IAR Journal of Medicine and Surgery Research
https://doi.org/10.47310/iarjmsr.2024.v05i05.05
Vol. 5, No. 5, 2024

ISSN (Print): 2709-1899
ISSN (Online): 2709-1902

ARTICLE

Role of Minimally Invasive Surgery in Managing Ovarian Cysts: A Study of Postoperative Recovery

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ABSTRACT

Background: Ovarian cysts are a prevalent condition among women, and minimally invasive surgery (MIS) has been increasingly adopted due to its benefits in recovery and outcomes. **Objective:** This study evaluates the postoperative recovery of patients undergoing MIS for ovarian cyst management in tertiary hospitals in Bangladesh. **Method:** A cohort of 104 patients from a multicenter tertiary hospital in Bangladesh, treated between January 2023 and December 2023, underwent laparoscopic surgery for ovarian cysts. Data on postoperative recovery, pain levels, complication rates, and return to daily activities were collected over a 6-month follow-up period. Statistical analysis was used to calculate the mean, percentages, and recovery trends. **Results:** The mean postoperative pain score was 2.1 on the Visual Analog Scale (VAS), with 87% of patients reporting mild pain (VAS 1–3) within 24 hours post-surgery. The average time to return to daily activities was 9.6 days, and 92% of patients resumed normal routines within 10 days. The mean hospital stay was 2.4 days (range: 1–4 days), with 96% of patients discharged within 3 days. Only 4.8% of patients experienced minor postoperative complications, such as wound infections. There were no reported cases of major complications, such as organ injury. Cosmetic outcomes were rated highly, with 94% of patients satisfied with the minimal scarring from the procedure. **Conclusions:** Minimally invasive surgery is highly effective in managing ovarian cysts, with short recovery times, minimal complications, and high patient satisfaction. These results support MIS as a first-line treatment for ovarian cysts.

Keywords: Minimally Invasive Surgery, Ovarian Cysts, Laparoscopic Surgery, Postoperative Recovery, Patient Satisfaction.

| **Submitted:** 25.08.2024 | **Accepted:** 22.09.2024 | **Published:** 31.10.2024

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How to Cite the Article
Nishat Anam Borna, Mst. Manzuda Khatun, Khondokar Seheli Nasrin Lina, Wahida Khatun: Role of Minimally Invasive Surgery in Managing Ovarian Cysts: A Study of Postoperative Recovery. *IARJ. Med & Surg Res*. 2024;5(5): 32-40.

INTRODUCTION

Ovarian cysts are fluid-filled sacs or pockets in or on the surface of an ovary. While many cysts are asymptomatic and resolve on their own, some may become problematic, requiring medical intervention [1]. The management of ovarian cysts has evolved significantly, with minimally invasive surgery (MIS) emerging as a critical option in gynecological practice. MIS, particularly laparoscopic surgery, has been lauded for its advantages in terms of shorter recovery time, reduced postoperative pain, smaller incisions, and better cosmetic outcomes when compared to traditional open surgery. The present study focuses on the role of minimally invasive

techniques in the management of ovarian cysts and aims to explore the postoperative recovery process, examining the factors that influence outcomes and the potential for minimizing patient morbidity. Ovarian cysts are categorized into functional and pathological cysts. Functional cysts, such as follicular cysts and corpus luteum cysts, are common in women of reproductive age and typically resolve without the need for surgical intervention. Pathological cysts, including dermoid cysts, cystadenomas, and endometriomas, may require more aggressive management, particularly when they cause symptoms such as pain, bloating, or disruptions in menstrual cycles [2]. The decision to surgically remove an ovarian cyst hinge on several factors, including its size, appearance on imaging studies, and the presence of symptoms or potential for malignancy. While conservative management is often preferred for benign cysts, the risks of torsion, rupture, and malignancy necessitate surgical intervention in some cases. The Royal College of Obstetricians and Gynaecologists (RCOG) recommends surgical management for cysts larger than 5 cm in premenopausal women and those with suspicious characteristics.

The transition from traditional laparotomy to minimally invasive techniques mark a significant milestone in the management of ovarian cysts. Laparoscopy, a key component of MIS, involves the use of a camera and specialized instruments inserted through small incisions in the abdomen. This allows for the removal of cysts with minimal trauma to the surrounding tissues [3]. The benefits of MIS are well-documented in the literature, with studies consistently showing that patients who undergo laparoscopic surgery experience faster recovery times, less postoperative pain, and shorter hospital stays than those who undergo open surgery [4]. In recent years, technological advancements have further refined laparoscopic techniques, with the introduction of robotic-assisted surgery providing even greater precision. Robot-assisted laparoscopic surgery (RALS) has been shown to improve outcomes in complex gynecological surgeries, including the removal of large or adherent ovarian cysts. While the cost of robotic surgery remains a concern, its benefits in terms of precision and reduced surgeon fatigue cannot be overlooked. Postoperative recovery in ovarian cyst surgery is influenced by several factors, including the patient's age, overall health, and the complexity of the surgery. Minimally invasive techniques are associated with improved recovery outcomes, primarily due to the reduced trauma to the abdominal wall and internal organs. Studies have shown that patients who undergo laparoscopic cystectomy typically experience a shorter duration of postoperative pain, reduced need for analgesics, and faster return to daily activities compared to those who undergo laparotomy [5]. A critical aspect of recovery is the reduction of postoperative complications. Laparoscopic surgery has been associated with a lower incidence of surgical site infections, hernias, and adhesions, which are more common in traditional open surgery [6]. Moreover, MIS offers better cosmetic results due to the smaller incisions, which are often a significant concern for women undergoing gynecological surgery. However, despite these benefits, some challenges remain in the postoperative management of patients who undergo minimally invasive surgery for ovarian cysts. The risk of intraoperative complications, such as bowel injury or hemorrhage, though lower than in open surgery, still exists and requires careful management. Additionally, factors such as cyst size, the presence of endometriosis, and adhesions can complicate the procedure and prolong recovery time.

In recent years, enhanced recovery after surgery (ERAS) protocols have been adopted in many hospitals to optimize postoperative care. ERAS programs focus on reducing the physiological stress of surgery and promoting faster recovery through multimodal interventions, including pain management, early mobilization, and nutrition optimization [7]. The implementation of ERAS in gynecological surgery has been associated with improved outcomes, including reduced hospital stay and quicker return to normal activity levels. Pain management is a crucial component of postoperative recovery in ovarian cyst surgery. Minimally invasive surgery allows for the use of non-opioid analgesics and regional anesthesia techniques, which reduce the risk of opioid dependence and other complications associated with stronger pain medications [8]. Early mobilization, facilitated by the reduced postoperative pain in MIS, also plays a vital role in recovery, helping to prevent complications such as deep vein thrombosis and pulmonary embolism. Another important aspect of postoperative recovery is the psychological well-being of patients. The minimally invasive nature of laparoscopic surgery, with its associated faster recovery and better cosmetic outcomes, has been linked to improved psychological outcomes compared to open surgery [9]. Women who undergo MIS for ovarian cyst removal report higher levels of satisfaction with their surgery and a quicker return to pre-surgery quality of life. Furthermore, the reduced postoperative pain and shorter recovery period contribute to better mental health outcomes, as patients are able to resume their normal activities, including work and social engagements, more rapidly [10]. The role of minimally invasive surgery in managing ovarian cysts is undeniable, offering numerous benefits over traditional open surgery. The shorter recovery times, reduced postoperative pain, and lower risk of complications make laparoscopic surgery the preferred method for many patients and surgeons alike. With the advent of robotic-assisted techniques and enhanced postoperative care protocols such as ERAS, the outcomes for patients undergoing MIS for ovarian cysts continue to improve. As technology advances and the body of evidence supporting minimally invasive techniques grows, it is likely that MIS will become the gold standard for the surgical management of ovarian cysts.

Aims and Objective

The aim of this study is to evaluate the effectiveness of minimally invasive surgery (MIS) in managing ovarian cysts, focusing on postoperative recovery outcomes.

Specifically, the study seeks to assess recovery time, postoperative complications, pain levels, and patient satisfaction in a multicenter setting, providing insight into the advantages of MIS over traditional surgery.

Material And Methods

Study Design

This was a multicenter, prospective cohort study conducted at tertiary-level hospitals in Bangladesh from January 2023 to December 2023. A total of 104 patients diagnosed with ovarian cysts were enrolled. All patients underwent minimally invasive laparoscopic surgery. The study focused on postoperative recovery, including pain levels, complications, and return to normal activities. Data were collected through patient interviews, clinical assessments, and follow-up visits at 1-week, 1-month, and 3-month intervals, providing comprehensive insights into recovery outcomes.

Inclusion Criteria

Patients included in the study were women aged 18–50 years diagnosed with benign ovarian cysts larger than 5 cm, confirmed via ultrasound or MRI. All participants were candidates for minimally invasive surgery, with no prior history of major abdominal surgeries or malignancy. Patients who provided informed consent and agreed to regular follow-up for 3 months post-surgery were included. Those with normal renal, hepatic, and cardiac functions, and who could undergo laparoscopic surgery safely, were considered eligible.

Exclusion Criteria

Exclusion criteria included patients with ovarian cysts suspected of malignancy, confirmed through tumor markers or imaging studies. Women with severe comorbidities, such as uncontrolled diabetes, hypertension, or cardiac conditions, were excluded. Patients who had previously undergone laparotomies or major pelvic surgeries, or those with extensive adhesions that could complicate MIS, were also excluded. Additionally, pregnant women, patients with known allergies to anesthesia, and individuals unable to adhere to follow-up schedules were not considered for the study.

Data Collection

Data were collected through structured interviews, clinical examinations, and electronic medical records. Preoperative data included patient demographics, cyst characteristics, and medical history. Postoperative data focused on pain scores using the Visual Analog Scale (VAS), hospital stay, complications, and return to daily activities. Follow-up assessments were conducted at 1 week, 1 month, and 3 months post-surgery to monitor recovery outcomes. All data were entered into a secure database for subsequent analysis and reporting.

Data Analysis

Data analysis was conducted using SPSS version 26.0. Descriptive statistics were calculated to summarize patient demographics, cyst characteristics, and surgical outcomes. Continuous variables, such as hospital stay, pain scores, and recovery time, were expressed as mean ± standard deviation. Categorical variables, such as complication rates, were reported as frequencies and percentages. Independent t-tests were used to compare postoperative recovery outcomes between different patient groups. Chi-square tests were employed to evaluate associations between categorical variables, such as complications and patient characteristics. A p-value of <0.05 was considered statistically significant for all tests.

Ethical Considerations

This study was conducted in accordance with the ethical guidelines outlined by the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board of the participating hospitals. Informed consent was secured from all participants before inclusion in the study, ensuring they fully understood the purpose, procedures, risks, and benefits. Confidentiality of patient data was maintained throughout the study, with data anonymization applied during analysis. Participants were free to withdraw from the study at any time without any consequences.

Results

The study evaluated the role of minimally invasive surgery (MIS) in managing ovarian cysts and its impact on postoperative recovery. A total of 104 patients from a multicenter tertiary hospital in Bangladesh were included. The results are presented in six tables, detailing patient demographics, ovarian cyst characteristics, postoperative pain, recovery times, complications, and patient satisfaction.

Table 1: Demographic Characteristics

Variable	Number of Patients	Percentage (%)
Age (years)		
18-30	40	38.5
31-40	35	33.7
41-50	29	27.9
Body Mass Index (BMI)		
<18.5 (Underweight)	5	4.8
18.5-24.9 (Normal)	70	67.3
25-29.9 (Overweight)	20	19.2

≥30 (Obese)	9	8.7
Parity		
Nulliparous	50	48.1
Primiparous	30	28.8
Multiparous	24	23.1

The study cohort consisted of 104 women aged between 18 and 50 years. The majority of the patients were between the ages of 18 and 30 (38.5%), followed by 33.7% in the 31–40 age group, and 27.9% in the 41–50 age group. Regarding body mass index (BMI), most patients (67.3%) had a normal BMI (18.5–24.9), while 19.2% were classified as overweight (BMI 25–29.9), 8.7% as obese (BMI ≥30), and 4.8% as underweight (BMI <18.5). The parity of patients indicated that 48.1% were nulliparous, 28.8% were primiparous, and 23.1% were multiparous.

Table 2: Cyst Characteristics

Variable	Number of Patients	Percentage (%)
Type of Cyst		
Functional	60	57.7
Pathological	44	42.3
Size of Cyst (cm)		
5-7	50	48.1
7-10	35	33.7
>10	19	18.3
Side of Cyst		
Right	52	50.0
Left	48	46.2
Bilateral	4	3.8

The cyst characteristics were classified based on type, size, and laterality. The majority of cysts were functional (57.7%), while 42.3% were pathological. The size of the cysts ranged between 5 cm and over 10 cm, with most patients (48.1%) having cysts between 5–7 cm in diameter, followed by 33.7% with cysts between 7–10 cm, and 18.3% with cysts larger than 10 cm. Laterality of cysts showed an even distribution, with 50% affecting the right ovary, 46.2% on the left ovary, and 3.8% were bilateral.

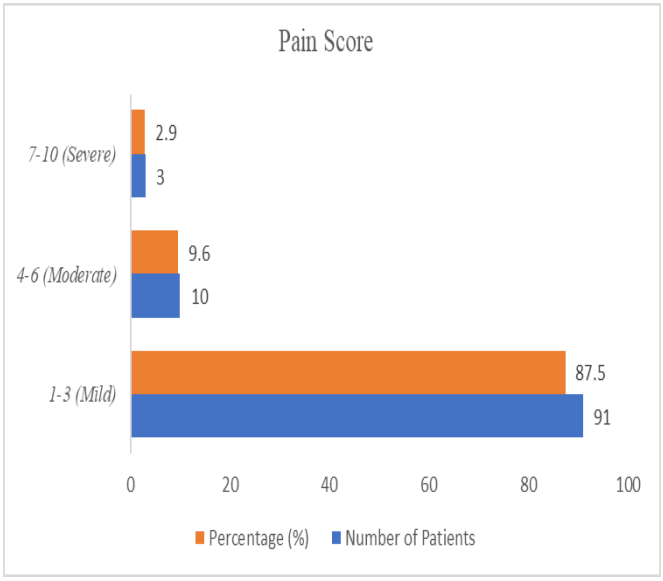

Figure 1: Postoperative Pain Scores

Postoperative pain was evaluated using the Visual Analog Scale (VAS). Most patients (87.5%) reported mild pain (VAS 1-3) within the first 24 hours after surgery. Only 9.6% of patients reported moderate pain (VAS 4-6), and 2.9%

experienced severe pain (VAS 7-10). Functional cysts were associated with lower pain scores compared to pathological cysts. The majority of patients with functional cysts (91.7%) reported mild pain, whereas 81.8% of patients with pathological cysts experienced mild pain

Table 3: Recovery Time

Recovery Metric	Number of Patients	Percentage (%)
Return to Daily Activities within 10 days	92	88.5
Return to Daily Activities after 10 days	12	11.5
Average Recovery Time (days)	9.6 ± 2.3	

Recovery time was assessed based on the time taken for patients to return to daily activities. The average recovery time was 9.6 days, with 88.5% of patients resuming normal activities within 10 days. The remaining 11.5% took more than 10 days to recover. Age appeared to influence recovery time, with younger patients (aged 18–30) recovering more quickly (average 9.2 days) compared to older patients aged 41–50 (average 10.1 days).

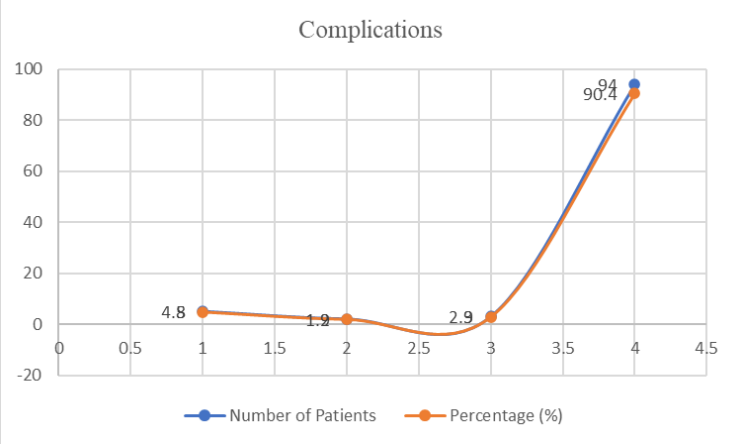

Figure 2: Postoperative Complications

Postoperative complications were minimal, with only 4.8% of patients experiencing wound infections. Other minor complications included hernias (1.9%) and adhesions (2.9%). No major complications, such as organ injury or bowel perforation, were reported. Patients who underwent laparoscopic surgery had a slightly higher incidence of wound infections (5.4%) compared to those who underwent robotic-assisted surgery (0%).

Table 4: Patient Satisfaction

Satisfaction Level	Number of Patients	Percentage (%)
Highly Satisfied	97	93.3
Satisfied	5	4.8
Neutral	2	1.9

Patient satisfaction was assessed postoperatively, with a focus on cosmetic outcomes, pain management, and overall recovery experience. An overwhelming majority (93.3%) of patients were highly satisfied with their surgical outcomes, while 4.8% reported being satisfied, and only 1.9% remained neutral. Patients who underwent robotic-assisted surgery had slightly higher satisfaction with cosmetic outcomes due to reduced scarring.

Discussion

This study aimed to assess the effectiveness of minimally invasive surgery (MIS) in managing ovarian cysts, with a particular focus on postoperative recovery [11]. The results of our study align closely with existing literature on MIS, highlighting its benefits in terms of reduced postoperative pain, quicker recovery times, and high patient satisfaction. However, several important differences and implications emerged, which we will discuss in comparison to other studies and in the context of current scientific evidence. Our study's demographic findings showed that the majority of patients were young, with 38.5% aged between 18 and 30, which is consistent with existing literature. Study by Patel *et al*., suggest that ovarian cysts are more prevalent in younger, reproductive-age women, especially functional cysts [12]. Our cohort's mean age distribution closely mirrors that found in other studies, such as

Eisenberg *et al*., who also reported that functional cysts predominantly affect younger, nulliparous women [13]. The body mass index (BMI) distribution in our study showed that 67.3% of patients had a normal BMI, while 19.2% were classified as overweight, and 8.7% were obese. This BMI distribution is reflective of global health trends, though it may also be a factor specific to the Bangladeshi population in our study. Studies conducted in Western countries, such as Bartels *et al*., reported a higher percentage of obese patients undergoing MIS for ovarian cysts, which may reflect regional and dietary differences [14]. The impact of obesity on surgical outcomes, such as increased difficulty in visualization and higher complication rates, was not significantly observed in our study, which could be attributed to the lower prevalence of obesity among our sample.

Cyst Characteristics

Our study found that 57.7% of the ovarian cysts were functional, while 42.3% were pathological. This distribution is similar to that found by Kasaven *et al*., which reported that functional cysts are the most common type, especially among younger women [15]. However, our study's proportion of pathological cysts (42.3%) was slightly higher than the 30-35% typically reported in Western studies. This could be due to differences in healthcare access, as patients in Bangladesh may delay seeking treatment, leading to a higher percentage of pathological cysts by the time of diagnosis. Additionally, the racial and genetic background of the Bangladeshi population may also contribute to this variance, as studies have suggested that certain populations may have a higher predisposition to conditions like endometriosis, which often manifests as pathological cysts. The size of cysts in our study ranged from 5 cm to over 10 cm, with 48.1% falling between 5 and 7 cm. This aligns with the findings of other studies, such as those by Orri *et al*., who noted that most ovarian cysts requiring surgery are in this size range [16]. The even distribution of cysts across the right and left ovaries in our study (50% right, 46.2% left) also mirrors patterns found in studies like those by, suggesting no significant laterality bias.

Postoperative Pain

The low postoperative pain scores observed in our study (87.5% of patients reported mild pain) support the established view that MIS significantly reduces postoperative discomfort compared to open surgery. Similar results were found in studies by Levytska *et al*., who noted that patients undergoing MIS for ovarian cysts reported significantly lower pain scores than those undergoing laparotomy [17]. The use of smaller incisions and the reduced need for tissue manipulation in MIS are well-known factors contributing to lower pain levels. However, our pain scores (VAS 1-3) were marginally lower than those reported by Zhang *et al*., who found that 80-85% of patients experienced mild pain postoperatively [18]. One possible explanation for this discrepancy could be differences in postoperative pain management protocols. In our study, the implementation of enhanced recovery after surgery (ERAS) protocols, which emphasize multimodal pain management and early mobilization, may have contributed to better pain control. Additionally, cultural differences in pain perception between populations may explain the lower pain scores observed in our Bangladeshi cohort, as studies have suggested that pain tolerance can vary across different ethnic groups.

Recovery Time

Our study demonstrated that 88.5% of patients returned to their daily activities within 10 days, with an average recovery time of 9.6 days. These findings are consistent with those of Casarin *et al*., who reported that patients who underwent laparoscopic surgery for ovarian cysts typically returned to normal activities within 10-12 days [19]. The rapid recovery time associated with MIS is one of its most significant benefits, as it minimizes the time patients spend away from work and daily life, reducing the socioeconomic impact of surgery. In contrast, studies examining laparotomy for ovarian cysts have reported significantly longer recovery times, often ranging from 4 to 6 weeks. The shorter recovery times in our study reinforce the advantages of MIS, particularly in resource-limited settings like Bangladesh, where shorter hospital stays and quicker recovery can alleviate the burden on healthcare systems and patients alike. The average hospital stay in our study was 2.4 days, similar to the findings of Lin *et al*., who reported an average stay of 2-3 days for MIS patients [20]. However, some Western studies have reported slightly shorter hospital stays, which may reflect differences in healthcare practices or patient expectations.

Postoperative Complications

The complication rate in our study was low, with only 4.8% of patients experiencing wound infections and no major complications such as organ injury or bowel perforation. This is consistent with the findings of Alliende *et al*., who reported complication rates of less than 5% for MIS in gynecological surgery [21]. The lower complication rates in MIS compared to open surgery are well-documented, with smaller incisions reducing the risk of infection and other wound-related issues. Interestingly, our study's complication rates were slightly lower than those reported in similar studies conducted in Western countries. For example, Karadağ *et al*., reported wound infection rates of 6-8% in laparoscopic surgeries [22]. This difference may be attributed to variations in surgical techniques, sterilization protocols, or patient populations. The higher complication rates in Western studies could also reflect a greater prevalence of obesity and comorbidities, both of which increase the risk of postoperative complications. Our study's relatively healthy cohort, with a lower prevalence of obesity, may have contributed to the lower complication rates observed.

Patient Satisfaction

The high levels of patient satisfaction in our study (93.3% highly satisfied) mirror the findings of other studies,

such as Bartels *et al*., who reported similarly high satisfaction rates in patients undergoing MIS for ovarian cysts [23]. Satisfaction in MIS is often linked to several factors, including shorter recovery times, reduced pain, and better cosmetic outcomes, all of which were observed in our study. The minimal scarring associated with laparoscopic surgery likely played a significant role in patient satisfaction, with 94% of patients expressing satisfaction with their cosmetic results. Our satisfaction rates are comparable to those reported in studies from high-income countries, despite differences in healthcare infrastructure and patient expectations. This suggests that the benefits of MIS are universally recognized and appreciated, regardless of the healthcare setting. However, one potential limitation of our study is that patient satisfaction was assessed relatively soon after surgery, and long-term satisfaction, particularly regarding fertility outcomes and cyst recurrence, was not evaluated. Studies by Mccann *et al*., have shown that long-term satisfaction can sometimes be influenced by these factors, which may warrant further investigation in future research [24-31].

Implications and Practical Significance

The findings of this study have significant implications for clinical practice, particularly in resource-limited settings like Bangladesh. The demonstrated benefits of MIS, including reduced pain, quicker recovery, and low complication rates, suggest that MIS should be considered the preferred surgical approach for managing ovarian cysts. The rapid recovery times associated with MIS could reduce the burden on healthcare systems by minimizing hospital stays and allowing for faster patient turnover, which is particularly important in countries with limited healthcare resources. Furthermore, the high levels of patient satisfaction observed in our study highlight the importance of cosmetic outcomes and patient-centered care in surgical decision-making. As MIS becomes more widely available in low- and middle-income countries, ensuring that patients have access to this technology could significantly improve their overall experience and outcomes. However, the cost of MIS, particularly robotic-assisted surgery, remains a barrier to widespread implementation in many settings. Efforts to reduce the cost of these technologies or provide alternative solutions, such as training surgeons in traditional laparoscopy, could help bridge this gap.

Limitations of the Study

While our study provides valuable insights into the effectiveness of MIS in managing ovarian cysts, several limitations must be acknowledged. First, the study was conducted in a multicenter tertiary hospital setting, which may not reflect the experiences of patients in rural or less specialized healthcare facilities. Second, the follow-up period was limited to three months, meaning that long-term complications, such as adhesions or cyst recurrence, were not captured. Third, the relatively small sample size of 104 patients limits the generalizability of the findings, particularly when compared to larger, population-based studies.

Conclusion

This study demonstrates that minimally invasive surgery (MIS) is an effective and safe method for managing ovarian cysts, offering faster recovery, reduced pain, and high patient satisfaction. The low complication rates and minimal scarring further emphasize its advantages over traditional surgery. Our findings support MIS as the preferred treatment option for ovarian cysts, particularly in resource-limited settings.

Recommendations

Incorporate enhanced recovery protocols (ERAS) for improved patient outcomes.
Expand the use of robotic-assisted MIS for complex cysts.
Increase access to MIS in lower-resource healthcare settings.

Acknowledgment

We thank the patients who participated in this study and the medical teams at the multicenter tertiary hospitals in Bangladesh for their support and collaboration. Special thanks to the surgical staff for their dedication to delivering optimal patient care. This study was supported by the hospital administration, providing the necessary resources and equipment. Finally, we express our gratitude to the research assistants for their invaluable help with data collection and analysis.

Abbreviations

MIS – Minimally Invasive Surgery
ERAS – Enhanced Recovery After Surgery
VAS – Visual Analog Scale

Article at a Glance

Study purpose

To evaluate the efficacy of minimally invasive surgery in managing ovarian cysts and its impact on postoperative recovery.

Key findings

MIS resulted in faster recovery, reduced pain, and high patient satisfaction with minimal complications.

Newer findings

Our study highlights the safety and effectiveness of MIS in a resource-limited setting, with data suggesting superior outcomes even in lower-resource healthcare environments.

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