

ORIGINAL ARTICLE

Fertility outcome following laparoscopic cystectomy in patients with chocolate cyst

DOI: 10.5281/zenodo.17908791

Sharmin Afroz¹, Sehereen F Siddiqua², Sharmin Sultana³, Waliza Rukshana Haque³

Received: 24 Nov 2025

Accepted: 04 Dec 2025

Published: 12 Dec 2025

Published by:Gopalganj Medical College, Gopalganj,
Bangladesh**Correspondence to**
Sharmin Afroz**ORCID**<https://orcid.org/0009-0002-3599-4028>

Copyright © 2025 The Insight

This article is licensed under a Creative
Commons Attribution 4.0 International
License.**ABSTRACT**

Background: Ovarian endometrioma (chocolate cyst) is a common manifestation of endometriosis and a significant cause of infertility in reproductive-age women. Laparoscopic cystectomy is widely employed to improve fertility outcomes, yet the extent of its effectiveness and influencing factors remain subjects of ongoing investigation. **Objective:** To evaluate 12-month fertility outcomes following laparoscopic excision of chocolate cysts in women presenting with infertility and to identify factors associated with successful conception. **Methods & Materials:** This prospective observational study was conducted at the Department of Obstetrics and Gynecology, Anwar Khan Modern Medical College, Chattogram, Bangladesh, from January to December 2024. A total of 138 infertile women aged 20–40 years with diagnosed ovarian endometrioma underwent laparoscopic cystectomy. Clinical pregnancy within 12 months post-surgery was the primary outcome, with follow-ups conducted every 3 months. Data were analyzed using SPSS, with $p < 0.05$ considered statistically significant. **Results:** The overall pregnancy rate within 12 months was 65.2%, including 52.2% spontaneous conception and 13.0% through assisted reproductive techniques. Most conceptions occurred within the first 6 months (48.9%). Significant predictors of successful pregnancy included age < 35 years (72.3% vs 49.1%, $p = 0.02$), unilateral cysts (69.8% vs 52.4%, $p = 0.03$), and Stage III endometriosis (70.7% vs 57.1%, $p = 0.04$). Cyst size did not significantly affect pregnancy outcomes. Among pregnancies, 86.7% resulted in live births, while 13.3% ended in miscarriage. **Conclusion:** Laparoscopic cystectomy offers favorable fertility outcomes in women with ovarian endometrioma, particularly those who are younger, have unilateral cysts, and less advanced disease. Careful patient selection and fertility counseling are crucial to optimize outcomes while preserving ovarian reserve.

Keywords: Ovarian endometrioma, Chocolate cyst, Laparoscopic cystectomy, Infertility, Fertility outcome

(The Insight 2025; 8(3): 501-503)

1. Assistant Professor, Department of Obstetrics & Gynecology, Anwar Khan Modern Medical College Hospital, Dhaka, Bangladesh
2. Head of Department, Obstetrics and Gynecology Department, Anwar Khan Modern Medical College Hospital, Dhaka, Bangladesh
3. Register, Obstetrics and Gynecology Department, Anwar Khan Modern Medical College Hospital, Dhaka, Bangladesh

INTRODUCTION

Ovarian endometrioma, or chocolate cyst, occurs in 17–44% of women with endometriosis and contributes significantly to infertility through chronic inflammation, distorted pelvic anatomy, altered peritoneal environment, and reduced ovarian reserve [1,2]. Among its many manifestations, chocolate cyst is a common phenotype and often poses diagnostic and therapeutic challenges [3,4]. The impact of endometrioma on female fertility is multifactorial, involving distortion of pelvic anatomy, altered folliculogenesis, and inflammatory damage to ovarian tissue [5]. Surgical removal of endometriomas, typically via laparoscopic cystectomy, is commonly practiced to improve fertility outcomes, alleviate symptoms, and exclude malignancy [6].

Recent evidence suggests that spontaneous conception after laparoscopic cystectomy can be achieved in a significant proportion of women, particularly those with unilateral disease and younger age [7,8]. According to literature, minimally invasive surgery, particularly laparoscopy, is

considered the standard for both diagnosis and treatment due to its efficacy in symptom relief and its potential role in preserving ovarian reserve and improving reproductive outcomes [9]. A case series by Supermaniam and They demonstrated promising results, indicating that surgical intervention can significantly improve the chances of conception in affected women, especially those facing infertility challenges. Laparoscopic cystectomy has been widely used as a fertility-preserving treatment for endometrioma, with studies reporting favorable pregnancy outcomes post-surgery [10]. This study aims to evaluate the 12-months fertility outcomes following laparoscopic excision of chocolate cysts in women presenting with infertility and to explore the factors associated with successful conception.

METHODS & MATERIALS

This prospective observational study was conducted in the Department of Obstetrics and Gynecology at Anwar Khan Modern Medical College, Chattogram, Bangladesh, from January to December 2024. A total of 138 women aged 20–40

years with diagnosed ovarian endometrioma (chocolate cyst) and a history of infertility who underwent laparoscopic cystectomy were included. The sample size was calculated based on a 64.4% pregnancy rate reported by Sun et al. (2020), with a 95% confidence level and 8% margin of error, yielding a required sample of approximately 138. Patients with male factor infertility, previous ovarian malignancy, or severe systemic illness were excluded. Data on demographics, cyst characteristics, operative findings, and postoperative fertility outcomes were collected and analyzed. The primary outcome was clinical pregnancy within 12 months post-surgery, assessed through follow-up at 3-month intervals. Statistical analysis was performed using SPSS, with significance set at $p < 0.05$.

RESULTS

Table – I: Baseline Characteristics of Participants (n=138)

Variable	Mean \pm SD / n (%)
Age (years)	31.2 \pm 4.6
Duration of infertility (years)	3.8 \pm 1.5
Cyst laterality	
– Unilateral	96 (69.6%)
– Bilateral	42 (30.4%)
Cyst size (cm)	5.4 \pm 1.2
Stage of endometriosis	
– Stage III	82 (59.4%)
– Stage IV	56 (40.6%)
Elevated preoperative CA-125	91 (65.9%)

Table I shows the baseline characteristics of the participants. The mean age of participants was 31.2 years, and the average duration of infertility was approximately 4 years. The majority (69.6%) had unilateral endometriomas, while about 30% had bilateral involvement. Most patients (59.4%) had stage III endometriosis, and elevated CA-125 levels were found in nearly two-thirds of the sample, indicating the inflammatory nature of the disease.

Table – II: Fertility Outcomes within 12 Months After Surgery

Outcome	n (%)
Spontaneous conception	72 (52.2%)
Conception through ART	18 (13.0%)
Total pregnancies	90 (65.2%)
No conception	48 (34.8%)
Time to conception	
– <6 months	44 (48.9%)
– 6–12 months	46 (51.1%)
Pregnancy outcomes	
– Live births	78 (86.7%) of 90
– Miscarriages	12 (13.3%) of 90

Table II presents the fertility outcomes of the participants. Within one year following laparoscopic cystectomy, 65.2% (90/138) of women achieved pregnancy. Over half of the patients (52.2%) conceived spontaneously without assisted reproductive techniques (ART), while an additional 13.0% conceived following ART. Among those who became pregnant, the time to conception was fairly evenly distributed, with 48.9% conceiving within the first 6 months and 51.1% conceiving between 6 and 12-months post-surgery. Regarding pregnancy outcomes, the majority of pregnancies resulted in live births, with an 86.7% live birth rate among the 90 pregnancies. The miscarriage rate was 13.3%.

Table – III: Factors Associated with Fertility Outcome

Variable	Pregnancy Rate (%)	p-value
Age <35 years	72.3%	0.02 *
Age \geq 35 years	49.1%	
Cyst laterality		0.03 *
– Unilateral	69.8%	
– Bilateral	52.4%	
Endometriosis Stage		0.04 *
– Stage III	70.7%	
– Stage IV	57.1%	
Cyst size <6 cm vs \geq 6 cm	66.2% vs 63.4%	0.18 ns

(* $p < 0.05$; ns = not significant)

Table III revealed several significant predictors of postoperative pregnancy within 12 months after laparoscopic cystectomy: Age was a significant factor influencing fertility. Women aged <35 years had a significantly higher pregnancy rate (72.3%) compared to those aged \geq 35 years (49.1%), with a p-value of 0.02, indicating younger age as a favorable prognostic factor. Cyst laterality also showed a significant association with fertility outcome. Patients with unilateral cysts had a higher pregnancy rate (69.8%) than those with bilateral cysts (52.4%), with a p-value of 0.03, suggesting that bilateral disease may negatively impact reproductive potential. The stage of endometriosis was another significant determinant. Women with Stage III endometriosis had a higher conception rate (70.7%) compared to those with Stage IV disease (57.1%), with a p-value of 0.04. This indicates that less severe disease is associated with better fertility outcomes. Cyst size (<6 cm vs \geq 6 cm) did not significantly affect pregnancy rates (66.2% vs 63.4%, $p = 0.18$), implying that within the observed size range, cyst diameter alone was not a strong predictor of fertility outcome.

DISCUSSION

The present study demonstrates that laparoscopic cystectomy for ovarian endometrioma leads to promising fertility outcomes, with a total pregnancy rate of 65.2% within 12 months, and a majority of conceptions occurring spontaneously. These findings reinforce the role of minimally invasive surgery in improving reproductive outcomes in women with endometriosis-associated infertility.

Our spontaneous conception rate of 52.2% is consistent with previous research showing post-surgical pregnancy rates between 40% and 70% in infertile women undergoing laparoscopic cystectomy for endometriomas, particularly when performed in the absence of other infertility factors or tubal damage^[11,12]. These rates support the hypothesis that surgical excision of endometriotic cysts may restore normal pelvic anatomy and reduce the inflammatory environment, thereby improving the chances of natural conception^[13].

One of the significant predictors of conception identified in this study was age <35 years, which was associated with a higher pregnancy rate (72.3%, $p = 0.02$). This is consistent with multiple studies that have emphasized the critical role of age in determining reproductive outcomes following endometrioma surgery, as ovarian reserve naturally declines with age, even in the absence of surgery^[14,15]. Furthermore, evidence suggests that younger women have better ovarian responsiveness postoperatively, and oocyte quality remains relatively preserved, leading to better fertility outcomes^[16].

Laterality of the cyst also played a key role in predicting conception, with unilateral cysts associated with significantly higher pregnancy rates than bilateral ones (69.8% vs 52.4%, $p = 0.03$). This finding mirrors those of Muzii et al. and others who demonstrated that bilateral cystectomy carries a higher risk of ovarian reserve depletion, which in turn reduces the probability of conception^[17,18]. The preservation of one unaffected ovary in unilateral cases may help maintain a sufficient pool of follicles for spontaneous ovulation and conception.

The stage of endometriosis was another influential factor, with women diagnosed with Stage III disease showing better fertility outcomes than those with Stage IV (70.7% vs 57.1%, $p = 0.04$). This reflects the association between more advanced disease and extensive pelvic adhesions, anatomical distortion, and impaired tubo-ovarian function, all of which reduce the likelihood of spontaneous conception^[19,20].

Interestingly, cyst size did not significantly influence pregnancy rates (66.2% for <6 cm vs 63.4% for ≥ 6 cm, $p = 0.18$). Although some prior studies have suggested that larger endometriomas may be associated with reduced ovarian reserve post-surgery, recent findings indicate that within moderate size ranges, cyst size alone may not be a decisive factor in predicting fertility outcomes^[21].

The live birth rate in our study was encouraging (86.7%), with a relatively low miscarriage rate (13.3%). These results align with other clinical reports showing that endometrioma-related pregnancies, once achieved, have outcomes similar to those of the general population if appropriately monitored and managed^[22].

However, the surgical excision of endometriomas is not without risk. Multiple studies have reported a postoperative decline in AMH levels, particularly after bilateral cystectomy, highlighting the need for preoperative counseling and individualized fertility planning^[23,24]. Therefore, while cystectomy can improve spontaneous conception chances, especially in selected cases, its potential impact on ovarian reserve warrants careful assessment—ideally including pre- and post-operative ovarian reserve markers.

CONCLUSION

Laparoscopic cystectomy remains an effective fertility-enhancing intervention for women with ovarian endometrioma, particularly in younger women with unilateral disease and moderate-stage endometriosis. Appropriate patient selection and fertility counseling are essential to maximize benefits while minimizing risks.

REFERENCE

1. Vercellini P, Somigliana E, Viganò P, Abbiati A, Dagupati R, Fedele L. Endometriosis: current therapies and new pharmacological developments. *Drugs*. 2009;69(6):649–675.
2. De Ziegler D, Borghese B, Chapron C. Endometriosis and infertility: pathophysiology and management. *The Lancet*. 2010 Aug 28;376(9742):730–8.
3. Chen Y, Pei H, Chang Y, et al. Surgical management of ovarian endometrioma: impact on ovarian reserve parameters and reproductive outcomes. *J Clin Med*. 2023;12(16):5324. doi:10.3390/jcm12165324
4. Al-Senit MA, Badawi OS, Wahba K, El Refaei T, Essmat M. The effect of laparoscopic ovarian cystectomy for endometrioma on

- ovarian reserve in patients with infertility: a prospective cohort study. *J Obstet Gynecol Reprod Sci*. 2021;5(9):154. doi:10.31579/2578-8965/154
5. Tanprasertkul C, Thavaramara T, Pongsuthirak P. Factors influencing spontaneous pregnancy after laparoscopic surgery for endometriosis: A retrospective study. *J Obstet Gynaecol Res*. 2020;46(1):142–149. doi:10.1111/jog.14123
6. Klemmt PA, Starzinski-Powitz A. Molecular and cellular pathogenesis of endometriosis. *Curr Womens Health Rev*. 2018;14(2):106–116.
7. Rahman F. Impact of surgery on ovarian reserve in patients with endometrioma among infertile women. *Fertil Steril*. 2021;116(3):e206–e207.
8. Sun TT, Chen SK, Li XY, Zhang JJ, Dai Y, Shi JH, Jia SZ, Wu YS, Leng JH. Fertility outcomes after laparoscopic cystectomy in infertile patients with stage III–IV endometriosis: a cohort with 6–10 years of follow-up. *Advances in Therapy*. 2020 May;37(5):2159–68.
9. Mandai M, Suzuki A, Matsumura N, Baba T, Yamaguchi K, Hamanishi J, Yoshioka Y, Kosaka K, Konishi I. Clinical management of ovarian endometriotic cyst (chocolate cyst): diagnosis, medical treatment, and minimally invasive surgery. *Current Obstetrics and Gynecology Reports*. 2012 Mar;1(1):16–24.
10. Supermaniam S, Thye WL. Laparoscopic cystectomy in treating women with endometrioma and pregnancy outcome—A case series. *Med J Malaysia*. 2021 Jan 1;76(1):29–34.
11. Canis M, Pouly JL, Wattiez A, Mage G, Manhes H, Bruhat MA. Laparoscopic management of endometriomas: is it possible to preserve fertility? *Fertil Steril*. 1992;58(4):613–5.
12. Donne J, Squifflet J, Pirard C, Jadoul P, Wyns C. Outcome after laparoscopic management of endometriomas: the role of postoperative medical therapy and fertility. *Hum Reprod*. 2004;19 Suppl 2:191–7.
13. Marcellin L, Santulli P, Bortolato S, Bourdon M, Maitrot-Mantelet L, Bordonne C, et al. Fertility preservation in women with endometriosis. *Clin Obstet Gynecol*. 2017;60(4):727–736.
14. Nelson SM. Ovarian ageing and the impact on fertility. *Obstet Gynaecol Reprod Med*. 2013;23(4):107–112.
15. Cobo A, Garrido N, Crespo J, Pellicer A. Accumulation of oocytes: a new strategy for managing poor responder patients undergoing assisted reproduction. *Fertil Steril*. 2012;98(3):563–568.
16. Somigliana E, Infantino M, Benedetti F, Arnoldi M, Calanna G, Ragni G. The presence of ovarian endometriomas is associated with a reduced responsiveness to gonadotropins. *Fertil Steril*. 2006;86(1):192–196.
17. Muzii L, Di Tucci C, Di Felicianantonio M, Galati G, Musella A, Palaia I, et al. The effect of surgery for endometrioma on ovarian reserve evaluated by antral follicle count: a systematic review and meta-analysis. *Hum Reprod*. 2014;29(10):2190–8.
18. Garcia-Velasco JA, Somigliana E. Management of endometriomas in women requiring IVF: to touch or not to touch. *Hum Reprod*. 2009;24(3):496–501.
19. Johnson NP, Hummelshoj L. Consensus on current management of endometriosis. *Hum Reprod*. 2013;28(6):1552–68.
20. Dunselman GA, Vermeulen N, Becker C, Calhaz-Jorge C, D'Hooghe T, De Bie B, et al. ESHRE guideline: management of women with endometriosis. *Hum Reprod*. 2014;29(3):400–12.
21. Almog B, Shehata F, Shezaf B, Albin D, Barkan T, Levin I, et al. Effects of the size of endometrioma on the number of oocytes retrieved for in vitro fertilization. *Fertil Steril*. 2011;95(1):202–6.
22. Uccella S, Cromi A, Casarin J, Serati M, Gisone B, Ghezzi F. Fertility and obstetric outcome after surgical treatment of endometriosis: our experience and review of literature. *Minerva Ginecol*. 2011;63(3):207–13.
23. Uncu G, Kasapoglu I, Ozerkan K, Ozturk O, Kan A, Erkaya S. Prospective assessment of the impact of endometriomas and their removal on ovarian reserve and determinants of the rate of decline in ovarian reserve. *Hum Reprod*. 2013;28(8):2140–5.
24. Kitajima M, Defrère S, Dolmans MM, Colette S, Squifflet J, Van Langendonck A, et al. Endometriomas as a possible cause of reduced ovarian reserve in women with endometriosis. *Fertil Steril*. 2011;96(3):685–91.