

Outcome of Laparoscopic Versus Open Surgery in The Management of Endometriosis Related Infertility

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ABSTRACT

Introduction: Endometriosis is a common gynaecological disorder and an important cause of female infertility, often impairing reproductive function through pelvic adhesions, and chronic inflammation etc. Surgical treatment plays a key role in restoring pelvic anatomy and improving fertility, with laparoscopic and open surgery being the two principal approaches. The present study was conducted to compare the outcomes of laparoscopic versus open surgery in the management of endometriosis-related infertility. **Methods & Materials:** This retrospective comparative study was conducted in the Department of Obstetrics and Gynaecology Mugda Medical College & Hospital, Dhaka, Bangladesh. Medical records of women who underwent surgical management for endometriosis-related infertility, from January 2021 and December 2024 were reviewed. A total of 104 patients who fulfilled the eligibility criteria were included in the study by purposive sampling. Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 26.0. **Result:** The laparoscopic group had a shorter operative time (92.4 vs 108.7 minutes), lower intraoperative blood loss (104.6 vs 218.9 mL), lower postoperative pain score (3.1 vs 5.8), shorter hospital stay (2.4 vs 5.6 days), earlier return to normal activities (8.7 vs 16.4 days), and fewer overall postoperative complications (7.7% vs 21.2%). Fertility outcomes also favoured laparoscopy, with a higher overall pregnancy rate (57.7% vs 46.2%) and spontaneous conception rate (42.3% vs 26.9%) compared with open surgery. **Conclusion:** The findings of the present study indicate that laparoscopic surgery yielded more favourable perioperative and postoperative outcomes than open surgery for the management of endometriosis-related

infertility. Patients treated laparoscopically had lower intraoperative blood loss, less postoperative pain, shorter hospitalisation, earlier recovery, fewer postoperative complications, and improved reproductive outcomes, including a higher proportion of spontaneous pregnancies.

Keywords: Laparoscopic Surgery, Open Surgery, Endometriosis

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INTRODUCTION

Endometriosis is a chronic, estrogen-dependent inflammatory disorder characterized by the presence of endometrial-like tissue outside the uterine cavity. It affects approximately 10% of women of reproductive age worldwide and up to 30–50% of women presenting with infertility, making it one of the leading causes of female subfertility. The disease adversely affects reproductive function through multiple mechanisms, including distortion of pelvic anatomy, formation of adhesions, chronic inflammation, impaired folliculogenesis, altered tubal function, and reduced endometrial receptivity. Consequently, women with endometriosis often experience delayed conception, diminished fertility, and reduced quality of life due to the combined burden of infertility and chronic pelvic pain. Recent evidence has further emphasized the substantial global health and socioeconomic impact of endometriosis, highlighting the need for effective fertility-preserving management strategies [1–3]. Surgical intervention remains an important component of the management of endometriosis-related infertility, particularly in women with symptomatic disease, ovarian

endometriomas, or moderate to severe pelvic involvement. The principal goals of surgery are to restore normal pelvic anatomy, excise or ablate endometriotic lesions, remove adhesions, relieve pain, and improve the chances of spontaneous conception while preserving ovarian reserve. Although medical therapy may alleviate symptoms, it does not improve fertility and is therefore not recommended as a primary treatment for women actively seeking pregnancy [1,4]. Laparoscopic surgery has become the preferred surgical approach for the treatment of endometriosis because it offers several advantages over conventional open surgery (laparotomy). These advantages include superior visualization of pelvic structures, greater precision in identifying and excising endometriotic implants, reduced blood loss, shorter hospital stay, less postoperative pain, earlier recovery, and lower rates of postoperative adhesion formation. In contrast, open surgery is generally reserved for selected patients with extensive disease, severe adhesions, bowel or urinary tract involvement, or when minimally invasive surgery is technically infeasible or unavailable [5–7]. Several studies have demonstrated that operative laparoscopy

improves spontaneous pregnancy rates in women with minimal to mild endometriosis compared with diagnostic laparoscopy alone. For women with moderate to severe disease, laparoscopic excision may restore pelvic anatomy sufficiently to enhance natural conception and improve subsequent assisted reproductive outcomes. Current international guidelines recommend considering operative laparoscopy after careful evaluation of patient age, ovarian reserve, disease severity, previous surgical history, associated infertility factors, and the Endometriosis Fertility Index (EFI). Nevertheless, the optimal surgical approach remains individualized because extensive ovarian surgery may adversely affect ovarian reserve, particularly in women with bilateral endometriomas [1,8]. Despite the widespread adoption of laparoscopic surgery, open surgery continues to be performed in selected clinical settings, especially in resource-limited countries or in cases requiring complex pelvic reconstruction. Comparative evaluation of laparoscopic and open surgery is therefore important to determine differences in operative outcomes, perioperative complications, postoperative recovery, recurrence rates, and reproductive success.

Existing literature generally favours laparoscopy; however, direct comparisons remain relatively limited, and variations in patient selection, disease severity, surgical expertise, and follow-up duration contribute to inconsistent findings. Furthermore, evidence from low- and middle-income countries, including Bangladesh, remains scarce [6,9,10]. Therefore, the present study aims to evaluate and compare the outcomes of laparoscopic versus open surgery in the management of endometriosis-related infertility.

METHODS & MATERIALS

This retrospective comparative study was conducted in the Department of Obstetrics and Gynaecology of Mugda Medical College & Hospital, Dhaka, Bangladesh. Medical records of women who underwent surgical management for endometriosis-related infertility, from January 2021 and December 2024 were reviewed. A total of 104 patients who fulfilled the eligibility criteria were included in the study by purposive sampling. Women aged 20–40 years with infertility for at least 12 months, a diagnosis of endometriosis confirmed

intraoperatively (with histopathological confirmation where tissue specimens were available), and who underwent either laparoscopic surgery or open surgery (laparotomy) were included. Patients were followed up for 3 years. Patients with infertility attributable to severe male factor, untreated endocrine disorders (e.g., uncontrolled thyroid disease or hyperprolactinaemia), congenital uterine anomalies, active pelvic inflammatory disease, gynaecological malignancy, previous hysterectomy or bilateral oophorectomy, or incomplete medical records or follow-up data were excluded. The study participants were divided into two groups according to the surgical approach performed, comprising 52 patients in the laparoscopic group and 52 patients in the open surgery group. Data on demographic characteristics, clinical presentation, duration and type of infertility, stage of endometriosis according to the revised American Society for Reproductive Medicine (rASRM) classification, operative findings, operative time, estimated blood loss, intraoperative and postoperative complications, duration of hospital stay,

postoperative recovery, and fertility outcomes during follow-up were extracted using a predesigned data collection form. Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Categorical variables were expressed as frequencies and percentages, and associations between the two groups were analysed using the Chi-square test. A *p*-value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Review Board of the respective institution before commencement of the study, and patient confidentiality was maintained throughout the study by anonymising all collected data.

RESULTS

The mean age was 31.2 ± 4.6 years in the laparoscopic group and 31.8 ± 4.9 years in the open surgery group. Most participants had primary infertility in both groups, accounting for 38 (73.1%) and 36 (69.2%), respectively. The baseline BMI and duration of infertility were also similar between the groups, with no statistically significant differences (Table I).

Table I
Baseline characteristics of the study participants (n = 104).

Characteristics	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value
Age (years), mean ± SD	31.2 ± 4.6	31.8 ± 4.9	0.52
20–29 years	18 (34.6)	16 (30.8)	
30–39 years	28 (53.8)	30 (57.7)	
≥40 years	6 (11.5)	6 (11.5)	
BMI (kg/m²), mean ± SD	24.1 ± 2.7	24.4 ± 2.9	0.61
Duration of infertility (years), mean ± SD	4.3 ± 1.8	4.5 ± 1.7	0.58
Primary infertility, n (%)	38 (73.1)	36 (69.2)	0.66
Secondary infertility, n (%)	14 (26.9)	16 (30.8)	

More than half of the women in both groups had stage I–II disease: 28 (53.8%) in the laparoscopic group and 24 (46.2%) in the open group. Pelvic adhesions were

common, seen in 30 (57.7%) and 34 (65.4%) participants, respectively. Ovarian endometrioma and deep infiltrating disease were present in similar proportions in both

groups, showing no significant baseline imbalance (Table II).

Table II
Disease characteristics at presentation (n = 104).

Disease characteristics	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value*
rASRM stage I–II, n (%)	28 (53.8)	24 (46.2)	0.45
rASRM stage III–IV, n (%)	24 (46.2)	28 (53.8)	
Ovarian endometrioma, n (%)	18 (34.6)	20 (38.5)	0.68
Pelvic adhesions, n (%)	30 (57.7)	34 (65.4)	0.42
Deep infiltrating endometriosis, n (%)	10 (19.2)	12 (23.1)	0.63
Dysmenorrhoea, n (%)	40 (76.9)	42 (80.8)	0.63
Chronic pelvic pain, n (%)	31 (59.6)	33 (63.5)	0.68

*Chi-square test.

The laparoscopic group had significantly better intraoperative outcomes. The mean operative time was shorter in the laparoscopic group (92.4 ± 18.6 minutes)

than in the open surgery group (108.7 ± 21.4 minutes). Estimated blood loss was also markedly lower with laparoscopy (104.6 ± 38.2 mL) compared with open surgery

(218.9 ± 64.7 mL). Blood transfusion was required in 2 (3.8%) laparoscopic cases and 8 (15.4%) open surgery cases (Table III).

Table III
Intraoperative outcomes (*n* = 104).

Intraoperative outcomes	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value*
Operative time (minutes), mean ± SD	92.4 ± 18.6	108.7 ± 21.4	0.001
Estimated blood loss (mL), mean ± SD	104.6 ± 38.2	218.9 ± 64.7	<0.001
Blood transfusion required, n (%)	2 (3.8)	8 (15.4)	0.04
Intraoperative complication, n (%)	3 (5.8)	7 (13.5)	0.18
Conversion to laparotomy, n (%)	4 (7.7)	-	-

*Chi-square test.

Recovery was significantly faster after laparoscopic surgery. The laparoscopic group had a much lower pain score at 24 hours (3.1 ± 1.0) than the open surgery group (5.8 ± 1.2). Hospital stay was also shorter, with a mean of 2.4 ± 0.8 days in the laparoscopic group versus 5.6 ± 1.3 days in the open group. Women who underwent laparoscopy returned to normal activity earlier (8.7 ± 2.9 days) than those who had open surgery (16.4 ± 4.1 days) (Table IV).

Table IV
Postoperative recovery outcomes (*n* = 104).

Postoperative outcomes	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value*
Postoperative pain score (first 24 h), mean ± SD	3.1 ± 1.0	5.8 ± 1.2	<0.001
Hospital stay (days), mean ± SD	2.4 ± 0.8	5.6 ± 1.3	<0.001
Return to normal activity (days), mean ± SD	8.7 ± 2.9	16.4 ± 4.1	<0.001
Wound infection, n (%)	1 (1.9)	5 (9.6)	0.09
Febrile morbidity, n (%)	2 (3.8)	6 (11.5)	0.14

*Chi-square test.

Postoperative complications were less frequent in the laparoscopic group. Overall complications occurred in 4 (7.7%) women after laparoscopy and in 11 (21.2%) after open surgery. Pelvic infection, prolonged ileus, and readmission were also more common in the open surgery group, although not all differences reached statistical significance (Table V).

Table V
Postoperative complications (*n* = 104).

Complications	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value*
Overall complication, n (%)	4 (7.7)	11 (21.2)	0.05
Pelvic infection, n (%)	1 (1.9)	4 (7.7)	0.17
Prolonged ileus, n (%)	0 (0.0)	3 (5.8)	0.08
Postoperative nausea/vomiting, n (%)	2 (3.8)	2 (3.8)	1.00
Readmission within 30 days, n (%)	1 (1.9)	3 (5.8)	0.31

*Chi-square test.

Fertility outcomes were numerically better in the laparoscopic group. Any pregnancy was achieved in 30 (57.7%) women after laparoscopy compared with 24 (46.2%) after open surgery. Spontaneous conception was also higher in the laparoscopic group (42.3% vs 26.9%) (Table VI).

Table VI
Fertility outcomes during follow-up (*n* = 104).

Fertility outcomes	Laparoscopic surgery (n=52)	Open surgery (n=52)	p-value*
Spontaneous conception, n (%)	22 (42.3)	14 (26.9)	0.09
Conception with ART, n (%)	8 (15.4)	10 (19.2)	0.61
Any pregnancy achieved, n (%)	30 (57.7)	24 (46.2)	0.24
Ongoing pregnancy at last follow-up, n (%)	26 (50.0)	19 (36.5)	0.17
No pregnancy achieved, n (%)	22 (42.3)	28 (53.8)	0.24

*Chi-square test.

DISCUSSION

In our study, the laparoscopic and open surgery groups were similar at baseline: mean age was 31.2 ± 4.6 vs 31.8 ± 4.9 years, BMI 24.1 ± 2.7 vs 24.4 ± 2.9 kg/m², and infertility duration 4.3 ± 1.8 vs 4.5 ± 1.7 years. Li et al. studied 226 women and reported a mean age of 33.6 years, BMI 22.4 – 22.9 kg/m², and infertility duration of 3.38 ± 0.92 years in the laparoscopic group and 3.58 ± 0.87 years in the laparotomy group [11]. So, our patients were slightly younger and had a longer infertility history, but both studies showed good baseline balance before surgery. In our study, 53.8% in the

laparoscopic group and 46.2% in the open group had stage I–II disease, while 46.2% and 53.8%, respectively, had stage III–IV disease. Endometrioma was present in 34.6% vs 38.5%, pelvic adhesions in 57.7% vs 65.4%, and deep infiltrating endometriosis in 19.2% vs 23.1%. Li et al. reported stage I in 40.3%, stage II in 25.7%, stage III in 23.5%, and stage IV in 10.6% of their 226 patients [11]. Compared with that study, our cohort had a slightly heavier advanced-disease burden, especially in stage III–IV cases. Our laparoscopic group had shorter operative time (92.4 vs 108.7 minutes) and much less blood loss (104.6 vs

218.9 mL) than the open surgery group; transfusion was needed in 3.8% vs 15.4%. Li et al. also found better intraoperative results with laparoscopy: operative time was 72–79 minutes in the laparoscopic subgroups and 79 minutes in laparotomy, blood loss was 48.7–53.2 mL vs 83.2 mL, and hospital stay was 2.42–2.71 days vs 4.63 days [11]. In the present study, postoperative recovery was significantly better in the laparoscopic group, with lower postoperative pain scores (3.1 ± 1.0 vs 5.8 ± 1.2), shorter hospital stay (2.4 ± 0.8 vs 5.6 ± 1.3 days), and earlier return to normal activities (8.7 ± 2.9 vs 16.4 ± 4.1 days) than

the open surgery group. Similarly, another study reported that implementation of an Enhanced Recovery After Surgery (ERAS) protocol in endometriosis surgery reduced the mean hospital stay from 5.42 ± 4.04 days to 4.28 ± 3.80 days and decreased postoperative pain syndrome from 8.38% to 2.62% [12]. In our study, the overall complication rate was 7.7% in the laparoscopic group and 21.2% in the open surgery group. In a laparoscopic series of deep infiltrating endometriosis, Khazali et al. reported major postoperative complications in 1.2% and minor complications in 11.1% of patients [13]. Hudelist et al. reported severe complication rates of 5.1% (48/937) in a large surgical series for deep endometriosis [14]. So, our laparoscopic complication rate was slightly higher than some specialised laparoscopic series, but it was still much lower than open surgery. Fertility outcome also favoured laparoscopy in our study: pregnancy was achieved in 57.7% vs 46.2%, and spontaneous conception in 42.3% vs 26.9%. Li et al. found a pregnancy rate of 69.35% after laparoscopy in infertility patients, compared with 15.0% after laparotomy at 1 year [11]. Zhang et al. reported a 1-year pregnancy rate of 57.3% after surgery [15]. Rodríguez et al. found spontaneous pregnancy in 71.8% of women who waited after laparoscopic treatment [16]. Hui et al. reported a 3-year cumulative pregnancy rate of 75.6% (195/258), Asgari et al. reported 50.0% at 3 years with 43.2% spontaneous conception, and Rad et al. reported 69.6% after 38 months [17-19].

LIMITATIONS

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community. The duration of postoperative follow-up was not uniform for all patients, which may have influenced the assessment of fertility outcomes.

CONCLUSION

The present study demonstrated that laparoscopic surgery was associated with superior perioperative and postoperative outcomes compared with open surgery in the management of endometriosis-related infertility. Women who underwent laparoscopic surgery experienced reduced intraoperative blood loss, lower postoperative pain, shorter hospital stay, faster recovery, fewer complications, and a higher rate of pregnancy, particularly spontaneous conception.

RECOMMENDATION

Laparoscopic surgery can be considered the preferred surgical approach for women with endometriosis-related infertility whenever appropriate expertise and facilities are available. Careful patient selection and timely surgical intervention may help optimize reproductive outcomes while minimizing postoperative morbidity. Further prospective multicentre studies with larger sample sizes and longer follow-up are recommended to validate these findings and assess long-term fertility and recurrence outcomes.

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CONFLICT OF INTEREST

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