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RESEARCH ARTICLE

Laparoscopic Assessment of Ovarian Factors in Primary Infertility: A Prospective Observational Study

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Abstract

Background: Ovarian factors are a common cause of female infertility, yet their true prevalence and associations with pelvic pathology in primary infertility remain underreported in many regions. Laparoscopy offers direct visualisation and the opportunity for concurrent therapeutic intervention.

Objective: To determine the prevalence, laterality, and associated pelvic findings of ovarian pathologies in women with primary infertility using diagnostic laparoscopy.

Methods: This prospective observational study was conducted at Dhaka Medical College in 2024, including 100 women with primary infertility. All participants underwent standardised laparoscopic evaluation. Ovarian diagnoses, laterality, associated pelvic findings, and tubal patency were recorded. Statistical analyses included ANOVA and chi-square tests where appropriate.

Results: Polycystic ovarian morphology (PCOM) was the most common finding (43%), followed by endometrioma (32%), benign ovarian tumours (7%), and hypoplastic ovaries (7%); 11% had normal ovaries. Bilateral involvement occurred in 46.1% of abnormal ovaries, most frequently in PCOM cases. Endometrioma was significantly associated with pelvic adhesions ($p = 0.041$) and peritoneal endometriosis ($p = 0.022$). Tubal abnormalities were more common in women with adhesions (58.8% vs. 29.3%, $p = 0.018$).

Conclusion: PCOM and endometrioma are the leading ovarian pathologies in primary infertility, with a notable proportion demonstrating bilateral involvement. The association between endometrioma, adhesions, and tubal abnormalities reinforces the importance of comprehensive laparoscopic evaluation in infertility workups.

Keywords: Primary Infertility, Laparoscopy, Ovarian Pathology, Endometrioma, Polycystic Ovarian Morphology.

1. Introduction

Infertility is a significant global health concern, affecting an estimated 8–12% of couples worldwide, with female factors accounting for approximately 40–50% of cases. Among these, ovarian pathology—such as polycystic ovarian morphology, endometriotic cysts, and other structural abnormalities—plays a critical role in impairing ovulation and reducing fertility potential. Accurate identification of ovarian factors is therefore essential for tailoring management strategies and optimizing reproductive outcomes.

Laparoscopy has emerged as a gold-standard tool for the evaluation of pelvic pathology in infertility, offering both diagnostic accuracy and the potential

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for concurrent therapeutic intervention. Compared to non-invasive imaging, laparoscopy allows direct visualization of ovarian morphology, assessment of surface lesions, and identification of subtle adhesions that may be missed on ultrasound. Aziz [1] highlighted that laparoscopy not only delineates ovarian factors but also provides a comprehensive overview of other pelvic structures, aiding in holistic infertility evaluation. Similarly, Naz et al. [2] demonstrated its utility in detecting combined pathologies, emphasizing its role in cases where prior investigations are inconclusive.

Studies from diverse clinical settings have underscored the contribution of laparoscopy to identifying ovarian factors in infertility. Al-Wazzan and Jabbar [3] reported that diagnostic laparoscopy revealed significant pelvic pathology in a substantial proportion of women previously labelled as having unexplained infertility. Shetty et al. [4] and Jain et al. [5] further confirmed that laparoscopy can identify tubal and ovarian pathologies in the same sitting, making it a valuable first-line diagnostic tool in selected patients. More recent work by Kumar et al. [6] reiterates the technique's relevance, especially in resource-limited settings where maximizing diagnostic yield in a single procedure is a priority.

Despite extensive literature on laparoscopic evaluation of female infertility, relatively few studies focus specifically on the ovarian factors and their distribution in the context of primary infertility in the Bangladeshi population. Regional variations in the prevalence of specific ovarian pathologies driven by genetic, lifestyle, and healthcare access factors—necessitate local data to guide clinical practice.

The present prospective observational study was undertaken to evaluate ovarian factors contributing to primary infertility using diagnostic laparoscopy at a tertiary care centre in Bangladesh. By focusing on a homogeneous group of women with primary infertility, this study aims to quantify the prevalence of various ovarian pathologies and correlate them with clinical presentation, thereby contributing to evidence-based infertility management in the local setting.

2. Objectives

2.1 General Objective

To evaluate ovarian factors contributing to primary infertility using diagnostic laparoscopy in women attending a tertiary care centre.

2.2 Specific Objectives

1. To determine the prevalence of specific ovarian pathologies (e.g., polycystic ovarian morphology, endometriotic cysts, hypoplastic ovaries, benign ovarian tumours) among women with primary infertility.
2. To assess the laterality and extent of ovarian involvement.
3. To correlate laparoscopic ovarian findings with patients' demographic and clinical characteristics (age, body mass index, menstrual history).
4. To document any concurrent pelvic pathologies incidentally identified during laparoscopic examination.

3. Materials and Methods

3.1 Study Design and Setting

This was a prospective observational study conducted in the Department of Obstetrics and Gynaecology, Dhaka Medical College Hospital, from January to December 2024. The study included women with primary infertility undergoing diagnostic laparoscopy as part of their infertility workup.

3.2 Study Population

3.2.1 Inclusion Criteria

- Women aged 20–35 years with primary infertility (no prior conception despite ≥12 months of unprotected intercourse).
- Clinical and preliminary investigative workup indicating the need for laparoscopic evaluation.
- Normal or patent fallopian tubes on hysterosalpingography (HSG) or diagnostic laparoscopy, allowing ovarian assessment as the primary focus.

3.2.2 Exclusion Criteria

- Secondary infertility.
- Significant male factor infertility (severe oligozoospermia, azoospermia).
- Patients with contraindications to laparoscopy (e.g., severe cardiopulmonary disease, uncorrected coagulopathy).
- Known pelvic malignancy.

3.3 Sample Size

A total of 100 women meeting the inclusion criteria were enrolled consecutively over the study period.

3.4 Data Collection

Demographic and clinical data (age, body mass index [BMI], menstrual history, previous treatments) were recorded in a structured proforma.

3.5 Laparoscopic Procedure

Diagnostic laparoscopy was performed under general anaesthesia in the lithotomy position using standard sterile techniques. A pneumoperitoneum was created via Veress needle insertion, and a 10-mm trocar was introduced at the umbilicus for the laparoscope. Additional accessory ports were placed as needed. Ovarian morphology was evaluated for:

- Polycystic ovarian morphology (PCOM): Enlarged ovaries with multiple peripheral follicles and thickened stroma.
- Endometriotic cysts: Presence of chocolate-coloured cysts with or without surface adhesions.
- Hypoplastic ovaries: Small, underdeveloped ovaries with reduced follicular reserve.
- Benign ovarian tumours: Cystadenomas, dermoid cysts, or other grossly benign lesions. Laterality (unilateral/bilateral) and associated pelvic findings (tubal disease, adhesions, peritoneal endometriosis) were documented.

3.6 Outcome Measures

Primary outcome: Prevalence of specific ovarian pathologies detected laparoscopically. Secondary outcomes: Laterality of ovarian involvement and co-existing pelvic pathology.

3.7 Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26.0. Descriptive statistics were expressed as mean ± standard deviation (SD) for continuous variables and as frequencies and percentages for categorical variables. Differences in means between groups were assessed using one-way analysis of variance (ANOVA). Associations between categorical variables were tested using the chi-square test or Fisher's exact test, as appropriate. A p-value <0.05 was considered statistically significant.

4. Results

4.1 Baseline Characteristics

A total of 100 women with primary infertility underwent laparoscopic evaluation during the study period. The mean age was 27.6 ± 4.4 years, with the largest proportion (46%) between 25 and 29 years of age. The mean BMI was 25.1 ± 4.3 kg/m², with 38% of participants falling into the overweight category (BMI ≥25 kg/m²). Menstrual pattern assessment revealed that half of the cohort reported regular cycles, while oligomenorrhea was present in more than one-third (35%), and amenorrhea in 15%. The mean AMH concentration was 4.05 ± 1.51 ng/mL, consistent with the predominance of polycystic ovarian morphology in the study sample. AMH values demonstrated notable inter-individual variability, with a right-skewed distribution and higher levels in women with PCOM compared to those with normal ovaries or other pathologies.

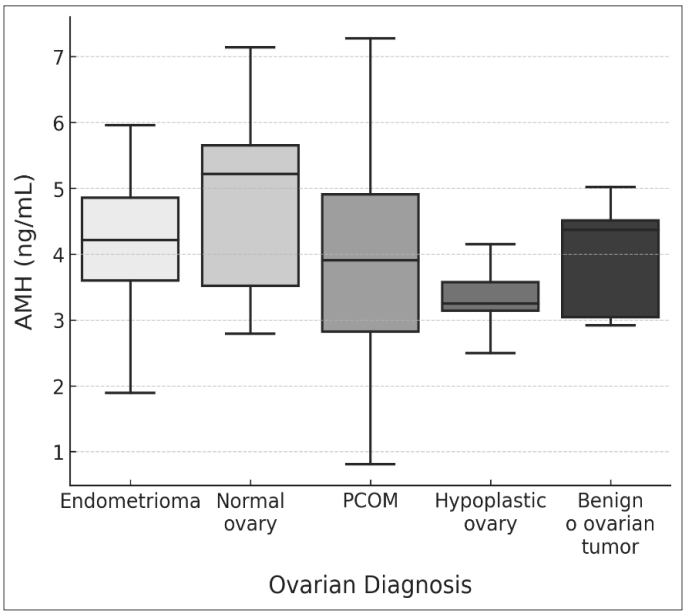

Figure 1. *Distribution of anti-Müllerian hormone (AMH) levels across ovarian diagnosis categories in women with primary infertility (n = 100). Boxes represent the interquartile range, horizontal lines indicate medians, and whiskers extend to 1.5× the interquartile range. PCOM = Polycystic ovarian morphology.*

Table 1. *Baseline characteristics of study participants*

Variable	Mean ± SD / n (%)
Age (years)	27.6 ± 4.4
BMI (kg/m²)	25.1 ± 4.3
Menstrual pattern	
– Regular	50 (50.0%)
– Oligomenorrhea	35 (35.0%)
– Amenorrhea	15 (15.0%)
AMH (ng/mL)	4.05 ± 1.51

4. 2 Laparoscopic Ovarian Findings

On laparoscopic evaluation, polycystic ovarian morphology (PCOM) was the most common finding, present in 43% of participants, followed by endometrioma in 32%. Hypoplastic ovaries and benign ovarian tumours were each observed in 7% of cases, while 11% of women had normal ovarian morphology.

Women with PCOM had significantly higher mean AMH levels (4.91 ± 1.32 ng/mL) compared to those with normal ovaries (2.67 ± 0.94 ng/mL, $p < 0.001$, ANOVA). Endometrioma cases showed mean AMH values closer to the overall cohort average (3.74 ± 1.18 ng/mL). BMI did not differ significantly across ovarian diagnosis categories ($p = 0.12$).

Table 2. *Distribution of ovarian pathologies detected on laparoscopy*

Ovarian Diagnosis	n	%
PCOM	43	43.0
Endometrioma	32	32.0
Hypoplastic ovary	7	7.0
Benign ovarian tumour	7	7.0
Normal ovary	11	11.0

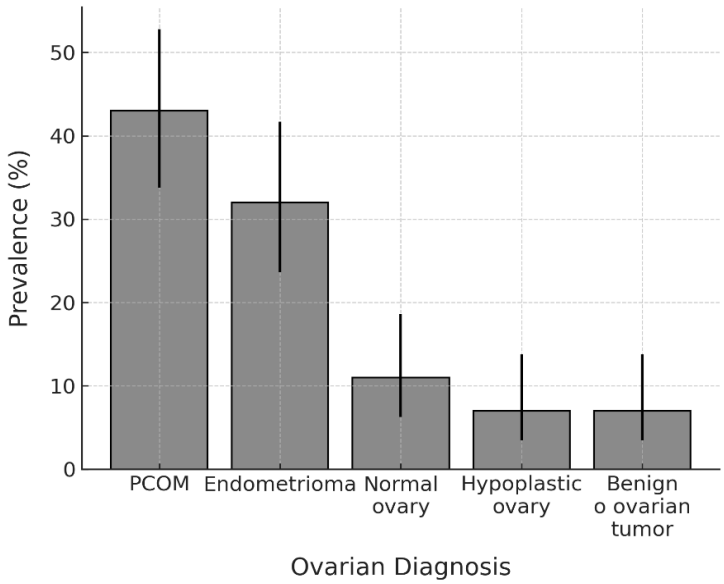

Figure 2. *Prevalence of ovarian pathologies detected on laparoscopy with 95% confidence intervals (n = 100). PCOM = Polycystic ovarian morphology. Error bars represent Wilson score confidence intervals for binomial proportions.*

4. 3 Laterality of Ovarian Involvement

Among participants with abnormal ovarian findings (n = 89), unilateral involvement was slightly more common than bilateral disease (53.9% vs. 46.1%). Endometriomas were predominantly unilateral (65.6%), whereas PCOM cases were more frequently bilateral (55.8%). Hypoplastic ovaries and benign ovarian tumours showed no consistent laterality pattern.

A chi-square test showed a statistically significant association between ovarian diagnosis and laterality ($p = 0.032$), driven primarily by the higher bilateral rate in PCOM and the unilateral tendency in endometriomas.

Table 3. *Laterality of ovarian involvement*

Laterality	n	%
Unilateral	48	53.9
Bilateral	41	46.1

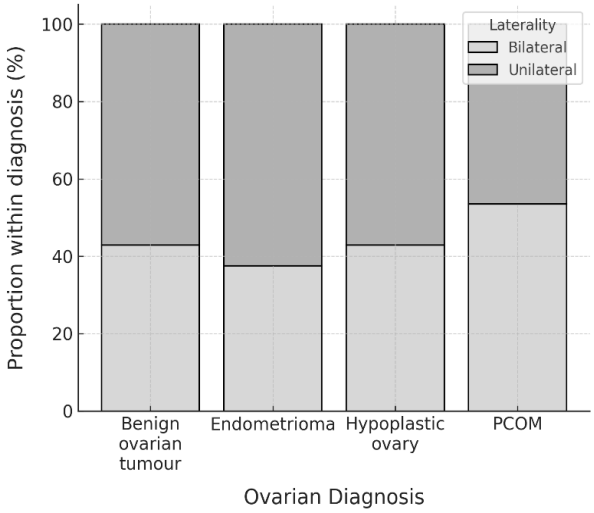

Figure 3. *Distribution of laterality of ovarian involvement by diagnosis in women with primary infertility (n = 89). Percentages are calculated within each diagnosis category. PCOM = Polycystic ovarian morphology.*

4.4 Associated Pelvic Findings

In addition to the primary ovarian diagnoses, several associated pelvic pathologies were observed during laparoscopy. Adhesions were present in 18% of participants, most frequently in those with endometrioma (28.1%) and benign ovarian tumours (28.6%). Peritoneal endometriosis was identified in 11% of cases, often coexisting with endometrioma. Peritubal adhesions were seen in 18%, with a higher prevalence among those with a history of pelvic inflammatory disease or prior pelvic surgery. A statistically significant association was found between the presence of endometrioma and both pelvic adhesions ($p = 0.041$) and peritoneal endometriosis ($p = 0.022$). No significant relationship was observed between PCOM and any of the associated pelvic findings.

Table 4. *Associated pelvic findings in women with primary infertility (n = 100)*

Finding	n	%
Adhesions	18	18.0
Peritoneal endometriosis	11	11.0
Peritubal adhesions	18	18.0

4. 5 Tubal Status

Tubal patency assessment performed during laparoscopy revealed that 62% of women had patent fallopian tubes, 25% showed delayed peritoneal spill, and 13% had unilateral or bilateral tubal block. Tubal abnormality (delayed spill or blockage) was more frequent among women with pelvic adhesions (58.8%) compared to those without adhesions (29.3%), and this association was statistically significant ($p = 0.018$).

Peritoneal endometriosis was also associated with a higher rate of tubal abnormality (54.5% vs. 34.8%), although this did not reach statistical significance ($p = 0.087$). No significant difference in tubal status was observed between PCOM and non-PCOM groups.

Table 5. *Tubal status among study participants (n = 100)*

Tubal Status	n	%
Patent	62	62.0
Delayed spill	25	25.0
Blocked	13	13.0

5. Discussion

In this prospective series of 100 women with primary infertility, laparoscopic evaluation identified polycystic ovarian morphology (PCOM) as the most common ovarian abnormality (43%), followed by endometrioma (32%). These findings are in agreement

with Wani et al., who reported PCOM in 38% and endometriotic lesions in 28% of infertile women undergoing laparoscopy in the Kashmir Valley [7]. Our slightly higher proportion of endometrioma may reflect differences in referral patterns and inclusion criteria, as our cohort excluded women with secondary infertility.

Reddy et al. also found that ovarian factors, particularly PCOM, were among the predominant contributors to infertility in their South Indian cohort [8]. Their reported prevalence of PCOM (41%) closely mirrors our findings, underscoring the consistency of this diagnosis across diverse geographic populations. Endometriomas were present in 29% of their series, again comparable to our 32%.

The distribution of laterality in our study—bilateral involvement in 46.1% of abnormal ovaries—was similar to that reported by Annan et al., who observed bilateral ovarian disease in approximately 42% of cases during laparoscopy for tubal factor infertility [9]. They, however, found a stronger association between bilateral ovarian disease and tubal pathology than we did, possibly due to their higher baseline prevalence of pelvic inflammatory disease.

Our observation of pelvic adhesions in 18% of participants aligns with the 16–22% range reported by Omokanye et al. in Nigerian women with primary infertility [10]. They also noted that adhesions frequently coexisted with endometriotic lesions, a relationship that was confirmed in our series, where endometrioma was significantly associated with both adhesions and peritoneal endometriosis ($p = 0.041$ and $p = 0.022$, respectively).

The prevalence of peritoneal endometriosis in our cohort (11%) is slightly lower than the 14% reported by Imtiaz [11], which may reflect our exclusion of secondary infertility, where endometriosis tends to be more common. Hovav et al. reported even higher rates of endometriosis—up to 21%—in a mixed infertility population [12], suggesting that population selection exerts a considerable influence on endometriosis detection rates.

Shobha et al. emphasised the utility of combined hysteroscopy and laparoscopy in detecting subtle ovarian and pelvic lesions, with ovarian abnormalities identified in over 60% of cases [13]. In our series, the ovarian abnormality detection rate was higher, at 89%, which may be attributable to the inclusion of both gross and subtle morphological changes detected intraoperatively, as well as the comprehensive visualisation possible with laparoscopy. Similarly, Nayak et al. reported ovarian factors in 54% of their retrospective series of 300 patients [14]; although lower than our figure, their rate reflects differences in study design, diagnostic thresholds, and patient selection. These comparisons support the robustness of our prevalence estimates while highlighting how methodology influences reported detection rates.

Garg et al. observed that benign ovarian tumours accounted for approximately 6% of laparoscopic findings in infertile women [15], closely matching our rate of 7%. This suggests a relatively stable baseline prevalence of benign ovarian lesions in primary infertility across populations. Jahan's study from Dhaka Medical College, conducted over a decade earlier, also reported comparable rates of benign ovarian tumours and hypoplastic ovaries, despite temporal changes in referral patterns and diagnostic technology [16].

Taken together, these comparisons indicate that our cohort's ovarian pathology profile is broadly consistent with other regional and international studies, though subtle differences likely reflect study design, case selection, and diagnostic criteria. The strong association between endometrioma and pelvic adhesions in our findings reinforces the importance of thorough laparoscopic evaluation in primary infertility, both for accurate diagnosis and for identifying potentially correctable factors that may influence fertility outcomes.

Limitations

This study was conducted at a single tertiary centre with a relatively small sample size, which may limit the generalisability of the findings. The absence of long-term follow-up prevented assessment of postoperative fertility outcomes. Preoperative imaging was not uniformly correlated with laparoscopic findings, which could influence detection rates.

6. Conclusion

In women with primary infertility, diagnostic laparoscopy remains an invaluable tool for identifying ovarian and associated pelvic pathologies that may not be apparent on non-invasive assessment. In our cohort, PCOM and endometrioma were the predominant ovarian findings, with nearly half of abnormal ovaries showing bilateral involvement. Endometrioma demonstrated a significant association with pelvic adhesions and peritoneal endometriosis, underscoring the interrelated nature of ovarian and peritoneal disease. Tubal abnormalities were common in the presence of pelvic adhesions, highlighting

the importance of comprehensive evaluation during laparoscopy. These findings support the continued role of laparoscopic assessment in the infertility workup, particularly in settings where early detection and targeted intervention may improve reproductive outcomes.

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