Original Article

Association of Clinical and Sonographic Findings with Laparoscopic Findings in Female Infertility

Fatematul Jannat[1], Begum Hosne Ara[2], Kamrun Naher[3], Mohammad Ariful Islam[4], Umma Habib Nadia[5]

Abstract

Background: *Infertility is a major problem affecting women's health and quality of life leading to social and psychological upsets and bringing misery and insecurity to many women. Accurate diagnosis of different pelvic pathologies has become a core part of the fertility work-up. Objective of this cross-sectional analytical study is to determine the association of clinical and sonographic findings with laparoscopic findings in female infertility.* ***Materials and Methods:*** *This study was done in the department of Obstetrics and Gynecology, Institute of Child and Mother Health (ICMH), Matuail, Dhaka, Bangladesh, during July 2017 to June 2018. A total of 112 infertile couples aged 19-45 years were included in this study. After clinical examination, all patients underwent ultrasonography (USG) and Laparoscopy. Data was summarized and then statistical analysis of the results was obtained by using SPSS V22.* ***Results:*** *Primary and secondary infertility were 66(58.9%) and 46(41.1%) respectively in the study cases. Mean age of the participants was 26.97±5.19 years in primary and 30.33±4.86 years in secondary infertility. The mean duration of infertility was 5.39±3.02 years in primary infertility and 5.28±2.49 years in secondary infertility. The test of validity of combined use of clinical and ultrasonography evaluation has the highest sensitivity of 100.0% for the diagnosis of uterine anomaly and fibroid followed by polycystic ovary 89.3%, chocolate cyst 66.7%, tubo-ovarian mass 40% and endometriosis 35%. It was observed that; clinical examination and ultrasonography are very much effective in the evaluation of female infertility and is well correlated with laparoscopic findings.* ***Conclusion:*** *It was concluded from the study that combination of clinical examination and ultrasonography can be used as an alternative to laparoscopy in the initial evaluation of infertility, especially in settings where laparoscopy is not available.*

Keywords: Infertility, Clinical findings, Ultrasonography, Laparoscopy, Pelvic organ pathology.
Received: February 19, 2025; **Accepted:** March 26, 2025
https://doi.org/10.3329/emcj.v10i2.85577

Introduction

Global estimates suggest that nearly 72.4 million couples experience fertility problems[1]. A global review of infertility, based on data from the World Fertility Survey and other sources, reported similar infertility rates across several South Asian countries - around 4% in Bangladesh, 12% in Nepal, 15% in Pakistan, 8% in India, and 4% in Sri Lanka. In industrialized nations, infertility is estimated to impact about 10-15% of couples[2]. Female-related factors contribute to 40-55% of cases, while male-related factors are responsible for 30-40%. Combined factors account for approximately 10%, and the remaining 10% have no identifiable cause. The common factor responsible for infertility in female are tubal factor, an ovulatory disorder, endometriosis, uterine and cervical factors[3].

An accurate diagnosis is crucial for successful treatment. Evaluation of the female partner typically starts with a thorough medical history and physical examination. Conducting relevant investigations in a timely and logical sequence is more important than routinely performing a series of tests. Simple, the least invasive and most predictive investigations should be performed first. Diagnostic laparoscopy is not typically included in the initial evaluation of infertility; however, numerous studies have demonstrated its effectiveness in assessing long-term infertility[4]. An ASRM committee opinion on the diagnostic evaluation for infertility in women addresses several tests and procedures, starting with a comprehensive medical, reproductive and family history, as well as a thorough physical exam. Further evaluation should be carried out in a systematic, timely, and cost-effective way to identify all contributing factors, with an initial focus on using the least invasive techniques to detect the most common causes of infertility[5].

Ultrasonography (USG) is the first-line imaging-based investigation in subfertility. It is easily accessible, fast, cost-effective, and does not involve

[1]Assistant Professor, Department of Obstetrics & Gynaecology, Eastern Medical College & Hospital, Cumilla, Bangladesh.
[2]Professor, Department of Obstetrics & Gynaecology, Dhaka Central International Medical College & Hospital, Dhaka, Bangladesh.
[3]Assistant Professor, Department of Obstetrics & Gynaecology, Eastern Medical College & Hospital, Cumilla, Bangladesh.
[4]Medical Officer, Department of Surgery, Dhaka Medical College & Hospital, Dhaka, Bangladesh.
[5]Medical Officer, Department of Obstetrics & Gynaecology, Central Medical College & Hospital, Cumilla, Bangladesh.

Adress of Correspondence: Dr. Fatematul Jannat, Assistant Professor, Department of Obstetrics & Gynaecology, Eastern Medical College & Hospital, Cumilla, Bangladesh. Mobile: 01752141817; Email: jannatimc@gmail.com

ionizing radiation; however, its effectiveness depends on the operator's skill and experience. USG can be employed to assess key parameters such as ovarian morphology and to identify structural abnormalities. It also plays a crucial role in diagnosing and evaluating the severity of acquired conditions that may contribute to subfertility, including fibroids and endometriosis. Pelvic USG is commonly performed using two primary approaches: transabdominal and transvaginal (endovaginal). Application of three-dimensional USG allows enhanced evaluation of uterine cavity configuration, which is important in congenital uterine anomalies and assessment of fibroid disease. Three-dimensional automated follicle scanning can also be utilized for follicle tracking in fertility assessments, offering enhanced accuracy and efficiency in monitoring ovarian response[6].

Laparoscopy offers valuable insights into the condition of the fallopian tubes and ovaries, the normality of the uterus, and serves as the standard method for diagnosing various pelvic pathologies such as pelvic inflammatory disease, endometriosis, pelvic congestion, and tuberculosis[7]. A diagnostic laparoscopy can be carried out as a first line of invasive investigation based on the view that it will expedite management and give the patient a better idea of prognosis. But laparoscopy is not readily available everywhere in our country and expensive, invasive and requires anesthesia which deals anxiety to the patient. So, it is not practical to do invasive procedures at an initial subfertility workup. In this case, a noninvasive diagnostic method can be used to exclude these abnormalities. Trans vaginal ultrasonography (TVS) might suit these purpose[8].

So, even though diagnostic laparoscopy is considered the gold standard in the infertility workup other alternatives which will be convenient and well accepted to the patients and relatively low cost like clinical exam and ultrasonography can be used as a part of the initial infertility workup. To determine the association between clinical and sonographic findings with laparoscopic findings in female infertility.

Materials and Methods

This cross-sectional analytic study was carried out from 1st July 2017 to 30th June 2018 in Obstetrics and Gynecology Department of Institute of Child and Mother Health (ICMH) after approval from the Ethical Clearance Committee of ICMH, Matuail, Dhaka, Bangladesh. A total of 112 infertile patients, aged from 19-45 years attending the Obstetrics and Gynecology department of ICMH were recruited in the study. Informed written consent was obtained from each patient prior to participation in the study. Patients with absolute or relative contraindication for laparoscopy e.g. cardiovascular or respiratory diseases and women whose husband's had semen abnormalities were excluded from the study.

A complete and relevant history was taken regarding menstrual abnormalities, chronic pelvic pain along with dysmenorrhea, dyspareunia, pelvic inflammatory disease (PID), septic abortion, intrauterine contraceptive device (IUCD) uses and history of any lower abdominal surgery e.g. ectopic pregnancy, ovarian cystectomy, appendicectomy etc. Clinical examinations include measurement of body mass index (BMI), per-abdominal and per-vaginal examination. On bimanual pelvic examination emphasis was given on size and mobility of uterus, tender adnexa and nodular feeling in the pouch of Douglas. A complete hormonal profile including FSH (follicle-stimulating hormone), LH (Luteinizing hormone), prolactin, progesterone, TSH (thyroid-stimulating hormone) and USG (ultrasonogram) of the pelvic organs were done before laparoscopy to see any pelvic pathology.

Diagnostic laparoscopy was performed in proliferative phase of the menstrual cycle under general anesthesia (GA). During the procedure, pelvis including uterus, fallopian tubes, ovaries, round ligaments, uterosacral ligaments, utero-vesical pouch and pouch of Douglass were inspected properly. Any abnormalities in tubes like abnormalities in length, shape and size were noted. Both ovaries were examined regarding their size, shape, thickness of peripheral follicles, evidence of ovulation, presence of endometriosis and their relationship with fimbrial end of the tubes. Uterine pathology like fibroid or any anomaly were noted. Any peritubal, periovarian and omental adhesions, tubo-ovarian masses, endometriotic deposits, presence of free fluid in the pouch of Douglas or any other pathology if present was noted. The patency of both tubes was ascertained by injecting autoclaved methylene blue dye into the uterine cavity.

Collected data were entered into a spreadsheet and analyzed using Statistical Package for the Social Sciences v22 (SPSS). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. To evaluate the diagnostic performance of clinical and sonographic assessments in predicting laparoscopic abnormalities: sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated. A p-value <0.05 was considered statistically significant.

Results

During the study period, a total of 112 patients were enrolled, of whom 66 (58.9%) had primary infertility and 46 (41.1%) had secondary infertility

(Figure-1). Table-I shows the mean age of participants was 27.02±5.51 years in primary and 30.33±4.86 years in secondary infertility. Table-II demonstrates the mean duration of infertility was 5.39±3.02 years in primary infertility and 5.28±2.49 years in secondary infertility. Table-III shows that 3 (4.5%) patients had polycystic ovary in primary infertility by clinically. More than one-third (36.4%) of patients with primary infertility and 6.5% to 8.7% of those with secondary infertility had polycystic ovaries detected by ultrasonography and laparoscopy. Endometriosis detection rates were higher with laparoscopy (18.2% in primary and 17.4% in secondary infertility) compared to clinical diagnosis (6.1%-6.5%) and ultrasonography (4.5%-4.35%). Hydrosalpinx was detected in 4.5% of primary infertility cases and 4.3% of secondary infertility cases by ultrasonography, while laparoscopy identified it in 4.5% and 6.5% of cases, respectively.

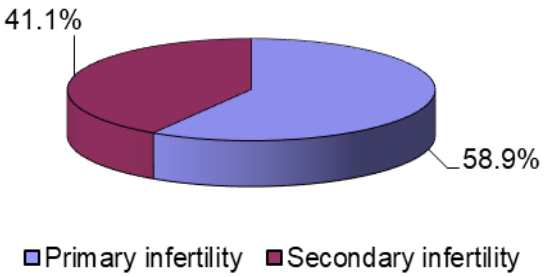

Figure-1: Pie chart showing the distribution of the types of infertility among the study participants (n=112)

Table-I: Age distribution in case of primary and secondary infertility (n=112)

Age (years)	Primary infertility (n=66)		Secondary infertility (n=46)	
	n	%	n	%
19-24	25	37.88	5	10.87
25-29	20	30.30	15	32.61
30-34	13	19.70	13	28.26
35-40	6	9.09	13	28.26
>40	2	3.03	0	0.00
Mean ± SD	27.02 ± 5.51		30.33 ± 4.86	
Range	19-44		22-40	

Table-II: Distribution of study participants based on the duration of infertility (n=112)

Duration of infertility (years)	Primary infertility (n=66)		Secondary infertility (n=46)	
	n	%	n	%
2-5	44	66.67	32	69.57
6-10	18	27.27	11	23.91
>11	4	6.06	3	6.52
Mean ± SD	5.39 ± 3.02		5.28 ± 2.49	
Range	2-17		2-12	

Table-III: Clinico-sonographic & laparoscopic findings of ovary, pouch of douglas & fallopian tube (n=112)

Parameters	Primary infertility (n=66)		Secondary infertility (n=46)	
	n	%	n	%
Clinical				
Polycystic ovary	3	4.5	0	0.0
Endometriosis	4	6.1	3	6.5
Hydrosalpinx	NA		NA	
Ultrasonography				
Polycystic ovary	24	36.4	3	6.5
Endometriosis	3	4.5	2	4.35
Hydrosalpinx	3	4.5	2	4.3
Laparoscopy				
Polycystic ovary	24	36.4	4	8.7
Endometriosis	12	18.2	8	17.4
Hydrosalpinx	3	4.5	3	6.5

Table-IV: Comparison of Hormone Levels between Study Groups with independent samples t-test (n=100)

Disease Conditions	Clinico-sonographic findings	Laparoscopic findings	
Polycystic Overy		**Positive (n=28)**	**Negative (n=84)**
	Present (n=27)	25	02
	Absent (n=85)	03	82
Chocolate Cyst		**Positive (n=9)**	**Negative (n=103)**
	Present (n=03)	03	00
	Absent (n=109)	06	103
Tubo-Ovarian Mass		**Positive (n=5)**	**Negative (n=107)**
	Present (n=02)	02	00
	Absent (n=110)	03	107
Hydrosalpinx		**Positive (n=6)**	**Negative (n=106)**
	Present (n=05)	05	00
	Absent (n=107)	01	106
Endometriosis		**Positive (n=20)**	**Negative (n=92)**
	Present (n=07)	07	00
	Absent (n=105)	13	92
Fibroid		**Positive (n=15)**	**Negative (n=97)**
	Present (n=15)	15	00
	Absent (n =97)	00	97
Uterine Anomaly		**Positive (n=3)**	**Negative (n=109)**
	Present (n=03)	03	00
	Absent (n=107)	00	109

Table-V: Sensitivity, specificity, accuracy, positive and negative predictive value of Clinico-sonographic findings of the study cases (n=112)

Clinico-sonographic findings	Sensitivity	Specificity	Accuracy	Positive Predictive Value	Negative Predictive Value
Polycystic Overy	89.2%	97.6%	95.5%	92.5%	96.4%
Chocolate Cyst	33.3%	100%	94.6%	100%	94.5%
Tubo-Ovarian Mass	40%	100%	97.3%	100%	97.2%
Hydro-Salpinx	83.3%	100%	99.1%	100%	99.1%
Endometriosis	35%	100%	88.3%	100%	87.6%
Fibroid	100%	100%	100%	100%	100%
Uterine Anomaly	100%	100%	100%	100%	100%

Table-IV shows strong agreement between clinico-sonographic and laparoscopic findings for fibroids, uterine anomalies, and polycystic ovaries. However, laparoscopy detected additional cases of endometriosis, chocolate cysts, and tubo-ovarian masses that were missed clinically, highlighting its added value in diagnosing these conditions. The clinico-sonographic findings demonstrate very high specificity and accuracy for all conditions, with fibroids and uterine anomalies showing 100% sensitivity and predictive values, while conditions like chocolate cyst and endometriosis have lower sensitivity but perfect specificity (Table-V).

Discussion

Infertility, a frequently occurring reproductive health problem, affects a large number of people worldwide[9]. In general, transvaginal ultrasonography (TVS) as a noninvasive and valuable diagnostic modality plays an important role in the evaluation of uterus and endometrial abnormalities[8]. Tubal patency is typically assessed using a combination of diagnostic methods, including hysterosalpingography (HSG), hysteroscopy (HSC), transvaginal ultrasonography (TVS) and laparoscopy[10,11]. The results of this study were analyzed and compared with existing literature in the field. Regarding types of subfertility in this study it was observed that 58.9% and 41.1% were primary and secondary subfertility respectively. Another study found primary and secondary infertility was 78.3% and 21.7% of subjects respectively[12].

In this study 37.88% of patients were 19-24 years in primary subfertility and 10.87% in secondary subfertility. The mean age was 27.02±5.51 years with ranged from 19 to 44 years in primary

subfertility and 30.33±4.86 years with ranged from 22 to 40 years in secondary subfertility Jahan et al.[13] reported a mean age of 25.68±3.81 years, with ages ranging from 18 to 35 years. Apirakviriya, et al.[12] and Mandia et al.[14] observed the average age of subjects was 34.1 years and 35.0±4.5 years respectively, which are higher than the present study. In this present study, 66.67% of patients have duration of subfertility 2-5 years in primary subfertility and 69.57% in secondary subfertility. The mean duration of subfertility was 5.39±3.02 years with ranged from 2 to 17 years in primary subfertility and 5.28±2.49 years with ranged from 2 to 12 years in secondary subfertility. Ashraf and Baqai[15] reported that 58% of patients experienced primary infertility lasting 2–5 years, while 71% had secondary infertility lasting over 5 years, with no cases of primary infertility shorter than 8 years, findings that support the present study.

Polycystic ovary is found to be the leading cause of primary subfertility. It was observed that 4.5% of patients had polycystic ovary in primary infertility by clinically. More than one-third (36.4%) of patients with primary infertility and 6.5% to 8.7% of those with secondary infertility had polycystic ovaries detected by ultrasonography and laparoscopy. Hydrosalpinx was detected in 4.5% of primary infertility cases and 4.3% of secondary infertility cases by ultrasonography, while laparoscopy identified it in 4.5% and 6.5% of cases, respectively. In the current study, clinical diagnosis identified endometriosis in 6.1% of patients with primary subfertility and 6.5% of those with secondary subfertility. Ultrasonography revealed endometriosis in 4.5% of primary subfertility cases and 4.35% of secondary subfertility cases. Laparoscopic evaluation identified endometriosis in 18.2% of patients with primary subfertility and 17.4% with secondary subfertility. Hussain and Das[16] conducted a study in Bangladesh assessing transvaginal sonography (TVS) findings in women experiencing subfertility. They found that 69% of cases had polycystic ovary (PCO), 14% had chronic pelvic inflammatory disease, 6% had fibroids, and 19% had anatomical abnormalities. Other findings included endometrial or cervical polyps (18%), free fluid in the pelvic or abdominal cavity (7%), endometritis (5%), endometriosis (4%), adenomyosis (5%), chocolate cysts (8%), tubo-ovarian masses (2%), intrauterine and intrapelvic adhesions (2%), septate uterus (2%), pelvic abscess (1%), and ectopic pregnancy (1%). Similar patterns and results have also been observed in studies conducted by Niknejadi et al[17].

The validity test of clinico-sonographic findings in the diagnosis of uterine anomaly and fibroid had sensitivity 100.0%, specificity 100.0%, accuracy 100.0% and positive predictive values 100.0% and negative predictive value 100.0%. Soares et al.[18] reported that TVS had a positive predictive value of 100% for uterine malformations detected in hysteroscopy of infertile patients, which support with the present study. In cases of fibroids Niknejadi et al.[17] observed TVS had a sensitivity of 89.2% and a specificity of 99.6%. Similarly, Loverro et al.[19] reported that TVS demonstrated 90.9% sensitivity and 100% specificity for detecting fibroids in infertile women, findings that are consistent with the current study.

Regarding the diagnosis of Hydrosalpinx, the validity test of Ultrasonography had sensitivity 83.3%, specificity 100.0%, accuracy 91.1% and positive predictive values 100.0% and negative predictive value 99.1%.%. Hussain and Das[16] found 2.0% of patients with hydrosalpinx in TVS evaluation. In this current series it was observed that the validity test of clinic-sonographic findings had sensitivity 40.0%, specificity 100.0%, accuracy 97.3% and positive predictive values 100.0% and negative predictive value 97.3% in the evaluation of tubo-ovarian mass. Choi et al.[20] study found that the sensitivity, specificity, and accuracy for tubo-ovarian complex were 88.0%, 96.0%, and 86.0%, respectively, Sensitivity of the above study is higher with the present study, but specificity and accuracy are comparable with the current study.

The present study found that clinical diagnosis of chocolate cyst had a sensitivity of 66.7% and a specificity of 100.0%. accuracy 97.3%, positive predictive values 100.0% and negative predictive value 97.2%. Similar results are observed in the validity test of ultrasonography. The combined use of clinical assessment and ultrasonography (USG) for diagnosing chocolate cysts showed a sensitivity of 66.7%, specificity of 100.0%, accuracy of 97.3%, positive predictive value of 100.0%, and negative predictive value of 97.2%

In this present study it was observed that the validity test of clinical finding had sensitivity 35.0%, specificity 100.0%, accuracy 88.4% and positive predictive values 100.0% and negative predictive value 87.6% in evaluation of endometriosis. Similarly, the validity test of ultrasonography had sensitivity 25.0%, specificity 100.0%, accuracy 86.6% and positive predictive values 100.0% and negative predictive value 86.0% in the diagnosis of endometriosis. The combined use of clinical and TVS evaluation in the diagnosis of endometriosis had sensitivity 35.0%, specificity 100.0%, accuracy 88.4% and positive predictive values 100.0% and negative predictive value 87.6%. For detection of endometriosis. Apirakviriya et al.[12] study showed 61.0% sensitivity, 91.5% specificity, 83.1% diagnostic accuracy, 73.3% positive predictive value, and 86% negative predictive value. Similar

findings also observed by Fang et al.[21] that reported sensitivity of 65.6% and specificity of 89% for TVS in detection of endometriosis, which are comparable with the present study.

Mise et al.[22] reported that the sensitivity of TVS in diagnosing fibroids and ovarian masses was 68.9% and 80.9%, respectively, with a specificity of 100% for both conditions. Diagnostic performance analysis showed transvaginal ultrasonography (94% accuracy) to be substantially more effective than clinical evaluation (70% accuracy) in identifying gynecological abnormalities. In another study Niazi[23] reported that Trans-vaginal sonography had sensitivity of 96.0%, specificity of 89.0%, positive predictive value of 97.0%, negative predictive value of 84.0%. Based on the data obtained, it can be said that USG is sensitive to fibroid, uterine anomaly, polycystic ovary and tubo-ovarian mass but not very sensitive to endometriosis.

Limitations

The study population was drawn from a single hospital in Dhaka city, which may limit the generalizability of the results to whole country. The data included results from both transabdominal and transvaginal ultrasounds, which may have affected the consistency and accuracy of the findings. Additionally, variations in the personnel performing the ultrasonogram and laparoscopy, as well as differences in the machines used, could have introduced inter-observer variability. Furthermore, the study was conducted within a limited timeframe, which may have impacted on the depth and scope of the findings.

Conclusion

Primary infertility was most common among women aged 19–24, while secondary infertility predominated in the 25–34 age group. Most patients were either asymptomatic or experienced irregular menstrual cycles. Ultrasonography showed high sensitivity in detecting uterine anomalies and fibroids (100%) and polycystic ovaries (89.3%). Clinical examinations combined with ultrasonography closely matched laparoscopic findings, indicating that ultrasonography, along with clinical assessment, is a reliable and practical alternative to laparoscopy for initial infertility evaluation, especially where laparoscopy is unavailable.

Recommendations

Future studies should include multiple hospitals from different regions to improve generalizability. Standardizing ultrasound methods by consistently using transvaginal ultrasound and ensuring all personnel are properly trained and following uniform protocols can reduce variability. Additionally, extending the study duration will also allow for more comprehensive data collection and a deeper understanding of the findings.

Conflict of interest

The authors declared that they have no conflicts of interest.

References

1. Gurunath S, Pandian Z, Anderson RA, Bhattacharya S. Defining infertility--a systematic review of prevalence studies. Hum Reprod Update. 2011; 17 (5): 575-88. doi: 10.1093/humupd/dmr015.
2. Bushnik T, Cook JL, Yuzpe AA, Tough S, Collins J. Estimating the prevalence of infertility in Canada. Hum Reprod. 2012; 27 (3): 738-46. doi: 10.1093/humrep/der465.
3. Speroff L, Fritz MA, editors. Clinical gynecologic endocrinology and infertility. 7th ed. Philadelphia: Lippincott Williams & Wilkins; 2005.
4. Fatum M, Laufer N, Simon A. Investigation of the infertile couple: should diagnostic laparoscopy be performed after normal hysterosalpingography in treating infertility suspected to be of unknown origin? Hum Reprod. 2002;17 (1): 1-3. doi: 10.1093/humrep/17.1.1.
5. Practice Committee of the American Society for Reproductive Medicine. Diagnostic evaluation of the infertile female: a committee opinion. Fertil Steril. 2015; 103 (6): e44-50. doi: 10.1016/j.fertnstert.2015.03.019.
6. Ata B, Seyhan A, Reinblatt SL, Shalom-Paz E, Krishnamurthy S, Tan SL. Comparison of automated and manual follicle monitoring in an unrestricted population of 100 women undergoing controlled ovarian stimulation for IVF. Hum Reprod. 2011; 26 (1): 127-33. doi: 10.1093/humrep/deq320.
7. Parveen SA, Khanam M. Role of combined diagnostic laparoscopy and simultaneous diagnostic hysteroscopy for evaluation of female subfertility factors. J Surg Pak (Int). 2010; 15 (1): 44–7.
8. Shalev J, Meizner I, Bar-Hava I, Dicker D, Mashiach R, Ben-Rafael Z. Predictive value of transvaginal sonography performed before routine diagnostic hysteroscopy for evaluation of infertility. Fertil Steril. 2000; 73 (2): 412-7. doi: 10.1016/s0015-0282(99)00533-6.
9. Inhorn MC, Patrizio P. Infertility around the globe: new thinking on gender, reproductive technologies and global movements in the 21st century. Hum Reprod Update. 2015; 21 (4): 411-26. doi: 10.1093/humupd/dmv016.
10. Suresh YN, Narvekar NN. The role of tubal patency tests and tubal surgery in the era of assisted reproductive techniques. Obstet

Gynaecol. 2014; 16 (1): 37-45. doi: 10.1111/tog.12070.
11. Panchal S, Nagori C. Imaging techniques for assessment of tubal status. J Hum Reprod Sci. 2014; 7 (1): 2-12. doi: 10.4103/0974-1208.130797.
12. Apirakviriya C, Rungruxsirivorn T, Phupong V, Wisawasukmongchol W. Diagnostic accuracy of 3D-transvaginal ultrasound in detecting uterine cavity abnormalities in infertile patients as compared with hysteroscopy. Eur J Obstet Gynecol Reprod Biol. 2016; 200: 24-8. doi: 10.1016/j.ejogrb.2016.01.023.
13. Jahan P, Giasuddin AS, Haq AM. Effects of metformin in reducing insulin resistance and reversing gonadotrophin levels (LH, FSH) followed by ovulation induction in infertile women with polycystic ovarian syndrome. Sri Lanka J Obstet Gynaecol. 2012; 33 (3): 98–103. doi: 10.4038/sljog.v33i3.4017.
14. Mandia L, Personeni C, Antonazzo P, Angileri SA, Pinto A, Savasi V. Ultrasound in Infertility Setting: Optimal Strategy to Evaluate the Assessment of Tubal Patency. Biomed Res Int. 2017; 2017: 3205895. doi: 10.1155/2017/3205895.
15. Ashraf MV, Baqai SM. Laparoscopy: diagnostic role in infertility. Prof Med J. 2005; 12 (1): 74-9. doi: 10.29309/TPMJ/2005.12.01.5169.
16. Hussain NB, Das RR. Transvaginal ultrasound findings among the women presenting with infertility. Chattagram Maa-O-Shishu Hosp Med Coll J. 2018; 16 (2): 31–4. doi: 10.3329/cmoshmcj.v16i2.37290.
17. Niknejadi M, Haghighi H, Ahmadi F, Niknejad F, Chehrazi M, Vosough A, et al. Diagnostic accuracy of transvaginal sonography in the detection of uterine abnormalities in infertile women. Iran J Radiol. 2012; 9 (3): 139-44. doi: 10.5812/iranjradiol.8063.
18. Soares SR, Barbosa dos Reis MM, Camargos AF. Diagnostic accuracy of sonohysterography, transvaginal sonography, and hysterosalpingography in patients with uterine cavity diseases. Fertil Steril. 2000; 73 (2): 406-11. doi: 10.1016/s0015-0282(99)00532-4.
19. Loverro G, Nappi L, Vicino M, Carriero C, Vimercati A, Selvaggi L. Uterine cavity assessment in infertile women: comparison of transvaginal sonography and hysteroscopy. Eur J Obstet Gynecol Reprod Biol. 2001; 100 (1): 67-71. doi: 10.1016/s0301-2115(01)00434-1.
20. Choi JS, Kim YH, Shin HC, Han GS, Kim IY. Transvaginal sonography of acute pelvic inflammatory disease. J Korean Soc Med Ultrasound. 1999; 18 (4): 299-304.
21. Fang L, Su Y, Guo Y, Sun Y. Value of 3-dimensional and power Doppler sonography for diagnosis of endometrial polyps. J Ultrasound Med. 2013; 32 (2): 247-55. doi: 10.7863/jum.2013.32.2.247.
22. Mise PJ, Mise SJ, Mise A, Siddappa M. Role of transvaginal sonography in various gynecological disorders. Int J Reprod Contracept Obstet Gynecol. 2017; 6 (7): 3138-42. doi: 10.18203/2320-1770.ijrcog20172949.
23. Niazi M, Kamal MM, Malik N, Farooq MA, Wahid N. Transabdominal vs transvaginal sonography - comparison in pelvic pathologies. J Rawalpindi Med Coll. 2015; 19 (3): 223-6.

Citation of this article
Jannat F, Ara BH, Naher K, Islam MA, Nadia UH. Association of Clinical and Sonographic Findings with Laparoscopic Findings in Female Infertility. Eastern Med Coll J. 2025; 10 (2): 95-101.
https://doi.org/10.3329/emcj.v10i2.85577