology	16	12.30
Tubal pathology	18	13.84
Uterine abnormalities	10	7.69
Endometriosis/adhesions	11	8.46
Normal findings	75	57.69

Rural vs. Urban comparison

Geographical analysis revealed that rural women had a significantly higher incidence of tubal pathology likely related to delayed access to care and untreated pelvic infections. Urban women, conversely, showed a greater tendency toward ovarian dysfunction, which may be influenced by lifestyle and metabolic factors. Uterine and peritoneal abnormalities occurred at comparable rates in both populations (Table 4).

Table 4: Comparison of findings in urban and rural population (n=130).

Finding	Urban (n=88)	Rural (n=42)	Total (n=130)
Hysteroscopy: normal uterine cavity (%)	76 (86.4)	35 (83.3)	111 (85.4)
Hysteroscopy: abnormal (polyps, septum, synechiae, etc.) (%)	12 (13.6)	7 (16.7)	19 (14.6)
Laparoscopy: ovarian pathology (%)	11 (12.5)	5 (11.9)	16 (12.3)
Laparoscopy: tubal pathology (%)	8 (9.1)	10 (23.8)	18 (13.8)
Laparoscopy: uterine abnormalities (%)	7 (8.0)	3 (7.1)	10 (7.7)
Laparoscopy: endometriosis/adhesions (%)	6 (6.8)	5 (11.9)	11 (8.5)

Overall diagnostic impact

Despite many women having unremarkable findings on imaging, combined hysteroscopy and laparoscopy uncovered abnormalities in nearly half the cases. This dual-modality approach offered not only diagnostic clarification but also therapeutic potential, underscoring its value in comprehensive infertility evaluation.

Combined hysteroscopy and laparoscopy are invaluable tools in the evaluation of female infertility.

While most findings are normal, a significant proportion of women have treatable abnormalities, especially tubal and uterine pathologies.

Women from rural areas may benefit from earlier access to endoscopic evaluation.

DISCUSSION

Infertility continues to be a major public health concern globally, with unique challenges in low-resource settings like Southern Rajasthan. In our study, primary infertility was the predominant type (76.15%), similar to previous studies by Khan et al and Wankhede et al reflecting early reporting and greater concern among women who have never conceived.[6,4] This trend may also indicate improved awareness about reproductive health, especially among urban populations.

The present study underlines the value of combined laparoscopy and hysteroscopy in the evaluation of female infertility. These procedures not only enhance diagnostic accuracy but also provide the opportunity for immediate therapeutic intervention. The diagnostic yield of abnormalities on hysteroscopy was 14.6%, whereas laparoscopy revealed abnormalities in 42.3% of cases, with tubal factor infertility (13.8%) being the most frequently detected pathology. This finding aligns with Indian studies by Patel et al. and Sharma et al, which emphasize the continued burden of tubal disease due to genital tuberculosis and pelvic inflammatory disease, particularly in rural settings.[2]

A notable urban-rural disparity was observed: tubal pathology was more common in rural women (23.8%), while endometriosis and adhesions were slightly more frequent in urban women (6.8%). This suggests a difference in etiological patterns rural women are more exposed to untreated infections and unsafe obstetric practices, while urban women are more likely to experience endometriosis due to delayed childbearing, stress, and lifestyle factors. This is consistent with studies by Shokeir et al and Missmer et al who found a higher prevalence of endometriosis in educated, career-oriented women who delay conception.[8,9]

The prevalence of ovarian pathology (12.3%) in our study is comparable to findings by Shetty et al and Mahapatra et al, reinforcing the need to screen for PCOS and chocolate cysts, especially in younger women with irregular cycles.[10,11] PCOS, a major contributor to anovulatory infertility, is often underdiagnosed without laparoscopic evaluation. Where ovarian drilling can be simultaneously performed.

Hysteroscopy revealed subtle uterine abnormalities like polyps (2.31%), intrauterine adhesions (1.54%), and septate uterus (1.54%). These are clinically relevant findings, particularly in patients with secondary infertility or recurrent implantation failure. Literature supports the high sensitivity and specificity of hysteroscopy in diagnosing intrauterine lesions, often missed on HSG or ultrasound, as highlighted in the work by Shinde et al and Lasmar et al.[5,12]

An important observation is that 57.7% of women had normal laparoscopic findings, and 85.38% had normal hysteroscopic findings. This may indicate either unexplained infertility or functional abnormalities like luteal phase defect or immunological causes, which are not detectable via endoscopy. However, the benefit of endoscopy in ruling out anatomical causes and providing reassurance to patients.

Furthermore, the ability to perform chromopertubation during laparoscopy makes it the gold standard for tubal assessment, as supported by NICE and ASRM guidelines.[13] Detection of tubal blockages, delayed spill, or fimbrial pathology plays a crucial role in deciding the next steps be it surgical correction or referral for assisted reproductive techniques.

The safety profile of both procedures in our study was excellent, with no major intraoperative or postoperative complications reported. This mirrors the experience of Chimote et al, reinforcing that with proper training and infrastructure, laparo-hysteroscopy can be safely offered even in low-resource hospitals.

Our findings advocate for the early use of diagnostic hysterolaparoscopy in the infertility work-up, especially where imaging is inconclusive. This approach can potentially reduce the time to diagnosis, avoid unnecessary treatments, and improve outcomes. In a resource-constrained environment, a one-time combined diagnostic and therapeutic procedure is both cost-effective and patient-centric.

Future studies with follow-up on conception rates and assisted reproductive technologies outcomes post hysterolaparoscopy would help establish its prognostic value. Moreover, larger multicentric studies would help validate the rural-urban differences noted in our research.

This study has several limitations. First, it was a single-center study with a cross-sectional design, which may limit the generalizability of the findings. Second, we did not include follow-up data on conception rates, thereby restricting conclusions regarding long-term reproductive outcomes. Finally, cases with male factor infertility were excluded, which may limit the applicability of the results to the broader infertile population.

CONCLUSION

Combined hysteroscopy and laparoscopy are invaluable tools in the evaluation of female infertility. While most

findings are normal, a significant proportion of women have treatable abnormalities, especially tubal and uterine pathologies. “Early access to endoscopic evaluation may be especially beneficial for women from rural areas”.

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