

Original Research Article

ROLE OF HYSTEROSCOPY IN EVALUATION OF UTERINE CAVITY ABNORMALITIES IN PATIENTS OF INFERTILITY: A COMPARATIVE STUDY WITH SONOGRAPHY

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ABSTRACT

Background and Objectives: Infertility is a significant concern affecting many couples of reproductive age. This condition arises due to a myriad of factors, and relying solely on pelvic examinations may not adequately detect all infertility-related abnormalities. Therefore, there is a need for additional diagnostic and therapeutic investigations. Transvaginal Ultrasound (TVS) has emerged as a crucial initial step in assessing uterine abnormalities, although numerous studies have established hysteroscopy as the gold standard. The aim of this study was to compare the findings of transvaginal ultrasound with hysteroscopy in evaluating uterine cavity and its abnormalities in infertility patients prior to undergoing in vitro fertilization (IVF).

Methods: This prospective, hospital-based study was carried out at a tertiary healthcare facility in India. It involved a cohort of 123 patients experiencing infertility, who were assessed using transvaginal sonography (TVS) followed by hysteroscopy. Data from these evaluations were documented and subjected to statistical analysis using SPSS 20 with significance level set at 5%.

Results: The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of TVS were found to be 82.50%, 73.00%, 91.80%, 66.50%, and 80.50%, respectively. In comparison, hysteroscopy demonstrated sensitivity, specificity, PPV, NPV, and accuracy of 97.50%, 97.90%, 99.50%, 86.50%, and 92.50%, respectively. When both hysteroscopy and TVS were combined for intrauterine pathology evaluation, the values significantly increased to 98.80%, 99.80%, 99.80%, 98.00%, and 95.50%, respectively.

Conclusion: Transvaginal ultrasound serves as a sensitive, cost-effective, and non-invasive tool for detecting pelvic pathologies in infertility patients. However, hysteroscopy emerges as a more sensitive method for uterine evaluation. Combining both techniques enhances diagnostic yield in terms of sensitivity and specificity, thus improving overall diagnostic accuracy.

Key Words: Ultrasound, Infertility, Hysteroscopy, Uterus

INTRODUCTION

Achieving parenthood is a fundamental aspiration within a healthy marital and societal framework, especially in culturally vibrant nations like India, where infertility carries significant social and

psychological repercussions. Infertility, often impacting 8%–10% of couples globally, encompasses approximately 15 to 20 million cases in India alone. Given current population trends, this places a substantial burden on society. Clinically, infertility is defined as the inability to conceive after one year of unprotected intercourse, with female

factors contributing to about 40% of cases. Among these, uterine factors account for 15-20%, with conditions like polyps, fibroids, and Mullerian anomalies playing significant roles [1-6].

Assisted reproductive techniques (ART) offer hope to couples grappling with infertility. Pre-ART evaluations necessitate thorough physical and pelvic examinations to assess uterine size, shape, position, and adnexa for intrauterine pathology. However, some uterine issues require advanced diagnostic tools such as Transvaginal Ultrasonography (TVS), abdominal ultrasound, hysteroscopy, and hysterosalpingography. TVS, a cost-effective non-invasive method, allows visualization of endometrial appearance and uterine cavity details. Conversely, hysteroscopy offers direct three-dimensional views of the endometrial cavity, aiding in identifying abnormalities and enabling guided biopsies. Although both techniques are correlated, their diagnostic value can vary, leading to controversial outcomes [7-10].

In light of these considerations, this study aims to determine the optimal diagnostic approach for evaluating the uterine cavity in infertility patients before ART, with the goal of enhancing prospects for parenthood. Specifically, it compares TVS findings with hysteroscopic observations to ascertain the most effective diagnostic modality for assessing uterine cavity abnormalities in preparation for ART procedures.

MATERIAL AND METHODS

This hospital-based prospective study was conducted at the Department of Obstetrics and Gynaecology, at an Indian tertiary care institute. The study included patients with unexplained infertility for more than 3 years who were aged less than 36 years, or those with unexplained infertility for more than 1 year who were aged more than 36 years.

Additionally, patients with anovulatory cycles, failure of more than 6 cycles of ovulation induction, and women with tubal causes of infertility who had undergone tubal surgery more than 2 years ago in women under 36 years and more than 1 year ago in women over 36 years were included. Patients with known congenital uterine abnormalities, genital infections, prior normal hysteroscopic findings within the past 2 years, a history of major cervical surgery, or pelvic tuberculosis were excluded from the study.

Detailed demographic information and a complete medical history were obtained from all included patients. After a thorough general physical and systemic examination, as well as basic blood investigations, all cases underwent TVS followed by hysteroscopy in the postmenstrual phase. The uterine cavity was assessed in the midline sagittal plane during TVS, and any focal lesions were noted. Subsequently, hysteroscopy was performed on the same day using a 4 mm rigid hysteroscope.

Data were recorded in a Microsoft Excel Spreadsheet and analyzed using SPSS version 21. Statistical tests such as the chi-square test and ANOVA were employed for further analysis of the collected data.

RESULTS

In this investigation, 123 cases of infertility were analyzed to assess the efficacy of TVS combined with hysteroscopy in diagnosing infertility causes. Among the participants, 70.73% had primary infertility (PI) while 29.27% exhibited secondary infertility (SI). The foundational demographic characteristics of the subjects, such as their place of residence, religious affiliation, employment status, educational attainment, and socioeconomic levels, (Table 1).

Table 1: Sociodemographic profile of study participants

Characteristic	n	%
Age Group; years		
21-25	30	24.39
26-30	48	39.02
31-35	36	29.27
36-40	9	7.32
Occupation		
Working	77	62.60
Non-Working	46	37.40
Educational Status		
Illiterate	11	8.94
High school	14	11.38
Graduate	73	59.35
Post graduate	25	20.33
Socioeconomic status		
Lower	0	0.00
Lower middle	21	17.07
Upper middle	80	65.04
Upper	22	17.89

Among the 123 cases examined in the study, 31.71% of patients exhibited normal findings on

TVS. Furthermore, 34.15% of cases were diagnosed with endometrial polyp, and 25.20% presented with a fibroid uterus (Table 2).

Table 2: Transvaginal USG findings in study participants

TVS Findings	Primary Infertility		Secondary Infertility		Total	
	n	%	n	%	n	%
Cervical Stenosis	-	-	2	1.63	2	1.63
Separate Uterus	2	1.63	0	0.00	2	1.63
Unicornuate uterus	2	1.63	0	0.00	2	1.63
Adhesions	0	0.00	5	4.07	5	4.07
Normal	15	12.19	24	19.51	39	31.71
Submucous Fibroid	27	21.95	4	3.25	31	25.20
Endometrial Polyp	36	29.27	6	4.88	42	34.15

During the investigation, the most prevalent uterine factor identified via transvaginal sonography (TVS) in both primary infertility (PI) and secondary

infertility (SI) cases was endometrial polyps, followed by submucosal fibroids, while about 2% of patients exhibited Mullerian anomalies (Table 3).

Table 3: Uterine factors identification by TVS

Uterine factors on TVS	Primary Infertility		Secondary Infertility		Total	
	n	%	n	%	n	%
Normal	10	8.13	16	13.01	26	21.14
Endometrial Polyp	36	29.27	8	6.50	44	35.77
Submucous Fibroid	27	21.95	6	4.88	33	26.83
Adhesions	0	0.00	7	5.69	7	5.69
Cervical Stenosis	-	-	4	3.25	4	3.25
Separate Uterus	2	1.63	3	2.44	5	4.07
Unicornuate uterus	2	1.63	2	1.63	4	3.25

The predominant intrauterine pathology observed in this study through hysteroscopy was endometrial polyps, affecting 21.95% of patients with primary infertility (PI) and 8.94% of those with secondary infertility (SI). Subsequently, submucosal fibroids

were identified in 8.13% of patients with primary infertility and 1.63% of patients with secondary infertility. In addition, intrauterine adhesions were also found (Table 4).

Table 4: Hysteroscopic findings in study participants

Hysteroscopy Findings	Primary Infertility		Secondary Infertility		Total	
	n	%	n	%	n	%
Uterine Synechiae	0	0.00	0	0.00	0	0.00
Unicornuate uterus	1	0.81	-	-	1	0.81
Submucous Fibroid	10	8.13	2	1.63	12	9.76
Endometrial Polyp	27	21.95	11	8.94	38	30.89
Normal	52	42.28	20	16.26	72	58.54

The study revealed that the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and accuracy of transvaginal sonography (TVS) were 82.50%, 73%, 91.80%, 66.50%, and 80.50%, respectively. On the other hand, hysteroscopy demonstrated sensitivity, specificity, PPV, NPV, and accuracy of 97.50%,

97.90%, 99.50%, 86.50%, and 92.50%, respectively. When TVS and hysteroscopy were combined for assessing intrauterine pathologies, there was a notable increase in sensitivity (98.80%), specificity (99.80%), PPV (99.80%), NPV (98%), and accuracy (95.50%) (Table 5).

Table 5: Comparison of TVS and Hysteroscopy

Parameter	TVS	Hysteroscopy	TVS + Hysteroscopy
Sensitivity	82.50	97.50	98.80
Specificity	73.00	97.90	99.80
PPV	91.80	99.50	99.80
NPV	66.50	86.50	98.00
Accuracy	80.50	92.50	95.50

DISCUSSION

In our study, among 123 cases of infertility, primary infertility (PI) was more prevalent than secondary infertility (SI). This trend aligns with findings from studies by Kale PS *et al.* [11] and Shah *et al.* [12], where PI was more common than SI. Conversely, Zhang *et al.* [13] observed nearly equal prevalence of PI and SI. Regarding the duration of infertility, the

majority of PI cases had durations of 1-3 years, while SI cases typically spanned 4-6 years.

Regarding menstrual patterns, most patients in our study had normal cycles, followed by light flow, intermenstrual bleeding, and heavy flow. These findings are consistent with those reported by Mali *et al.* [14]. On transvaginal ultrasonography (TVS), about 22% of participants showed normal findings. Endometrial polyps were the most common

pathology, followed by submucosal fibroids. These results are in line with studies by Chayanis Apirakviriyā *et al.* [15] and Marzieh Shiva *et al.* [16], although Maryam Niknejadi *et al.* [17] reported submucosal fibroids as the most common abnormality.

In hysteroscopy, approximately 16% of SI patients had normal findings, consistent with studies by Ragni *et al.* [18], Maryam Niknejadi *et al.* [17], and Nanaware *et al.* [19]. However, Chanu *et al.* [20] reported higher rates of normal findings. Cervical stenosis was rare, observed more in SI cases in our study compared to Chanu *et al.* [20]. Uterine anomalies were found in 4% of PI cases, consistent with findings by Nanaware *et al.* [19], whereas no anomalies were seen in the SI group.

The sensitivity of TVS in our study was 82.50%, comparable to findings by Maryam *et al.* [17], Ragni *et al.* [18], and Mansoureh Vahdat *et al.* [21]. Hysteroscopy showed a sensitivity of 97.50% in detecting intrauterine abnormalities, similar to Marzieh Shiva *et al.* [16], although Abo Bakr A. *et al.* [22] and Mohammed A Kandee *et al.* [23] reported higher sensitivities.

Overall, our study's results are consistent with existing literature regarding infertility patterns, diagnostic modalities, and their sensitivities and specificities in detecting uterine abnormalities.

CONCLUSION

Infertility represents a substantial health issue impacting a considerable proportion of couples within their reproductive years. Transvaginal sonography (TVS) is recognized as a highly sensitive, cost-efficient, and non-invasive modality for the identification of pelvic pathologies among patients experiencing infertility. Specifically, when assessing uterine abnormalities, hysteroscopy is noted for its superior sensitivity. Nonetheless, an integrative approach employing both TVS and hysteroscopy significantly enhances the diagnostic accuracy, improving both the sensitivity and specificity of evaluations. This combined methodology facilitates a more comprehensive assessment, thereby optimizing the diagnostic pathway for detecting relevant uterine and pelvic conditions in infertile patients.

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