International Journal of Biomedicine 16(2) (2026) 178-186
http://dx.doi.org/10.21103/Article16(2)_OA4

ORIGINAL ARTICLE

INTERNATIONAL JOURNAL OF BIOMEDICINE

Laparoscopic Surgery for Benign Gynecological Conditions: Perioperative Characteristics and Short-term Outcomes at a Private Hospital in Bangladesh: A Prospective Cross-sectional Study

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Abstract

Background: Laparoscopic surgery is widely recommended for benign gynecological conditions because it minimizes surgical trauma and accelerates postoperative recovery. Prospective evidence from low- and middle-income settings, particularly detailing operative determinants and short-term outcomes, remains limited. Our objective is to describe perioperative characteristics, identify predictors of operative complexity, and evaluate short-term outcomes among women undergoing laparoscopic surgery for benign gynecological conditions at a tertiary hospital in Bangladesh.

Methods and Results: A prospective observational study was conducted at Feni PVT Hospital and Laparoscopy Institute in Bangladesh from July to September 2025. Consecutive women aged 18–70 years undergoing elective laparoscopic surgery (hysterectomy, myomectomy, ovarian cystectomy, or diagnostic laparoscopy) for benign indications were included. Demographic, clinical, intraoperative, and postoperative data were collected prospectively. Descriptive statistics summarized outcomes. Multiple linear regression identified predictors of operative time, and binary logistic regression assessed factors associated with intra-abdominal adhesions.

A total of 181 women were included, with a mean age of 42.2±9.0 years and a mean parity of 2.5±0.6. Abnormal uterine bleeding was the most frequent indication (67.4%). Mean operative time was 47.9±4.8 minutes, and estimated blood loss was <50mL in 99.4% of cases. No intraoperative complications, conversions, or transfusions occurred. All participants were discharged after one day, and 97.2% were mobilized on the day of surgery. Intra-abdominal adhesions were identified in 37.0% of cases. Increased operative time was independently associated with higher parity, comorbidities, previous surgery, abnormal uterine bleeding, and adenomyosis, while age showed a modest inverse association. Adhesions were strongly associated with prior surgery, increasing age, and uterine fibroids.

Conclusion: In this experienced center, laparoscopic surgery for benign gynecological conditions was associated with a consistent safety profile, minimal blood loss, and rapid recovery. Patient- and pathology-related factors influence operative complexity but do not compromise short-term outcomes.(**International Journal of Biomedicine. 2026;16(2):178-186.**)

Keywords: adhesions • benign gynecological conditions • laparoscopic surgery • operative time• perioperative outcomes.

For citation: Medani I. Laparoscopic Surgery for Benign Gynecological Conditions: Perioperative Characteristics and Short-term Outcomes at a Private Hospital in Bangladesh: A Prospective Cross-sectional Study.. International Journal of Biomedicine. 2026;16(2):178-186. doi:10.21103/Article16(2)_OA4

Introduction

Contemporary clinical guidelines recommend hysterectomy for benign gynecological disease via a minimally invasive route whenever feasible, supported by more than three decades of comparative evidence.[1] Randomized trials and meta-analyses consistently show that laparoscopic and vaginal hysterectomy reduce postoperative pain, febrile morbidity, and hospital stay compared with abdominal hysterectomy.[2, 3] These benefits translate into earlier mobilization, faster return to normal activity, and improved patient satisfaction within enhanced recovery pathways.

The advantages of minimally invasive surgery arise from pneumoperitoneum and optical magnification, which facilitate precise dissection and hemostasis while minimizing tissue trauma and blood loss. Smaller incisions also attenuate inflammatory and endocrine stress responses associated with laparotomy.[2,3] Limitations of conventional laparoscopy, including restricted instrument articulation and two-dimensional imaging, have driven interest in robot-assisted

surgery. Robotic platforms offer enhanced dexterity, tremor filtration, and three-dimensional visualization, potentially facilitating complex pelvic procedures.[4]However, population-based analyses have not demonstrated consistent reductions in morbidity with robotic surgery compared with conventional laparoscopy for benign indications.[5]A systematic review of more than 4,000 procedures concluded that the cost-effectiveness of robotic surgery remains unproven, supporting selective rather than routine use.[6]Large registry data reinforce the benefits of minimally invasive approaches. In over 450,000 benign hysterectomies, laparoscopic access halved transfusion requirements and reduced mortality by nearly 40% compared with abdominal hysterectomy.[7] Single-center audits similarly report lower blood loss and shorter operating times once proficiency is achieved.[8] Meta-analyses also support vaginal hysterectomy, demonstrating faster recovery and non-inferior complication rates compared with total laparoscopic hysterectomy.[9] Randomized comparisons indicate that the ergonomic advantages of robotic surgery do not translate into superior early quality-of-life outcomes relative to vaginal or laparoscopic hysterectomy.[10] These findings highlight surgeon experience and appropriate case selection as key determinants of outcome.

Similar patterns are observed in myomectomy. Randomized evidence shows that laparoscopic myomectomy results in less postoperative pain and earlier discharge than open surgery without compromising uterine integrity.[11] Cochrane reviews confirm reduced febrile morbidity, lower transfusion rates, and faster recovery following minimally invasive approaches.[12] Multicenter cohorts demonstrate reduced blood loss with laparoscopic myomectomy,[13] while laparo-endoscopic single-site surgery provides cosmetic benefits without prolonging operative time.[14] Economic analyses suggest higher costs without clear differences in clinical outcomes,[15] while matched studies report comparable fertility and symptom relief between minimally invasive and open techniques.[16] Although abdominal myomectomy is associated with longer recovery and higher adhesion-related morbidity,[17] outcomes improve with increasing minimally invasive experience,[18] and meta-analyses confirm lower febrile morbidity across all minimally invasive routes.[19,20]

Benign ovarian surgery has similarly transitioned toward minimally invasive management. Randomized trials and Cochrane reviews demonstrate reduced analgesic requirements, shorter hospital stay, and comparable complication rates with laparoscopy compared with laparotomy.[21,22] Advances such as single-port laparoscopy allow removal of large ovarian cysts (>10 cm) while preserving ovarian reserve and achieving fertility outcomes comparable to those of open surgery.[23–26] Deep infiltrating endometriosis remains technically challenging, yet minimally invasive surgery predominates. Randomized trials show faster recovery with laparoscopic compared with open colorectal resection,[27] while large series report durable pain relief and acceptable complication rates even in advanced disease.[28,29] Registry analyses attribute major complications primarily to prolonged operative time rather than surgical access.[29,30] Overall, minimally invasive surgery for benign gynecological conditions accelerates recovery and reduces morbidity but often incurs higher costs with largely comparable clinical outcomes, particularly for robotic platforms. Selective application based on patient characteristics and anatomical complexity is therefore appropriate. Accordingly, this study aims to prospectively describe perioperative characteristics, identify predictors of operative complexity, and evaluate short-term postoperative outcomes among women undergoing laparoscopic surgery for benign gynecological conditions at a tertiary private hospital in Bangladesh.

Methods

Study Design and Setting

This was a prospective, single-arm, observational study conducted from July 9 to September 8, 2025, at Feni PVT Hospital and Laparoscopy Institute in Feni District, Chattogram Division, Bangladesh (Figure 1, Table 1). The hospital is a private multidisciplinary facility providing routine inpatient and outpatient care as well as advanced minimally invasive laparoscopic gynecological services. It serves a large number of patients from Feni and neighboring areas, achieving favorable surgical outcomes with short recovery times. The institution also functions as a training center for surgeons in minimally invasive gynecological techniques. The study aimed to evaluate perioperative characteristics and short-term postoperative outcomes of women undergoing laparoscopic surgery for benign gynecological conditions.

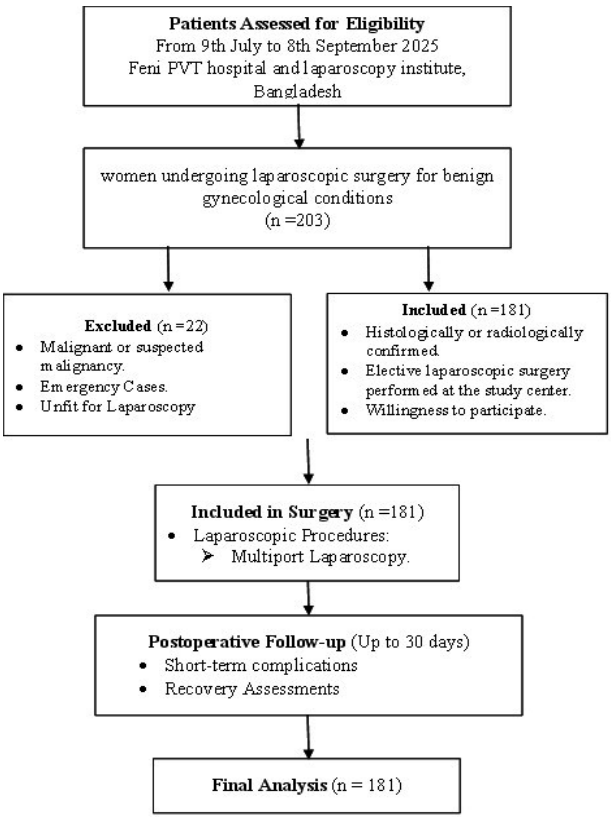

Figure 1. *A flow diagram showing patient inclusion, surgery types, and follow-up.*

Table 1.

Summarizing variables, their definitions, measurement methods, and timing.

Variable Category	Variable	Definition / Measurement	Timing	Notes
Demographic & Baseline	Age	Years, obtained from patient records	At enrollment	All participants
	Body Mass Index (BMI)	Weight (kg) / Height (m^2)	Preoperative assessment	All participants
	Parity	Number of previous births	At enrollment	All participants
	Comorbidities	Chronic conditions (e.g., diabetes, hypertension)	Preoperative assessment	All participants
Clinical Presentation	Primary Complaint	Main presenting symptom	At enrollment	All participants
	Diagnosis	Confirmed via imaging or histopathology	Preoperative assessment	All participants
	Imaging Findings	Size, number, or location of lesions	Preoperative assessment	All participants
Surgical Characteristics	Type of Laparoscopic Procedure	Multiport	Intraoperative	All participants
	Operative Time	Minutes from incision to closure	Intraoperative	All participants
	Intraoperative Blood Loss	mL measured via suction and sponge weight	Intraoperative	All participants
	Conversion to Open Surgery	Noted if conversion occurs	Intraoperative	Included as part of laparoscopic cohort
	Intraoperative Complications	Bleeding, organ injury, anesthesia events	Intraoperative	All participants
Postoperative Outcomes	Length of Hospital Stay	Days from surgery to discharge	Postoperative	All participants
	Pain Score	VAS 0–10 at 6, 12, 24, 48 hours	Postoperative	All participants
	Analgesic Requirement	Total dose of analgesics (mg)	Postoperative	All participants
	Febrile Morbidity	Temperature >38°C sustained >24 hours	Postoperative	All participants
	Wound Complications	Infection, dehiscence, seroma	Postoperative & 30-day follow-up	All participants
Follow-up Outcomes	Short-term Complications	Readmission, reoperation, other complications	30-day follow-up	All participants
	Recovery Parameters	Return to normal activity, symptom resolution	30-day follow-up	All participants

Study Population

Consecutive women aged 18–70 years undergoing elective laparoscopic surgery for benign gynecological conditions were enrolled. The primary procedures included total laparoscopic hysterectomy, laparoscopic myomectomy, laparoscopic ovarian cystectomy, and diagnostic laparoscopy with biopsy.

Inclusion criteria

- Histologically or radiologically confirmed benign gynecological pathology.
- Elective laparoscopic surgery performed at the study center.
- Willingness to participate and provide written informed consent.

Exclusion criteria

- Malignant or suspected malignant gynecological pathology.
- Emergency surgical cases.
- Previous extensive pelvic surgery making laparoscopic surgery unfeasible.
- Severe comorbidities contraindicating general anesthesia.

Sampling Technique

A total population (consecutive) sampling approach was used: all women meeting the inclusion criteria who underwent laparoscopic surgery during the study period were included in the study. No formal sample size calculation was performed, as the study aimed to capture the entire laparoscopic cohort available at the center.

Data Collection

Data were collected prospectively using a structured proforma and included:

- Demographic characteristics: age, BMI, parity, comorbidities.
- Clinical presentation: primary complaint, diagnosis, imaging findings.
- Surgical characteristics: type of laparoscopic procedure, operative time, intraoperative blood loss, intraoperative complications, conversion to open surgery (if any).
- Postoperative outcomes: length of hospital stay, postoperative pain (Visual Analog Scale at 6, 12, 24, and 48 hours), analgesic requirements, febrile morbidity, wound complications, readmissions within 30 days.
- Follow-up outcomes: short-term complications

and recovery parameters assessed up to 30 days postoperatively.

All data collection was performed by trained surgical residents and research assistants, supervised by senior gynecologists to ensure accuracy and standardization.

Surgical Procedures

- Laparoscopic surgery: Standard multiport technique was employed depending on case complexity. Pneumoperitoneum was established using a Veress needle or an open technique. Bipolar and monopolar energy devices were used for hemostasis.
- Conversion to open surgery: Cases requiring conversion were noted and analyzed as part of the laparoscopic cohort.

All procedures followed institutional perioperative protocols, including prophylactic antibiotics, thrombo-prophylaxis, and standardized anesthesia care.

Primary Outcomes

- Operative time (minutes)
- Intraoperative blood loss (mL)
- Length of hospital stay (days)

Secondary Outcomes

- Postoperative pain (VAS scores)
- Analgesic consumption
- Febrile morbidity
- Wound infection or dehiscence
- Conversion to open surgery
- Short-term complications within 30 days

Data Analysis

All data were coded with serial numbers, so personal information was removed during analysis, and privacy was maintained. Data were entered into an Excel sheet and transferred to SPSS (IBM 28.0). Descriptive statistics were calculated: means ± standard deviation for continuous variables and frequencies/percentages for categorical variables. Multiple linear regression was performed to identify predictors of operative time. All candidate predictors (age, parity, comorbidities, prior surgery, specific indications, and adhesions) were entered into the model simultaneously. Model assumptions, including linearity, normality of residuals, homoscedasticity, and the absence of problematic multicollinearity, were assessed and found satisfactory. Binary logistic regression was performed to identify factors associated with intra-abdominal adhesions, using the same entry method. Model fit was assessed using the Hosmer-Lemeshow test (P=0.62) and classification accuracy. Model assumptions, including the absence of multicollinearity and the adequacy of model fit, were assessed and found to be satisfactory.

Results

Participant Demographics and Clinical Characteristics

A total of 181 participants were included, all of Bangladeshi nationality. The cohort was predominantly married (99.4%), with only one participant reporting divorce (0.6%). Educational attainment was primarily at the primary level (97.8%), while a minority had secondary education (2.2%). Employment was rare, with only two participants (1.1%) employed.

The mean age was 42.2±9.0 years (range 25–75), and participants had an average parity of 2.5 ± 0.6 children (median 3, range 1–4). The mean operative time for the entire cohort was 47.9±4.8 minutes (median 46, range 40–75) (Table 2).

Table 2.

Descriptive statistics of numerical variables.

Variable	n	Mean	SD	Median	Min	Max
Age (years)	181	42.2	9.0	40.0	25	75
Number of children		2.5	0.6	3.0	1	4
Operative time (minutes)		47.9	4.8	46.0	40	75

Comorbidities were reported in 32 participants (17.7%), with hypertension being most common (10.5%), followed by diabetes (8.8%) and obesity (3.3%) (Figure 2). Regarding prior surgery, 56.4% of participants (n=102) had no surgical history, while 43.6% (n=79) had a previous cesarean section (Figure 3).

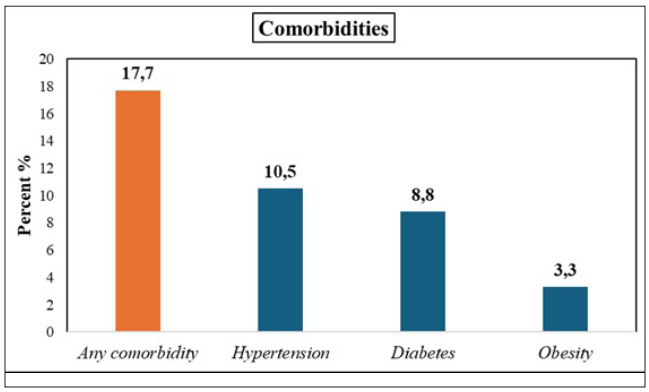

Figure 2. *Comorbidities among study participants (n=181). Bar chart showing the prevalence of comorbid conditions in participants undergoing laparoscopic hysterectomy. Overall, 32 participants (17.7%) reported at least one comorbidity. Hypertension was the most frequent (10.5%, n=19), followed by diabetes (8.8%, n=16) and obesity (3.3%, n=6). The majority (82.3%, n=149) had no comorbidities.*

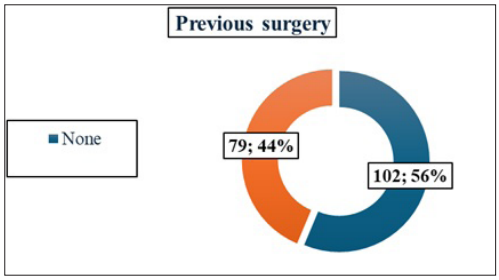

Figure 3. *History of previous surgery among study participants (n=181). Illustration of prior surgical history in the cohort. More than half of participants (56%, n=102) had no history of previous surgery, whereas 44% (n=79) reported a prior cesarean section. This distribution highlights the prevalence of prior lower abdominal surgery in the study population.*

Indications for Surgery

Abnormal uterine bleeding was the most frequent indication for laparoscopic hysterectomy, reported in 122 participants (67.4%), followed by chronic pelvic pain in 76 participants (42.0%). Uterine fibroids were identified in 56 participants (30.9%), and adenomyosis in 27 participants (14.9%). Less frequent indications included ovarian cysts (8.8%) and uterine prolapse (6.1%) (Figure 4).

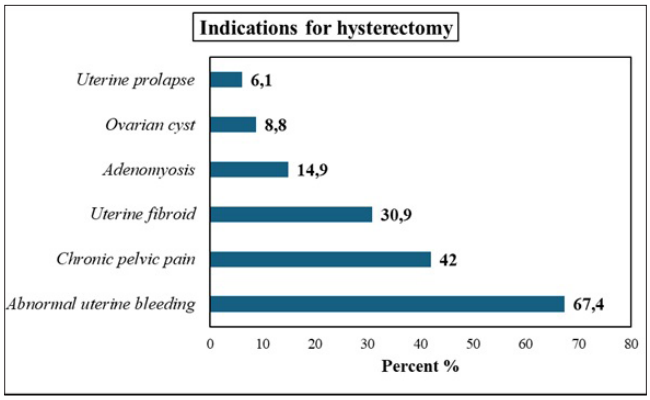

Figure 4. *Indications for laparoscopic hysterectomy (n=181). Bar chart depicting the primary clinical indications for hysterectomy. Abnormal uterine bleeding was the most common indication (67.4%, n=122), followed by chronic pelvic pain (42.0%, n=76), uterine fibroids (30.9%, n=56), and adenomyosis (14.9%, n=27). Less common indications included ovarian cysts (8.8%, n=16) and uterine prolapse (6.1%, n=11). Percentages exceed 100% in some cases due to overlapping indications.*

Intraoperative and Postoperative Outcomes

All procedures were laparoscopic and performed by senior consultants. No intraoperative complications, tissue injuries, or conversions to open surgery occurred, and no participants required blood transfusion. Estimated blood loss was <50 mL in 99.4% of participants and <100 mLin 0.6%. Early mobilization was achieved on the same day in 97.2% of participants and on the first postoperative day in 2.8% of participants. Hospital stay was uniformly one day, and all participants resumed normal activities within one week. Postoperative pain during the first 48 hours was mild in all participants, with 98.9% requiring analgesics. Only one participant (0.6%) required reoperation, and there were no 30-day readmissions. Intra-abdominal adhesions were identified in 67 participants (37.0%), while 114 participants (63.0%) had no adhesions (Figure 5).

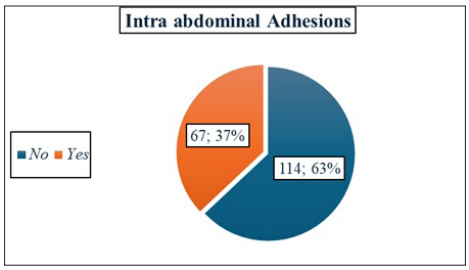

Figure 5. *Frequency of intra-abdominal adhesions identified during laparoscopic hysterectomy (n=181). Pie chart illustrating the presence of intra-abdominal adhesions. Adhesions were observed in 37.0% of participants (n=67), while 63.0% (n=114) had no adhesions identified intraoperatively.*

Predictors of Operative Time

Multiple linear regression analysis evaluated the relationship between demographic and clinical variables and operative time. The model was statistically significant ($F(11,167)=3.11$, $P=0.001$) and explained 17.0% of the variance ($R^2=0.170$; adjusted $R^2=0.115$).

Significant predictors of increased operative time included:

- Higher parity (B=1.947, 95% CI: 0.556–3.338, $P=0.006$)
- Presence of comorbidities (B=2.164, 95% CI: 0.178–4.151, $P=0.033$)
- History of previous surgery (B=2.522, 95% CI: 0.580–4.464, $P=0.011$)
- Abnormal uterine bleeding (B=2.421, 95% CI: 0.758–4.084, $P=0.005$)
- Adenomyosis (B=2.717, 95% CI: 0.277–5.157, $P=0.029$)

Conversely, increasing age was associated with a slight reduction in operative time (B=−0.116, 95% CI: −0.214 to −0.018, $P=0.020$). Chronic pelvic pain, uterine fibroid, ovarian cyst, uterine prolapse, and intra-abdominal adhesions were not significant predictors (Table 3).

Table 3*.*

Demographic and clinical predictors of operative time in patients undergoing laparoscopic hysterectomy.

Predictors	B	Std. Error	*P*-value	95.0% CI for B	
				L. Bound	U. Bound
Age	-0.116	0.050	0.020	-0.214	-0.018
Parity	1.947	0.705	0.006	0.556	3.338
Comorbidities	2.164	1.006	0.033	0.178	4.151
History of previous Surgery	2.522	0.984	0.011	0.580	4.464
Abnormal uterine bleeding	2.421	0.843	0.005	0.758	4.084
Chronic pelvic pain	-1.704	0.920	0.167	-3.520	0.113
Uterine fibroid	-1.320	0.973	0.177	-3.241	0.601
Adenomyosis	2.717	1.236	0.029	0.277	5.157
Ovarian cyst	1.474	1.326	0.268	1.143	4.092
Uterine prolapse	-2.316	1.686	0.171	-5.646	1.013
Intra-abdominal Adhesions	1.658	1.056	0.118	-0.426	3.742

** All listed variables were entered simultaneously into the multiple linear regression model.*

Predictors of Intra-Abdominal Adhesions

Binary logistic regression assessed factors associated with intra-abdominal adhesions. The model was significant ($\chi^2(10)=121.74$, $P<0.001$), explaining 49.2–67.2% of the variance (Cox & Snell $R^2=0.492$; Nagelkerke $R^2=0.672$) and achieving an overall classification accuracy of 87.2%.

Significant predictors included:

- Age (OR=1.11, 95% CI: 1.03–1.20, $P=0.006$)
- History of previous surgery (OR=45.21, 95% CI: 15.19–134.58, $P<0.001$)
- Presence of uterine fibroids (OR=5.22, 95% CI: 1.18–23.05, $P=0.029$)

Other variables—including parity, comorbidities, abnormal uterine bleeding, chronic pelvic pain, adenomyosis, ovarian cyst, and uterine prolapse—were not significantly associated (Table 4).

Table 4.

Demographic and clinical predictors of intra-abdominal adhesions in patients undergoing laparoscopic hysterectomy.*

Predictor	B	SE	*P*-value	OR (Exp(B))	95% CI for OR
Age	0.105	0.038	0.006	1.11	1.03–1.20
Parity	0.669	0.474	0.157	1.95	0.77–4.94
Comorbidities	0.067	0.664	0.920	1.07	0.29–3.93
History of previous surgery	3.811	0.557	<0.001	45.21	15.19–134.58
Abnormal uterine bleeding	0.646	0.628	0.304	1.91	0.56–6.54
Chronic pelvic pain	0.527	0.707	0.456	1.70	0.42–6.77
Uterine fibroid	1.652	0.758	0.029	5.22	1.18–23.05
Adenomyosis	0.846	0.971	0.384	2.33	0.35–15.64
Ovarian cyst	1.736	0.937	0.064	5.68	0.91–35.61
Uterine prolapse	0.663	1.159	0.567	1.94	0.20–18.81

** All listed variables were entered simultaneously into the binary logistic regression model.*

Patient-Reported Outcomes

Patient satisfaction was uniformly high. All participants reported being very satisfied with the surgical outcomes, perceived faster-than-expected recovery, and indicated they would recommend laparoscopic hysterectomy to others or choose the same procedure again if required.

Discussion

This prospective cross-sectional study demonstrates that laparoscopic surgery for benign gynecological conditions can be delivered with consistently favorable peri-operative performance and excellent short-term recovery in a real-world, resource-constrained private hospital setting. Without reiterating specific outcome measures, the collective pattern of findings reflects a highly standardized surgical pathway characterized by procedural efficiency, minimal physiological insult, and rapid functional recovery. Importantly, the absence of major intraoperative adversity and the uniformly short convalescence underscore the maturity of laparoscopic practice at the study center and reinforce the premise that surgical outcomes are primarily driven by case selection, surgeon experience, and perioperative systems rather than by patient demographics alone.

The observed determinants of operative duration highlight the interaction between patient-related complexity and surgical workload rather than technical failure. Factors such as prior pelvic surgery, higher parity, and specific uterine pathologies were associated with longer procedures, reflecting expected anatomical distortion and the demands of adhesiolysis. This aligns closely with large observational data reported by Wright et al.,[5] where increased operative time in minimally invasive hysterectomy correlated with prior surgery and case complexity but did not translate into higher morbidity. Unlike Wright et al., whose population-level analysis identified variability in outcomes across institutions, the present study demonstrates consistency, suggesting that standardized surgical teams may mitigate complexity-related risks.

Similarly, Aboulfotouh et al.[8] reported that operative efficiency improves substantially once laparoscopic proficiency is established, with case-mix factors—not surgical access—being the primary drivers of operative duration. The present study extends this observation by quantifying patient-level predictors within a homogeneous laparoscopic cohort, rather than by comparing surgical routes.

Intra-abdominal adhesions emerged as a clinically relevant intraoperative finding, predominantly associated with age and prior surgery. This mirrors findings from Clark et al.,[30] who identified previous abdominal surgery as the strongest predictor of intraoperative complexity and major complications during laparoscopic treatment of endometriosis. However, unlike Clark et al., in which adhesions increased the risk of complications, the present study did not observe downstream adverse outcomes, suggesting that experienced surgical teams can neutralize adhesion-related risk in benign gynecological surgery.

Comparable observations were reported by Khazali et al.,[29] who demonstrated that operative difficulty in advanced endometriosis was more strongly associated with duration and extent of dissection than with incision type. The present study broadens this concept beyond endometriosis, supporting adhesions as a marker of technical demand rather than a determinant of poor outcome.

The uniformly favorable short-term postoperative course observed in this cohort is concordant with high-quality evidence synthesized by Aarts et al.,[2] who demonstrated that minimally invasive hysterectomy consistently reduces postoperative morbidity compared with open approaches. Unlike randomized trials included in the Cochrane review, which often involve heterogeneous surgeons and centers, this study reflects outcomes within a single, high-volume laparoscopic institute, highlighting the potential for optimized outcomes when procedural standardization is achieved.

Furthermore, the findings resonate with the population-based analysis by Wiser et al.,[7] which showed substantial reductions in transfusion and mortality with laparoscopic hysterectomy. While Wiser et al. focused on national-level morbidity and mortality, the present study complements these data by detailing patient-reported recovery and early functional outcomes, areas often underrepresented in administrative datasets.

High patient satisfaction and rapid return to normal activity observed in this study parallel findings from Sandberg et al.,[9] who demonstrated that minimally invasive routes—particularly vaginal and laparoscopic hysterectomy—are associated with superior patient-reported recovery compared with abdominal surgery. However, unlike Sandberg et al., which compared different minimally invasive routes, the present study isolates laparoscopic surgery, thereby providing

a focused assessment of its patient-centered value in routine practice.

The consistency of satisfaction across all participants suggests that expectation management, peri-operative counseling, and early mobilization protocols may be as influential as surgical technique itself—an insight not explicitly addressed in comparative trials.

The uniformly positive short-term outcomes, including rapid mobilization and high patient satisfaction, mirror the benefits of minimally invasive surgery demonstrated in randomized trials and large registries from high-income countries.[2,7] This study confirms that these benefits are achievable in an LMIC setting with appropriate expertise and infrastructure. In contrast to concerns raised by Gala et al.[6] regarding the cost-effectiveness of advanced platforms, the present study demonstrates that standard laparoscopy—without reliance on costly technologies—can achieve outcomes comparable to those reported in high-income settings. This has particular relevance for South Asian and other LMIC contexts, where scalability and sustainability are critical.

By focusing exclusively on laparoscopic surgery and examining predictors of operative complexity and short-term recovery within this cohort, the study avoids the confounding inherent in route-comparison designs. Its prospective nature, comprehensive peri-operative assessment, and integration of patient-reported outcomes strengthen its contribution to the literature. When interpreted alongside comparable studies,[2,5,7,8,30] the findings position laparoscopic surgery not merely as a technically superior alternative, but as a mature, reproducible standard of care when delivered within an optimized institutional framework.

In summary, this study adds contextualized, practice-based evidence supporting the safety, efficiency, and patient-centered benefits of laparoscopic surgery for benign gynecological conditions, reinforcing global recommendations while offering practical insights relevant to similar healthcare settings.

Limitations

This study has several limitations. First, as a single-arm descriptive study, it lacks a direct comparator group (e.g., open surgery). Therefore, while outcomes are excellent, we cannot make comparative claims of superiority. Second, the study was conducted at a single, specialized private center with highly experienced surgeons, which may limit the generalizability of the results to public hospitals or less-experienced teams. Third, follow-up was limited to 30 days, precluding assessment of long-term complications or recurrence. Finally, the cohort was predominantly comprised of hysterectomy patients; outcomes for less common procedures (myomectomy, cystectomy) should be interpreted with caution due to small numbers.

Conclusion

This prospective study demonstrates that laparoscopic surgery for benign gynecological conditions can be performed safely and efficiently in an experienced tertiary center in Bangladesh. Operative performance and early postoperative outcomes were driven primarily by patient-related complexity, including prior surgery and underlying uterine pathology, rather than by the laparoscopic approach itself. The favorable peri-operative outcomes and high patient-reported satisfaction observed reinforce laparoscopy as a reliable standard of care for benign gynecological disease in routine clinical practice. Importantly, these findings provide context-specific evidence from a South Asian setting, supporting the feasibility and reproducibility of high-quality minimally invasive gynecological surgery beyond high-income health systems. Sustained investment in structured surgical training, appropriate case selection, and standardized perioperative pathways is essential to maximize the benefits of laparoscopy. Future studies should incorporate longer follow-up, cost-effectiveness analyses, and comparative designs to further inform evidence-based surgical planning in resource-constrained environments.

Ethical Considerations

The implementation of this study adhered to the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) of Feni PVT Hospital and Laparoscopy Institute, Bangladesh (Approval No 202501/FPHLI). Written informed consent was obtained from all participants. Confidentiality was maintained, and participants could withdraw at any time without affecting their treatment

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author.

Author Contribution Statement

Isameldin Medani confirms sole responsibility for all aspects of the research.

Conflict of Interest

The author declares that he has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We express our sincere gratitude to Prof. Dr. Mohammad Abdul Quayyum, Chief Consultant and Chairman of Feni Private Hospital & Laparoscopy Institute, for his invaluable support and guidance during this research. We also thank all the medical, nursing, and administrative staff for their dedicated assistance and cooperation. In addition, we gratefully acknowledge the Deanship of Scientific Research and Postgraduate Studies at Jazan University for their continuous support.

The author acknowledges QuillBot for providing proofreading support during the writing process.

References

1. Committee Opinion No 701: Choosing the Route of Hysterectomy for Benign Disease. Obstet Gynecol. 2017 Jun;129(6):e155-e159. doi: 10.1097/AOG.0000000000002112. PMID: 28538495.
2. Aarts JW, Nieboer TE, Johnson N, Tavender E, Garry R, Mol BW, Kluivers KB. Surgical approach to hysterectomy for benign gynaecological disease. Cochrane Database Syst Rev. 2015 Aug 12;2015(8):CD003677. doi: 10.1002/14651858.CD003677.pub5. Update in: Cochrane Database Syst Rev. 2023 Aug 29;8:CD003677. doi: 10.1002/14651858.CD003677.pub6. PMID: 26264829; PMCID: PMC6984437.
3. Johnson N, Barlow D, Lethaby A, Tavender E, Curr L, Garry R. Methods of hysterectomy: systematic review and meta-analysis of randomised controlled trials. BMJ. 2005 Jun 25;330(7506):1478. doi: 10.1136/bmj.330.7506.1478. PMID: 15976422; PMCID: PMC558455.
4. O'Neill M, Moran PS, Teljeur C, O'Sullivan OE, O'Reilly BA, Hewitt M, Flattery M, Ryan M. Robot-assisted hysterectomy compared to open and laparoscopic approaches: systematic review and meta-analysis. Arch Gynecol Obstet. 2013 May;287(5):907-18. doi: 10.1007/s00404-012-2681-z. Epub 2013 Jan 5. PMID: 23291924
5. Wright JD, Ananth CV, Lewin SN, Burke WM, Lu YS, Neugut AI, Herzog TJ, Hershman DL. Robotically assisted vs laparoscopic hysterectomy among women with benign gynecologic disease. JAMA. 2013 Feb 20;309(7):689-98. doi: 10.1001/jama.2013.186. PMID: 23423414.
6. Gala RB, Margulies R, Steinberg A, Murphy M, Lukban J, Jeppson P, et al.; Society of Gynecologic Surgeons Systematic Review Group. Systematic review of robotic surgery in gynecology: robotic techniques compared with laparoscopy and laparotomy. J Minim Invasive Gynecol. 2014 May-Jun;21(3):353-61. doi: 10.1016/j.jmig.2013.11.010. Epub 2013 Dec 1. PMID: 24295923.
7. Wiser A, Holcroft CA, Tulandi T, Abenhaim HA. Abdominal versus laparoscopic hysterectomies for benign disease: morbidity and mortality among 465 798 cases. Gynecol Surg. 2013;10:117-122. doi:10.1007/s10397-013-0781-9.
8. Aboulfotouh ME, Chaalan F, Mohammed ABF. Laparoscopic hysterectomy versus total abdominal hysterectomy: a retrospective study at a tertiary hospital. Gynecol Surg. 2020;17:1. doi:10.1186/s10397-020-01068-1
9. Sandberg EM, Twijnstra ARH, Driessen SRC, Jansen FW. Total Laparoscopic Hysterectomy Versus Vaginal Hysterectomy: A Systematic Review and Meta-Analysis. J Minim Invasive Gynecol. 2017 Feb;24(2):206-217.e22. doi: 10.1016/j.jmig.2016.10.020. Epub 2016 Nov 17. PMID: 27867051.
10. Lönnerfors C, Reynisson P, Persson J. A randomized trial comparing vaginal and laparoscopic hysterectomy vs robot-assisted hysterectomy. J Minim Invasive Gynecol. 2015 Jan;22(1):78-86. doi: 10.1016/j.jmig.2014.07.010. Epub 2014 Jul 19. PMID: 25045857.
11. Mais V, Ajossa S, Guerriero S, Mascia M, Solla E, Melis GB. Laparoscopic versus abdominal myomectomy: a prospective, randomized trial to evaluate benefits in early outcome. Am J Obstet Gynecol. 1996 Feb;174(2):654-8. doi: 10.1016/s0002-9378(96)70445-3. PMID: 8623802.
12. Bhave Chittawar P, Franik S, Pouwer AW, Farquhar C. Minimally invasive surgical techniques versus open myomectomy for uterine fibroids. Cochrane Database Syst Rev. 2014 Oct 21;2014(10):CD004638. doi: 10.1002/14651858.CD004638.pub3. PMID: 25331441; PMCID: PMC10961732.
13. Barakat EE, Bedaiwy MA, Zimberg S, Nutter B, Nosseir M, Falcone T. Robotic-assisted, laparoscopic, and abdominal myomectomy: a comparison of surgical outcomes. Obstet Gynecol. 2011 Feb;117(2 Pt 1):256-266. doi: 10.1097/AOG.0b013e318207854f. PMID: 21252737.
14. Song T, Kim TJ, Lee SH, Kim TH, Kim WY. Laparoendoscopic single-site myomectomy compared with conventional laparoscopic myomectomy: a multicenter, randomized, controlled trial. Fertil Steril. 2015 Nov;104(5):1325-31. doi: 10.1016/j.fertnstert.2015.07.1137. Epub 2015 Aug 8. PMID: 26263079.
15. Advincula AP, Xu X, Goudeau S 4th, Ransom SB. Robot-assisted laparoscopic myomectomy versus abdominal myomectomy: a comparison of short-term surgical outcomes and immediate costs. J Minim Invasive Gynecol. 2007 Nov-Dec;14(6):698-705. doi: 10.1016/j.jmig.2007.06.008. PMID: 17980329.
16. Gargiulo AR, Srouji SS, Missmer SA, Correia KF, Vellinga TT, Einarsson JI. Robot-assisted laparoscopic myomectomy compared with standard laparoscopic myomectomy. Obstet Gynecol. 2012 Aug;120(2 Pt 1):284-91. doi: 10.1097/AOG.0b013e3182602c7d. Erratum in: Obstet Gynecol. 2012 Nov;120(5):1214. Erratum in: Obstet Gynecol. 2013 Sep;122(3):698. Vellinga, Thomas [corrected to Vellinga, Thomas T]. PMID: 22825086.
17. Ascher-Walsh CJ, Capes TL. Robot-assisted laparoscopic myomectomy is an improvement over laparotomy in women with a limited number of myomas. J Minim Invasive Gynecol. 2010 May-Jun;17(3):306-10. doi: 10.1016/j.jmig.2010.01.011. Epub 2010 Mar 19. PMID: 20303834.
18. Özbaşlı E, Güngör M. Comparison of perioperative outcomes among robot-assisted, conventional laparoscopic, and abdominal/open myomectomies. J Turk Ger Gynecol Assoc. 2021 Dec 6;22(4):312-318. doi: 10.4274/jtgga.galenos.2021.2021.0049. Epub 2021 Oct 12. PMID: 34634858; PMCID: PMC8666999.
19. Nezhat C, Lavie O, Hsu S, Watson J, Barnett O, Lemyre M. Robotic-assisted laparoscopic myomectomy compared with standard laparoscopic myomectomy--a retrospective matched control study. Fertil Steril. 2009 Feb;91(2):556-9. doi: 10.1016/j.fertnstert.2007.11.092.
20. Wang T, Tang H, Xie Z, Deng S. Robotic-assisted vs. laparoscopic and abdominal myomectomy for treatment of uterine fibroids: a meta-analysis. Minim Invasive Ther Allied Technol. 2018 Oct;27(5):249-264. doi: 10.1080/13645706.2018.1442349.
21. Yuen PM, Yu KM, Yip SK, Lau WC, Rogers MS, Chang A. A randomized prospective study of laparoscopy and laparotomy in the management of benign ovarian masses. Am J Obstet Gynecol. 1997 Jul;177(1):109-14. doi: 10.1016/s0002-9378(97)70447-2. PMID: 9240592.
22. Medeiros LR, Rosa DD, Bozzetti MC, Fachel JM, Furness S, Garry R, Rosa MI, Stein AT. Laparoscopy versus laparotomy for benign ovarian tumour. Cochrane Database Syst Rev. 2009 Apr 15;(2):CD004751. doi: 10.1002/14651858.CD004751.pub3. PMID: 19370607.

23. Wang X, Li Y. Comparison of perioperative outcomes of single-port laparoscopy, three-port laparoscopy and conventional laparotomy in removing giant ovarian cysts larger than 15 cm. BMC Surg. 2021 Apr 21;21(1):205. doi: 10.1186/s12893-021-01205-3. PMID: 33882918; PMCID: PMC8061010.
24. Benezra V, Verma U, Whitted RW. Comparison of Laparoscopy versus Laparotomy for the Surgical Treatment of Ovarian Dermoid Cysts. Gynecol Surg. 2005;2(2):89-92. doi:10.1007/s10397-005-0091-y
25. Somigliana E, Ragni G, Infantino M, Benedetti F, Arnoldi M, Crosignani PG. Does laparoscopic removal of nonendometriotic benign ovarian cysts affect ovarian reserve? Acta Obstet Gynecol Scand. 2006;85(1):74-7. doi: 10.1080/00016340500334802. PMID: 16521684.
26. Sethi N, Agrawal M, Patel A, Reddy LS, Bhatt DM. Surgical Technique and Fertility Outcomes: A Comprehensive Review of Open and Laparoscopic Cystectomy in Women of Reproductive Age. Cureus. 2024 Oct 10;16(10):e71179. doi: 10.7759/cureus.71179.
27. Daraï E, Dubernard G, Coutant C, Frey C, Rouzier R, Ballester M. Randomized trial of laparoscopically assisted versus open colorectal resection for endometriosis: morbidity, symptoms, quality of life, and fertility. Ann Surg. 2010 Jun;251(6):1018-23. doi: 10.1097/SLA.0b013e3181d9691d.
28. Magrina JF, Espada M, Kho RM, Cetta R, Chang YH, Magtibay PM. Surgical Excision of Advanced Endometriosis: Perioperative Outcomes and Impacting Factors. J Minim Invasive Gynecol. 2015 Sep-Oct;22(6):944-50. doi: 10.1016/j.jmig.2015.04.016. Epub 2015 Apr 24. PMID: 25917276
29. Khazali S, Gorgin A, Mohazzab A, Kargar R, Padmehr R, Shadjoo K, Minas V. Laparoscopic excision of deeply infiltrating endometriosis: a prospective observational study assessing perioperative complications in 244 patients. Arch Gynecol Obstet. 2019 Jun;299(6):1619-1626. doi: 10.1007/s00404-019-05144-6. Epub 2019 Apr 5. PMID: 30953187
30. Clark NV, Dmello M, Griffith KC, Gu X, Ajao MO, Cohen SL, Einarsson JI. Laparoscopic treatment of endometriosis and predictors of major complications: A retrospective cohort study. Acta Obstet Gynecol Scand. 2020 Mar;99(3):317-323. doi: 10.1111/aogs.13762.

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