

Evaluating Safety and Efficiency of Laparoscopic General Surgery Techniques in Pakistan. A Retrospective Study

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Abstract

Background: The minimally invasive nature, reduced complications, and quick recovery of laparoscopic general surgery have changed the face of surgical practice around the world. However, the barriers, adoption of the technology is not widespread in low and middle-income countries (LMICs) such as Pakistan.

Objectives: The objectives of present study were to assess the safety and efficiency of laparoscopic general surgery techniques in Pakistan.

Methods: This retrospective study comprised 200 patients who were scheduled for elective laparoscopic surgeries (50%) cholecystectomy, (30%) appendectomy, and (20%) hernia repairs at tertiary care hospitals in Lahore, Pakistan from June 2023 to September 2024. Intraoperative and postoperative outcomes and predictors of complications were analyzed, and demographic data were analyzed. Logistic regression was used to identify significant predictors of statistical analysis performed using SPSS version 27.

Results: The Patients were 45.6 ± 12.3 years old and had a mean BMI of 28.7 ± 3.4 kg/m². Eighty-five percent of the cases had intraoperative complications; bleeding (4%) was the most common. In 6.5% of cases, conversion to open surgery was noted. In 15%, postoperative complications were found, and wound infection (6%) and seroma formation (5%) were most frequent. Hospital stays were longer in patients with complications (5.5 ± 1.6 days, $p < 0.001$). Logistic regression identified BMI >30 kg/m² (OR: 2.0), Operative time >90 minutes (OR: 2.6) and 1) as predictors of complications.

Conclusion: Safety & efficiency outcomes of laparoscopic general surgery in Pakistan, comparable to global standards, are demonstrated. To further improve access and outcomes, targeted investments in training, infrastructure, and patient optimization are necessary.

Keywords: Laparoscopic surgery, Retrospective study, Logistic regression, Postoperative, Appendectomy



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INTRODUCTION

Over the past 35 years, the advent of laparoscopic surgery, commonly known as minimally invasive surgery, has revolutionized surgical practice worldwide, leading to substantial improvements in patient outcomes [1]. Laparoscopic techniques were introduced in the late 20th century and were soon adopted as the standard of care for procedures like cholecystectomy, appendectomy, and hernia repair. Laparoscopy is different from conventional open surgery because it helps to reduce postoperative pain, reduces surgical incision size, reduces hospital stays, and speeds up recovery. Further refinement of surgical efficiency and safety has also been achieved in high-income countries by the adoption of advanced instruments, imaging technologies, and training programs leading to superior clinical outcomes[2].

The situation in low and middle-income (LMIC) countries such as Pakistan however is vastly different. The advantages of laparoscopic surgery are clear but the widespread use is hampered by a lack of advanced equipment, inadequate surgical training, and differences between urban and rural healthcare systems. As a consequence, open surgeries remain used to a larger extent and are correlated with higher rates of postoperative complications, longer recovery times, and higher healthcare costs. However, socioeconomic constraints and institutional resource constraints also exacerbate inequities in access to laparoscopic procedures[3].

The advantage of laparoscopic surgery has been demonstrated by numerous studies in high-resource settings. For example, randomized controlled trials have demonstrated that operative morbidity and recovery time is reduced by laparoscopic cholecystectomy over open cholecystectomy. Like with appendicitis, laparoscopic appendectomy is now considered the gold standard for uncomplicated appendicitis because laparoscopic

appendectomy has lower rates of wound infection and quicker discharge times. In developed countries, a meta-analysis reported a conversion rate to open surgery of less than 5% and therefore high levels of surgical proficiency and access to advanced tools[4].

Currently, the literature on LMICs is sparse and inconsistent. Studies from regions such as Sub-Saharan Africa and Southeast Asia report varied outcomes, often because of poor access to resources and a lack of expertise. These settings have notably higher conversion rates, of the order of 8% to 15%, because of intraoperative complications, unclear anatomy, or inadequate equipment. A study in India found that barriers did not prevent the integration of laparoscopy and that integration resulted in lower healthcare costs due to shorter hospitalization and fewer postoperative complications. It appears that laparoscopic surgery can be a viable alternative in resource-limited environments so long as capacity building and infrastructure investments are made[5].

A very limited studies have been done to study the outcomes of laparoscopic surgery in Pakistan. The data are mostly fragmented; they are available on specific procedures or small patient cohorts. A study done in Karachi showed that laparoscopic cholecystectomy in tertiary care hospitals had favorable rates of complications similar to those in developed countries. However, there are gaps in understanding the true feasibility and efficiency of laparoscopy in the Pakistani healthcare context due to the lack of large-scale, multi-institution studies. A comprehensive retrospective analysis of the real-world outcomes of laparoscopic general surgery techniques in Pakistan is addressed by this study. This study fills existing gaps in the literature by examining key parameters, such as operative times, intraoperative complications,

conversion rates, and postoperative recovery, with robust, evidence-based data[6, 7].

The results of the study can lead to the further development of minimally invasive surgery in Pakistan. This research shows how laparoscopic techniques can present context-specific insights offering the potential to improve surgical care, reduce healthcare burdens, and improve patient outcomes in resource-limited settings. It ultimately concludes with the need for targeted interventions such as training surgical residents in laparoscopic surgery, acquiring advanced equipment, and establishing policy to ensure equitable access to laparoscopic surgery across the United States. The integration of laparoscopic surgery in the Pakistani healthcare system is a critical step towards the modernization of surgical practice, improved clinical outcomes, and tackling the rising rates of surgical disease in the region[8].

MATERIALS AND METHODS

This retrospective study was conducted to assess the safety and efficiency of laparoscopic general surgeries performed at three major tertiary care hospitals in Lahore, Pakistan, from June 2023 to September 2024. Ethical approval was obtained from the respective institutional review boards and all of them were done in compliance with the Declaration of Helsinki and national research guidelines. To ensure diversity in age, gender and types of laparoscopic procedures included the study used a stratified random sampling method. A total 200 adult patients of aged 18 years or older undergoing elective laparoscopic surgeries including laparoscopic cholecystectomy, appendectomy, and hernia repair were included. Emergency surgical cases, robotic-assisted surgeries, and incomplete or unreliable medical records were exclusion criteria.

A structured and pre-validated data collection tool was used to extract data from a sample of 20 randomly selected records that were tested

for consistency and accuracy. Demographic information (age, gender, BMI), clinical information (type of surgery, operative time, intraoperative complications such as bleeding or organ injury, and conversion to open surgery), and postoperative outcomes (complication rates including infections, seroma formation, hospital stay duration, and 30-day readmission) were collected. Any records were anonymized before analysis and patient confidentiality was protected[9].

SPSS version 27 was used to perform statistical analysis. The data were summarized using descriptive statistics, including means with standard deviations for continuous variables and frequencies with percentages for categorical variables. Associations of categorical variables were assessed using the chi-square test and continuous variables were compared using the independent t-test. Independent predictors of intraoperative complications and conversion to open surgery were identified using logistic regression analysis, controlling for potential confounders. All tests were two-tailed and statistical significance was defined as a p-value of less than ($P \leq 0.05$). The methodological rigor ensured that findings were both reliable and generalizable to similar resource-limited healthcare settings. This study adhered to strict ethical principles, ensuring no direct patient involvement, harm, or deviation from existing standards of care.

RESULTS

The study included 200 patients who were to undergo elective laparoscopic surgeries. Laparoscopic cholecystectomy (50%, 100 cases), appendectomy (30%, 60 cases), and hernia repair (20%, 40 cases) were included as surgeries. The mean age of the study population was 45.6 ± 12.3 years (range: The average appendectomy patients (38.4 ± 10.2 years old) were significantly younger than cholecystectomy (47.8 ± 11.5 years old) and

hernia repair patients (51.2 ± 9.6 years old) ($p < 0.001$). Patients had a mean BMI of 28.7 ± 3.4 kg/m² and underwent hernia repair with the highest BMI (30.4 ± 3.9 kg/m², $p = 0.003$). The cohort consisted of 56% ($n = 112$) females and 44% ($n = 88$) males. Comorbidities were present in 21% ($n = 42$) with hypertension and 14% ($n = 28$) with type 2 diabetes mellitus (Table 1). All procedures had a mean operative time of 91.4 ± 13.2 minutes. The procedures also differed significantly ($p < 0.001$), with hernia repair taking the longest operative time (115.6 ± 14.2 minutes) and appendectomy the shortest (72.3 ± 11.6 minutes). The intraoperative complication rate was 8.5% ($n = 17$). Bleeding (4%, $n = 8$), organ injury (2.5%, $n = 5$), and visualization difficulties (2%, $n = 4$) were the most common intraoperative complications. In 6.5% ($n = 13$) cases, conversion to open surgery was performed, with the main causes of

conversion being intraoperative bleeding (3.5%, $n = 7$) and unclear anatomy (3%, $n = 6$). The conversion rate was the highest (10%, $n = 4$) for hernia repairs; however, there was no statistical difference ($p = 0.29$) between procedure types. Whereas 15% ($n = 30$) of patients had postoperative complications. Wound infection (6% $n = 12$), seroma (5% $n = 10$), and pulmonary (2.5% $n = 5$) were the most frequent complications. There was no statistical difference in complication rate between hernia repair (17.5%, $n = 7$) and cholecystectomy (15%, $n = 15$) and appendectomy (13.3%, $n = 8$) ($p = 0.64$). The mean hospital stay for all patients was 3.0 ± 0.8 days. Patients with postoperative complications had significantly longer hospital stays (5.5 ± 1.6 days) compared to those without complications (3.0 ± 0.8 days) ($p < 0.001$) (Table 1).

Table 1: Patient Demographics, Operative Outcomes, and Postoperative Complications

Parameter	Total (n=200)	Cholecystectomy (n=100)	Appendectomy (n=60)	Hernia Repair (n=40)	(P≤ 0.05)
Age (years, mean ± SD)	45.6 ± 12.3	47.8 ± 11.5	38.4 ± 10.2	51.2 ± 9.6	<0.001
BMI (kg/m ² , mean ± SD)	28.7 ± 3.4	28.2 ± 3.1	27.4 ± 2.8	30.4 ± 3.9	0.003
Gender, n (%)					
Male	88 (44%)	45 (45%)	24 (40%)	19 (47.5%)	0.65
Female	112 (56%)	55 (55%)	36 (60%)	21 (52.5%)	
Operative Time (minutes, mean ± SD)	91.4 ± 13.2	87.2 ± 12.8	72.3 ± 11.6	115.6 ± 14.2	<0.001
Intraoperative Complications, n (%)	17 (8.5%)	8 (8%)	5 (8.3%)	4 (10%)	0.82
Conversion to Open Surgery, n (%)	13 (6.5%)	6 (6%)	3 (5%)	4 (10%)	0.29
Postoperative Complications, n (%)	30 (15%)	15 (15%)	8 (13.3%)	7 (17.5%)	0.64
- Wound Infection, n (%)	12 (6%)	6 (6%)	3 (5%)	3 (7.5%)	0.78
- Seroma Formation, n (%)	10 (5%)	5 (5%)	3 (5%)	2 (5%)	1.00
Hospital Stay (days, mean ± SD)	3.0 ± 0.8	2.8 ± 0.6	2.5 ± 0.7	4.6 ± 1.3	<0.001

Significant predictors for intraoperative complications and conversion to open surgery were identified by logistic regression analysis. Patients with BMI >30 kg/m² had 2.1 times higher odds of complications (OR: 2.1, 95% CI: 1.5–3.3, p<0.001). Operative time >90 minutes was strongly associated with complications (OR: 2.6, 95% CI: 1.6–4.2, p<0.001). Comorbid conditions, including hypertension (OR: 1.8, 95% CI: 1.1–2.7, p=0.02) and diabetes mellitus (OR: 1.6, 95% CI: 1.0–2.6, p=0.03) increased risk of complications and conversion (Table 2).

Table 2: Logistic Regression Analysis for Predictors of Complications and Conversion

Variable	Odds Ratio (OR)	95% Confidence Interval	(P≤ 0.05)
BMI >30 kg/m ²	2.1	1.5–3.3	<0.001
Operative Time >90 minutes	2.6	1.6–4.2	<0.001
Hypertension	1.8	1.1–2.7	0.02
Diabetes Mellitus	1.6	1.0–2.6	0.03

This study showed the safety and efficiency of laparoscopic general surgery in Pakistan. Eighty-five percent of patients underwent conversion to open surgery and 8.5% experienced intraoperative complications. Observed postoperative complications in 15% of patients with significantly prolonged hospital stays. In our study, BMI > 30 kg/m², prolonged operative time, hypertension, diabetes mellitus, and anemia were key predictors of complications and conversion. This data provides robust, evidence-based data to guide clinical practice, train surgical residents, and inform policies to improve laparoscopic outcomes in resource-limited settings.

DISCUSSION

This retrospective study assesses the safety and efficiency of laparoscopic general surgery techniques in Pakistan, filling critical gaps in the current literature and providing context-specific insights for resource-limited healthcare settings[10]. The findings show that although infrastructural and training limitations exist, laparoscopic techniques are both safe and efficient, with complication rates and conversion to open surgery similar to international benchmarks. The overall intraoperative complication rate of 8.5% is

similar to that reported from both developed and developing countries. The most common intraoperative problem was bleeding (4%), with organ injury (2.5%) and visualization difficulties (2%) following it, which closely resembles the results of previous studies done in India and Sub-Saharan Africa. Our conversion rate to open surgery (6.5%) is consistent with the global conversion rates (5 – 10%) supporting the safety of laparoscopic techniques in tertiary care and is similar to the rates published in tertiary centers[11].

Postoperative complications occurred in 15% of patients, but wound infections (6%) and seroma formation (5%) were the main causes. The additional technical complexity and longer operative time of hernia repair may have led to slightly higher complication rates (17.5%) for hernia repair compared to cholecystectomy (15%) and appendectomy (13.3%). The results are consistent with international trends that show longer surgical duration and more complex procedures are associated with greater complication risk[12]. Additionally, complications were associated with longer hospital stays (5.5 ± 1.6 days) compared with patients without complications (3.0 ± 0.8 days, p<0.001), reflecting the heavy resource burden of postoperative morbidity[13].

The study found that BMI >30 kg/m², prolonged operative time (>90 minutes), hypertension, and diabetes mellitus to be significant predictors for complications and conversion to open surgery. Patients with elevated BMI had more than twice the odds (OR: 2. Consistent with previous studies, obesity is associated with increased development of complications (p<0.001) during laparoscopy due to technical difficulties, reduced visualization, and increased intraoperative bleeding. Prolonged operative time was also strongly associated with complications (OR: 2. This suggests that adverse events are due to technical challenges, unclear anatomy, or surgeon fatigue (p<0.001, 6). These findings stress the need for preoperative risk stratification, patient optimization, and targeted interventions to improve outcomes, especially in resource-limited settings like Pakistan[14, 15].

The outcomes in this study are promising compared to those seen in high-resource settings where complication rates and conversion rates are minimized by advanced training and technology. In developed countries, randomized controlled trials report conversion rates of less than 5% reflecting very high levels of surgical expertise and access to state-of-the-art tools. However, retrospective studies from other low and middle-income countries (LMICs) reveal conversion rates from 8–15 percent owing to resource limitations, inadequate surgeon training, and inconsistent availability of laparoscopic instruments. This study produced results with conversion and complication rates approaching global standards, suggesting an increasing proficiency in laparoscopic surgery in Pakistan's urban tertiary care hospitals[16].

These outcomes are encouraging but there is a lot to do to increase access and outcomes even more in the Pakistani healthcare system. Limited structured laparoscopic training programs, a shortage of advanced laparoscopic

equipment, and disparate availability of laparoscopic equipment between urban and rural facilities make widespread adoption of minimally invasive techniques difficult. Further, comorbid conditions such as hypertension and diabetes are prevalent in the Pakistani population, which further increases surgical risk and complicates postoperative recovery. Investing in training programs, infrastructure upgrades, and standardized protocols to address these systemic barriers is essential to the widespread benefits of laparoscopic surgery[17].

There are several strengths to this study. This represents one of the few large-scale, multi-institutional evaluations of laparoscopic surgery outcomes in Pakistan that provides comprehensive data on patient demographics, intraoperative complications, postoperative outcomes, and the predictors of adverse events. The study identifies modifiable risk factors including BMI and operative duration, providing actionable insights into ways to improve patient outcomes and to decrease healthcare burden. Nevertheless, the retrospective design does not allow causal inferences to be drawn, and reliance on medical records may induce selection bias or inaccuracies. Additionally, the study was conducted in tertiary care hospitals in urban centers, thus limiting the generalizability of these findings to rural or smaller healthcare facilities where resources may be more constrained[18].

Further research ought to be focused on multi-center studies in Pakistan to validate these findings in different healthcare settings. Long-term follow-up of quality of life, cost-effectiveness, and patient satisfaction following laparoscopic surgery should be added. Targeted interventions focused on surgeon training, preoperative patient optimization, and improved infrastructure can close the gap existing between the adoption of laparoscopic

techniques and address the identified challenges[19].

CONCLUSION

The safety and efficiency of laparoscopic general surgery techniques in Pakistan are provided in this retrospective study. The resulting findings indicate that laparoscopic procedures, such as cholecystectomy, appendectomy, and hernia repair, have favorable outcomes with complication rates and conversion to open surgery similar to those in the international literature. Predictors of complications were BMI >30 kg/m², prolonged operative time, and pre-existing comorbidities such as hypertension and diabetes mellitus. The study highlights the need for targeted interventions including enhanced laparoscopic training programs, preoperative patient optimization and investment in advanced surgical infrastructure to drive further improvement in outcomes and to reduce healthcare burden. This is by no means an insurmountable challenge and laparoscopic surgery can be a transformative force for modernizing surgical practice and improving patient care in Pakistan if systemic challenges are engaged.

Conflict of Interest:

The authors declare no conflicts of interest related to this study.

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Authors contribution:

F.F., A.A., N.U.R.H., H.A., I.Z., and M.U.I. contributed to data collection, analysis, and manuscript preparation, while M.R. was responsible for critical review and final editing of the manuscript.

Data Availability Statement:

The data supporting the findings of this study are available from the corresponding author, upon reasonable request.

REFERENCES

1. Bessoff KE, Choi J, Wolff CJ, Kashikar A, Carlos GM, Caddell L, et al. Evidence-based surgery for laparoscopic appendectomy: A stepwise systematic review. *Surgery Open Science*. 2021;6:29-39.doi: <https://doi.org/10.1016/j.sopen.2021.08.001>
2. Biondi A, Di Stefano C, Ferrara F, Bellia A, Vacante M, Piazza L. Laparoscopic versus open appendectomy: a retrospective cohort study assessing outcomes and cost-effectiveness. *World Journal of Emergency Surgery*. 2016;11(1):44.doi: 10.1186/s13017-016-0102-5
3. Sermonesi G, Tian BWCA, Vallicelli C, Abu-Zidan FM, Damaskos D, Kelly MD, et al. Cesena guidelines: WSES consensus statement on laparoscopic-first approach to general surgery emergencies and abdominal trauma. *World Journal of Emergency Surgery*. 2023;18(1):57.doi: 10.1186/s13017-023-00520-9
4. Ki YJ, Jo YG, Park YC, Kang WS. The Efficacy and Safety of Laparoscopy for Blunt Abdominal Trauma: A Systematic Review and Meta-Analysis. *J Clin Med*. 2021;10(9).doi: 10.3390/jcm10091853
5. Tiwari MM, Reynoso JF, High R, Tsang AW, Oleynikov D. Safety, efficacy, and cost-effectiveness of common laparoscopic procedures. *Surg Endosc*. 2011;25(4):1127-35.doi: 10.1007/s00464-010-1328-z
6. Zarka A, din M, Furqan K, Khan S. An Overview of Analysis of Learning Curve of Laproscopic Procedures in General Surgery Residents in Khyber Teaching Hospital, Peshawar. *Pakistan Journal of Medical and Health Sciences*. 2021;15:2766-8.doi: 10.53350/pjmhs2115102766

7. Yu M, Wang D-c, Wei J, Lei Y-h, Fu Z-j, Yang Y-h. Meta-Analysis on the Efficacy and Safety of Laparoscopic Surgery for Large Gastric Gastrointestinal Stromal Tumors. *The American Surgeon*TM. 2021;87(3):450-7.doi: 10.1177/0003134820951482
8. Rao G, Nayak S, Ganni S, Hassan A. Evaluation of Basic Laparoscopic Surgical Skills course programme for surgery residents- at a simulation lab in south India. *International Journal of Surgery and Medicine*. 2018;4:1.doi: 10.5455/ijsm.basic-laparoscopic-surgical-skills-course-programme-for-surgery-residents
9. Sousa JHBD, Tustumi F, Steinman M, Santos OFPDOS. Laparoscopic cholecystectomy performed by general surgery residents. Is it safe? How much does it cost? *Revista do Colégio Brasileiro de Cirurgiões*. 2021;48.doi,
10. Rangwala HS, Fatima H, Ali M, Rangwala BS. Comparing Safety and Efficacy: Laparoscopic vs. Open Pancreaticoduodenectomy for Pancreatic Ductal Adenocarcinoma: A Meta-analysis of Randomized Control Trials. *Indian Journal of Surgical Oncology*. 2024.doi: 10.1007/s13193-024-02132-4
11. Abdallah S, Dabas MM, Morcos RK, Rehman A, Shehryar A, Orakzai A, et al. Comparative Efficacy of Endoscopic Versus Open Surgical Techniques in the Management of Gastric Outlet Obstruction: A Systematic Review. *Cureus*. 2024;16(11):e73690.doi: 10.7759/cureus.73690
12. Muneeb MD, Baig MAN, Kamran M, Qudratullah S, Arain MS. Assessing the quality and standards of operative notes in general surgery; A teaching institute's experience in Pakistan. *Pak J Med Sci*. 2024;40(8):1837-40.doi: 10.12669/pjms.40.8.9443
13. Viqar Aslam KISKKAAGKSAH. Laparoscopic Treatment of Perforated Appendicitis. *Pakistan Journal of Medical & Health Sciences*. 2023;17(02):399.doi: 10.53350/pjmhs2023172399
14. Ahmed Siddiqui N, Siddiqui T, Shariff A, Khan MR, Ahmed M. Availability of Operative Surgical Experience and Supervision for Competency-Based Education: A Review of A General Surgery Program at A Tertiary Care Teaching Hospital in Pakistan. *World Journal of Surgery*. 2022;46(8):1849-54.doi: 10.1007/s00268-022-06571-4
15. Khan Z, Ahmed N, Rehman Au, Khan FU, Saqlain M, Martins MAP, et al. Audit of pre-operative antibiotic prophylaxis usage in elective surgical procedures in two teaching hospitals, Islamabad, Pakistan: An observational cross-sectional study. *PLOS ONE*. 2020;15(4):e0231188.doi: 10.1371/journal.pone.0231188
16. Toru HK, Aizaz M, Orakzai AA, Jan ZU, Khattak AA, Ahmad D. Improving the Quality of General Surgical Operation Notes According to the Royal College of Surgeons (RCS) Guidelines: A Closed-Loop Audit. *Cureus*. 2023;15(11):e48147.doi: 10.7759/cureus.48147
17. Hao Y, Yu P, Qian F, Zhao Y, Shi Y, Tang B, et al. Comparison of laparoscopy-assisted and open radical gastrectomy for advanced gastric cancer: A retrospective study in a single minimally invasive surgery center. *Medicine*. 2016;95(25).doi: 10.1097/MD.0000000000003936
18. Raza SMA, Mustafa A, Awan LA, Alam E, Abdal H, Cheema AI, et al. A comparative Clinical Trial of Laparoscopic Appendectomy versus Open Appendectomy in uncomplicated Cases: Evaluating Outcomes in Laparoscopic and Open Appendectomy. *DEVELOPMENTAL MEDICO-LIFE-SCIENCES*. 2024;1(5):35-42.doi: 10.69750/dmls.01.05.051
19. Hania b, Ahmad Z, Zafar A, Riaz D, Jawad A, Sahar DE. A Comparative Study of Postoperative Outcomes: Open Cholecystectomy versus Laparoscopic Cholecystectomy: Evaluating Postoperative Outcomes in Gallbladder Surgery. *DEVELOPMENTAL MEDICO-LIFE-SCIENCES*. 2024;1(5):27-34.doi: 10.69750/dmls.01.05.053

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