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The Impact of Laparoscopic Treatment on Fertility Outcomes in Patients with Severe Endometriosis

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Abstract

Background: Endometriosis, a prevalent gynecological disorder affecting women of reproductive age, is a significant cause of infertility, especially in severe cases involving extensive adhesions, endometriomas, and deep infiltrating lesions. In Bangladesh, the delay in diagnosis and limited access to advanced treatments, including laparoscopic surgery, poses challenges to improving fertility outcomes for women with severe endometriosis. ***Objective:*** This study aimed to assess the impact of laparoscopic treatment on fertility outcomes in patients with severe endometriosis, particularly in a resource-limited healthcare setting in Bangladesh. ***Methods:*** This retrospective cohort study included 78 women with severe endometriosis from tertiary hospitals in Dhaka and Khulna, Bangladesh. All participants had previously experienced unsuccessful in vitro fertilization (IVF) attempts and subsequently underwent laparoscopic surgery between 2015 and 2024. Data collection involved reviewing primary and secondary data from these tertiary hospitals, including medical records and operative reports, and was supplemented by follow-up interviews for comprehensive analysis. Variables such as patient age, infertility duration, previous IVF cycles, operative findings, and postoperative fertility outcomes were analyzed using SPSS, with statistical significance set at $P < .05$. ***Results:*** The mean age of patients was 34.3 years, and the average duration of infertility was 52.9 months. Post-laparoscopic surgery, 42.3% (33/78) of women successfully delivered, with 7% achieving spontaneous conception. Younger age, fewer prior IVF cycles, and a normal uterine appearance on transvaginal ultrasound were significantly associated with improved fertility outcomes. Salpingectomy was more common among those who delivered (70%), though the removal of ovarian endometriomas did not significantly impact fertility success. ***Conclusion:*** Laparoscopic treatment significantly improves fertility outcomes in Bangladeshi women with severe endometriosis, even in a resource-limited setting. Age, normal ovarian function, and uterine appearance were key factors influencing reproductive success. These findings underscore the importance of timely surgical intervention for endometriosis-related infertility, highlighting the need for improved access to laparoscopic surgery in low-resource healthcare systems.

Keywords: Endometriosis, Laparoscopy, Fertility, In vitro fertilization.

INTRODUCTION

Endometriosis, a chronic gynecological condition characterized by the presence of endometrial-like tissue outside the uterus, significantly affects women's reproductive health and quality of life. Among women of reproductive age, endometriosis is a common cause of infertility, with approximately 30-50% of infertile women suffering from the condition. In severe cases, where extensive pelvic adhesions, endometriomas, and deep infiltrating endometriosis are present, the chances of spontaneous conception are greatly diminished. In Bangladesh, where reproductive health issues are often compounded by delayed diagnosis and limited access to advanced treatment modalities, the impact of severe endometriosis on fertility is a pressing concern [1-4].

Laparoscopic surgery has emerged as the gold standard for the diagnosis and treatment of

endometriosis. It offers a minimally invasive approach that allows for the excision or ablation of endometrial lesions, removal of endometriomas, and restoration of normal pelvic anatomy, which is crucial for improving fertility outcomes. In developed countries, several studies have demonstrated the effectiveness of laparoscopic treatment in improving fertility among women with severe endometriosis. However, there is a paucity of data from low-resource settings like Bangladesh, where the availability of laparoscopic expertise and technology may be limited, and sociocultural factors may further delay treatment [5-8].

The fertility outcomes of Bangladeshi women with severe endometriosis undergoing laparoscopic treatment remain largely underexplored. Cultural factors, healthcare infrastructure, and socioeconomic conditions play a significant role in shaping the treatment landscape [9-11]. Often, women with endometriosis in Bangladesh experience delays in seeking medical care due to stigma, lack of awareness, and limited healthcare accessibility, leading to advanced disease by the time of diagnosis. Consequently, the impact of laparoscopic surgery on fertility in this population warrants specific attention, as the outcomes may differ from those reported in more developed healthcare systems.

A prospective study focused on Bangladeshi women with severe endometriosis undergoing laparoscopic treatment could provide valuable insights into the fertility outcomes of this demographic. Such a study would assess not only the reproductive success post-surgery but also the influence of factors such as age, duration of infertility, and the extent of the disease. By examining fertility rates, pregnancy outcomes, and time to conception post-surgery, researchers can better understand the effectiveness of laparoscopic intervention in this unique population.

Furthermore, this study would have implications for improving clinical guidelines and healthcare practices in Bangladesh. By identifying the barriers and facilitators to successful treatment, healthcare providers can tailor their approaches to address the specific needs of Bangladeshi women with severe endometriosis. This could lead to earlier diagnosis, improved access to laparoscopic surgery, and ultimately, enhanced fertility outcomes for affected individuals.

Objective

To asses impact of laparoscopic treatment on fertility outcomes in patients with severe endometriosis.

METHODOLOGY

This retrospective cohort study included 78 women with severe endometriosis from tertiary hospitals in Dhaka and Khulna, Bangladesh. All participants had previously failed in vitro fertilization (IVF) attempts and subsequently underwent laparoscopic surgery between 2015 and 2024. Data collection involved reviewing primary and secondary data from these tertiary hospitals, including medical records and operative reports, and was supplemented by follow-up interviews for a comprehensive analysis. All patients included in the study were operated on by highly skilled surgeons specializing in advanced laparoscopic surgery for endometriosis. The surgical team comprised senior gynecologists with extensive experience in treating complex cases of endometriosis.

Patients were selected based on the following criteria: (1) women with pathological confirmation of endometriosis, and (2) women who experienced infertility, underwent in vitro fertilization (IVF) treatment before surgery, and expressed a desire to conceive post-surgery. To ensure comprehensive data collection, information regarding previous IVF treatments was obtained from patient files at the hospital's IVF unit, and additional follow-up data were gathered through telephone interviews. The study collected detailed demographic and clinical data from medical records and operative reports, including patient age, duration of infertility, presence of additional infertility factors, previous assisted reproductive technology (ART) treatments, history of surgeries, and preoperative symptom profiles.

Operative findings, including the extent of endometriosis and the surgical procedures performed, were meticulously documented for each patient. Any missing or incomplete data were supplemented through follow-up phone interviews, enabling long-term tracking of fertility outcomes, including conception rates and pregnancy outcomes after the laparoscopic intervention. The goal of the study was to evaluate the impact of laparoscopic treatment on the fertility outcomes of Bangladeshi women with severe endometriosis, particularly in a setting where access to advanced reproductive technologies and specialized surgeries is often limited.

The collected data were analyzed using SPSS software. Continuous variables were tested for normal distribution using the D'Agostino-Pearson normality test. Parametric data were compared using the t-test, while nonparametric data were assessed with the Mann-Whitney U test. Categorical variables were analyzed using Fisher's exact test to evaluate relationships between different patient characteristics and fertility outcomes. Statistical significance was set at $P<.05$.

This study aims to provide valuable insights into the effectiveness of laparoscopic surgery in enhancing fertility outcomes for women in Bangladesh, offering a crucial perspective on the management of endometriosis in a resource-constrained healthcare environment.

RESULTS

In this study, 78 symptomatic women with severe endometriosis who had previously failed IVF treatments underwent laparoscopic surgery. The mean age of the women at the time of surgery was 34.3 years (±4.2), with a median gravidity of 1 and parity of 0. A significant portion of the group, 71.8% (56 women), were nulliparous, and the average duration of infertility was 52.9 months (±36.1). Notably, 21.8% (17 women) exhibited typical ultrasound signs of adenomyosis, and the average number of previous IVF cycles was 4.6 (±3.7) for oocyte aspiration and 6.6 (±4.9) including frozen embryo transfers (FET). Additionally, 75.9% (60 women) had undergone prior surgeries for endometriosis, and 44.9% (35 women) had other infertility factors. After surgery, 42.3% (33 women) achieved delivery, with 7% (6 women) conceiving spontaneously. Only 3.8% (3 women) experienced tubo-ovarian abscesses during IVF treatment.

Table-1: Characteristics of 78 symptomatic women with severe endometriosis who failed IVF treatment and underwent surgery

Characteristic	Mean (±SD)
Women age at operation, y	34.3 (4.2)
Gravidity, median	1
Parity, median	0
Nulliparous women, n (%)	56 (71.8)
Infertility (mo), n (%)	52.9 (36.1)
Typical ultrasound signs of adenomyosis	17/78 (21.8)
Previous IVF cycles (oocyte aspiration), n (%)	4.6 (3.7)
Previous IVF cycles (including FET), n (%)	6.6 (4.9)
Previous tubo-ovarian abcess during IVF treatment	3/78 (3.8%)
Women with previous endometriosis surgeries, n (%)	60 (75.9)
Women with additional infertility factors, n (%)	35 (44.9)
Women who delivered after surgery, n (%)	33/78 (42.3)
Women who delivered spontaneously after surgery, n (%)	6/78 (7)

Among the 78 symptomatic women with severe endometriosis who had failed IVF treatment and underwent laparoscopic surgery, various surgical procedures were performed. Salpingectomy was the most common, occurring in 59.0% (46 women), with 23.1% (18 women) undergoing the procedure on the left side, 10.3% (8 women) on the right, and 25.6% (20 women) bilaterally. Ovarian endometriomas were present in 56.4% (44 women), with 35.9% (28 women) undergoing cystectomy and 21% (16 women) receiving ablation or drainage. Bowel involvement was noted in 47.4% (37 women), including rectovaginal nodule resection in 25.6% (20 women) and segmental resection in 3.8% (3 women). Urinary bladder nodules were resected in 30.8% (24 women), with 3.85% (3 women) requiring partial bladder cystectomy. Ureteral adhesiolysis was performed in 23.1% (18 women).

Table-2: Laparoscopic surgical procedures in 78 symptomatic women with severe endometriosis who failed IVF treatment and underwent surgery

Surgical procedure	Incidence
Salpingectomy	46 (59.0)
Left	18 (23.1)
Right	8 (10.3)
Bilateral	20 (25.6)
Ovarian endometrioma	44 (56.4)
Cystectomy (±contralateral ablation—drainage)	28 (35.9)
Ablation (drainage only)	16 (21)
Bowel involvement	37 (47.4)
Rectovaginal nodule resection	20 (25.6)
Segmental resection	3 (3.8)
Urinary bladder nodule resection	24 (30.8)
Partial bladder cystectomy	3 (3.85)
Ureteral adhesiolysis	18 (23.1)

A comparison of preoperative variables between women who delivered after surgery (n = 33) and those who failed to deliver (n = 45) revealed several significant differences. Women who delivered were younger at the time of surgery, with a mean age of 32.5 years compared to 35.5 years for those who did not conceive (P < .001). There were no significant differences in prior pregnancies, spontaneous

pregnancies, or previous deliveries between the two groups. Previous surgeries for endometriosis were slightly more common in women who failed to deliver (80%) compared to those who did (64%), though this difference was not statistically significant.

Diminished ovarian response was observed more frequently in the group that failed to conceive (28.8% vs. 6%, P = .02). Additionally, a normal uterine appearance on transvaginal ultrasound (TVS) was significantly more common in women who delivered (82% vs. 58%, P = .03), while typical ultrasound signs of adenomyosis were more frequent in the group that did not conceive (28.8% vs. 12%, P = .02). Ovarian endometrioma size did not significantly differ between the two groups. Women who delivered had fewer previous IVF cycles (median of 4) compared to those who did not conceive (median of 6, P = .03), and the duration of infertility was shorter in the successful group, though this difference was not statistically significant (P = .07). Surgical interventions, such as cystectomy or ablation, did not differ significantly between the groups.

Table-3: Comparison of preoperative variables between women who delivered after surgery and women who failed to deliver after surgery

Characteristics	Delivered after surgery (n = 33)	Failed to deliver after surgery (n = 45)	*P* value
Age at surgery, y (±SD)	32.5 (4.1)	35.5 (3.8)	<.001
Previous pregnancies	17/33 (52)	26/45 (58)	ns
Previous spontaneous pregnancies	7/33 (21)	10/45 (22)	ns
Previous deliveries	8/33 (24)	14/45 (31.1)	ns
Previous endometriosis surgeries	21/33 (64)	36/45 (80)	ns
Dysmenorrhea	30/33 (91)	38/45 (84)	ns
Dyspareunia	16/33 (48)	16/45 (36)	ns
Gastrointestinal symptoms (constipation, diarrhea, dyschezia, tenesmus, rectal bleeding)	16/33 (48)	21/45 (47)	ns
Women with diminished ovarian response	2/33 (6)	13/45 (28.8)	.02
Normal uterus appearance (TVS)	27/33 (82)	26/45 (58)	.03
Typical ultrasound signs of adenomyosis (local and diffuse)	4/33 (12)	13/45 (28.8)	.02
Ovarian endometrioma size, mm (±SD)	40 (23.1)	45 (21.6)	ns
Infertility month, median (IQR)	36 (24–54)	48 (36–75)	.07
Previous IVF cycles, median (IQR)	4 (2–7)	6 (3–9)	.03
No ovary surgery	14/34 (41)	20/34 (59)	ns
Cystectomy	14/28 (50)	14/28 (50)	ns
Ablation (drainage)	5/16 (31)	9/16 (69)	ns

A comparison of operative and postoperative variables between women who delivered after surgery (n = 33) and those who failed to deliver (n = 45) showed notable trends, although many were not statistically significant. Salpingectomy was more common in women who delivered (70%) compared to those who did not (51%), though this difference did not reach statistical significance (P = .09). Surgical treatment for ovarian endometriomas, including cystectomy, ablation, or drainage, was similarly distributed between the two groups (58% vs. 56%). Rectovaginal nodule resection was performed in 18% of women who delivered and 31% of those who did not, though this difference was not statistically significant.

A significant difference was observed in the appearance of the uterus during surgery, with 45.5% of women who delivered having a normal uterine appearance compared to only 20% of women who did not conceive (P = .02). The median endometriosis fertility index (EFI) scores were similar between the groups (median 3 vs. 4), and there was no significant difference in follow-up duration after surgery (67.8 months for those who delivered vs. 58.7 months for those who did not). Among the women who delivered, the median interval between surgery and pregnancy was 6 months (IQR 4–13), and the median number of IVF cycles after surgery until delivery was 2 (IQR 2–5).

Table-4: Comparison of operative and postoperative variables between women who delivered after surgery and women who failed to deliver after surgery

Characteristic	Delivered after surgery (n = 33)	Failed to deliver after surgery (n = 45)	*P* value
Salpingectomy performed at surgery (%)	23/33 (70)	23/45 (51)	.09
Ovarian endometrioma surgical cystectomy/ablation/drainage (%)	19/33 (58)	25/45 (56)	ns
Rectovaginal nodule resection (%)	6/33 (18)	14/45 (31)	ns
Normal uterus appearance (at surgery) (%)	15/33 (45.5)	9/45 (20)	.02

Characteristic	Delivered after surgery (n = 33)	Failed to deliver after surgery (n = 45)	*P* value
Endometriosis fertility index, median (range)	3 (0–7)	4 (0–7)	ns
Follow-up after surgery (mo)	67.8 (30.3)	58.7 (30.6)	ns
Interval (mo) between surgery and pregnancy (with delivery), median (IQR)	6 (4–13)	NA	
No. of IVF cycles after surgery until delivery, median (IQR)	2 (2–5)	NA	

DISCUSSION

Previous research has consistently demonstrated that endometrial surgery may improve reproductive outcomes, even in cases of severe endometriosis, supporting the findings of this study. [12-15] In our series, all patients underwent radical laparoscopic procedures that included bowel and bladder resections, as well as ureterolysis. These surgeries not only provided significant symptom relief but also contributed to increased live birth rates following surgery. [15] Contrary to concerns that radical surgery might impair fertility, our data show the opposite. Although all patients had undergone multiple IVF cycles prior to surgery without success, they achieved pregnancy only after the surgical intervention. Remarkably, six patients conceived spontaneously, which is notable given the extensive nature of their endometriosis. Additionally, 67.7% (23 women) achieved successful pregnancies after their first or second round of IVF following surgery, highlighting the positive impact of surgical intervention on fertility outcomes.

Moreover, our findings align with previous studies that observed an increase in cumulative live birth rates after three or four IVF cycles, reaffirming the benefits of extending IVF treatment beyond this threshold. This observation appears particularly relevant for women with symptomatic endometriosis who had failed multiple IVF treatments prior to undergoing surgery. To further examine the factors influencing fertility outcomes, we compared preoperative and operative variables between patients who successfully delivered post-surgery and those who did not (Tables 3 and 4). As anticipated, younger women and those with normal ovarian responses had higher success rates, while older women and those with diminished ovarian responses fared worse. Notably, gestational history, including prior pregnancies and deliveries, showed no significant differences between those who conceived after surgery and those who did not. Similarly, preoperative symptoms, including dysmenorrhea (reported by 87% of patients), gastrointestinal complaints (47%), and dyspareunia (41%), did not differ between the two groups.

We also analyzed four other factors: uterine adenomyosis, salpingectomy, ovarian endometriomas, and endometrial fertility index scores. Uterine adenomyosis, a condition characterized by the presence of endometrial tissue within the myometrium, was prevalent in 50-70% of patients with severe endometriosis, consistent with previous reports. However, its impact on IVF success rates remains inconclusive. Some studies suggest that adenomyosis may increase miscarriage rates or reduce implantation success (25, 26), while others do not find a significant effect. [2,7] In our cohort, patients with adenomyosis had lower delivery rates compared to those with a normal uterine appearance (as determined by transvaginal ultrasound and surgical evaluation), indicating that adenomyosis may negatively affect fertility outcomes post-surgery.

Salpingectomy was another factor associated with improved reproductive outcomes. This finding was expected, as hydrosalpinx has been shown to reduce the success rate of IVF treatments. [10] Surgical intervention, including salpingotomy or tubal occlusion, is typically recommended before IVF. In our study, 60% of patients required salpingectomy during surgery due to hydrosalpinx, despite having undergone prior surgeries for endometriosis. This suggests that hydrosalpinges may have been misdiagnosed or untreated in earlier surgeries, likely due to severe pelvic adhesions or technical challenges. Additionally, repeated IVF cycles may have contributed to the development of hydrosalpinx [11], underscoring the importance of thorough evaluation of the fallopian tubes in patients with endometriosis and repeated implantation failure.

The treatment of ovarian endometriomas remains a subject of debate. Laparoscopic ovarian cystectomy is often recommended for endometriomas larger than 4 cm to reduce the risk of infection and improve ovarian function, but there is a risk of diminished ovarian reserve following surgery. [10] In our study, ovarian endometriomas were surgically removed from 56.4% of patients, but there was no significant difference in ovarian surgery rates between those who delivered post-surgery and those who did not (58% vs. 56%). Additionally, the size of the endometriomas did not differ significantly between these groups (Table 3), suggesting that the removal of ovarian endometriomas did not negatively impact fertility outcomes.

Endometrial fertility index (EFI) scores have been proposed as a predictor of spontaneous pregnancy after surgery for endometriosis. [12] As expected, our patients' EFI scores were quite low after surgery (median score of 3), leading most to continue with IVF treatments. However, six patients conceived

spontaneously after surgery. Three of these patients achieved their first pregnancy following the operation, while the other three conceived spontaneously after a successful IVF pregnancy. Interestingly, their EFI scores were higher than the median, with scores ranging from 4 to 6. Therefore, patients with higher EFI scores and normal sperm parameters in their partners may consider attempting natural conception for a limited time after surgery before transitioning to IVF if necessary.

CONCLUSION

In summary, laparoscopic surgery performed by an experienced multidisciplinary team specializing in endometriosis should be considered for women with severe symptomatic endometriosis who have faced repeated IVF implantation failure. Comprehensive excision of endometrial lesions, including bowel and urinary tract resection when necessary, is advised to restore pelvic anatomy. Salpingectomy may also be beneficial in appropriate cases. Favorable prognostic factors for delivery following surgery include younger age, normal ovarian response, and normal uterine morphology.

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