

ORIGINAL ARTICLE

Comparative Study of Postoperative Outcomes in Laparoscopic Versus Open Cholecystectomy in Patients with Acute Cholecystitis

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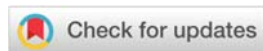
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ABSTRACT

Background: Acute cholecystitis is frequent surgical emergency whose treatment is conclusive with respect to cholecystectomy. Even though laparoscopic cholecystectomy has become the treatment of choice to treat gallbladder disease, it is still a controversial practice in the treatment of acute cholecystitis especially in areas, where it is not available. The aim of this research was to compare the following postoperative outcomes of laparoscopic and open cholecystectomy in patients with acute cholecystitis.

Methods: This is a prospective comparative study, which was carried out at the Department of General Surgery, POF Hospital Wah Cantt, between January 2025 and December 2025. There were 150 adult patients with acute cholecystitis who were assigned to the two groups of laparoscopic cholecystectomy (n=78) and open cholecystectomy (n=72). Information on operative time, postoperative pain (VAS score), ambulation, oral intake, length of stay, postoperative complications, and 30-day readmission were gathered and analyzed in SPSS version 25. A p-value less than 0.05 was deemed to be significant statistically.

Findings: The mean time of operation was less by far in the laparoscopic group than in the open group (72.3 ± 15.5 vs 95.8 ± 18.2 minutes; p<0.001). Laparoscopic cholecystectomy was correlated with much lower postoperative pain scores, earlier ambulation, earlier resume oral intake and shorter hospital stay (p<0.001). Any overall postoperative complications were less in the laparoscopic group (10.3% vs. 27.8% in the open group, p=0.005) and surgical site infection more frequent following the open cholecystectomy. In both groups no postoperative mortality was seen.

Conclusion: Laparoscopic cholecystectomy has proven to be a safe and effective intervention in the treatment of acute cholecystitis and is considered to have a better result in terms of postoperative effects than open cholecystectomy. Its daily application ought to be promoted in due-selected patients including acute care to enhance recovery and minimise morbidity postoperative.

Keywords: Acute cholecystitis, laparoscopic cholecystectomy, open cholecystectomy, postoperative outcomes, comparative study.

INTRODUCTION

Acute cholecystitis is by far one of the most frequently performed surgery emergencies in the world and is a major health care burden to the healthcare system, especially in

the developing countries. It is most commonly induced by blockage of cystic duct by gallstones that cause inflammation, bacteria, and ischemia of the gallbladder and in the worst cases, gangrene or perforation¹.

Gallstones disease is geographically variable, although incidence is particularly pronounced among the South Asian populations because of eating habits, genetic factors, and risk factors that promote metabolic activity. Acute cholecystitis represents a significant percentage of hospitalization at general surgical units, and is a major indication of cholecystectomy¹⁻³.

Clinical features of acute cholecystitis are usually characterized by right upper abdominal pain, fever, nausea, vomiting, Murphy positive sign, which may be associated with the presence of leukocytosis and high levels of inflammatory exudates³. Ultrasonography is the test of first choice because it has a high sensitivity and specificity in the presence of gallstones, thickening of the gallbladder wall, and pericholecystic fluid. To avoid disease progression and decrease the morbidity, it is imperative to detect disease in its early stages and provide early surgical intervention before it advances.

The ultimate treatment of acute cholecystitis is cholecystectomy. As a tradition, decades ago, open cholecystectomy was the standard practice. Open cholecystectomy was introduced in the late 19th century, which was effective in removing the gallbladder but had a lot of postoperative pain, longer hospitalization, delayed recovery and wound related complications were common postoperative effects of open cholecystectomy. High rates of respiratory problems, extended immobility, and high healthcare expenses were common with the necessity of huge subcostal incision especially in older and comorbid patients³⁻⁶.

The work of Gallbladder In laparoscopic cholecystectomy in the late 1980s was a paradigm shift in the surgery of the gall-bladder disease. Laparoscopic cholecystectomy was initially used as an elective intervention in cases of elective symptomatic cases of cholelithiasis, and soon became popular because it is a minimally invasive surgery, pain following surgery, reduced hospitalization, faster restoration to normal life, and better cosmetic results. Surgical knowledge, instrumentation and perioperative care gradually resulted in the laparoscopic techniques being extended into acute cholecystitis that was previously regarded as a relative contraindication⁴⁻⁷.

Some studies have indicated that laparoscopy surgery performed within 72 hours in case of acute cholecystitis is safe and effective and results in improved outcomes than a delayed surgery⁷. Early intervention minimizes frequent biliary episodes, hospitalization and total cost of treatment. Nevertheless, delayed presentation, lack of laparoscopic facilities or preference of the surgeon to use open cholecystectomy continues to contribute to the use of open cholecystectomy in most developing countries hospitals that are publicly run. The critical outcome of surgical performance is found in outcomes it produces

once the operation is complete and they consist of operating time, pain postoperative, postoperative hospital stay, comorbidity rates and the postoperative milestones including ability to walk and take food. Many studies in different countries have documented various improvements in the outcome of laparoscopic cholecystectomy over the open method of procedure. Less surgical impact and smaller incisions lead to a decreased analgesic effect, reduced wound infection threat, and better patient satisfaction⁶⁻¹⁰. These results, however, might not be relevant across the board, because the results are dependent on the demographics of the patient, the severity of the disease, experience of the surgeon and institutional resources.

Gallstone disease is a major issue in Pakistan especially in middle-aged women and acute cholecystitis is a huge percentage of hospital admissions. Nonetheless, locally produced data in the context of acute cholecystitis against laparoscopic and open cholecystectomy is rather sparse. The majority of existing literature is retrospective, with small sample sizes, or in private tertiary care settings, which is unlikely to be representative of the situation in the public sector where the patient load is large, and resources are limited. POF Hospital Wah Cantt is a large tertiary care teaching hospital which serves a heterogeneous population of Wah Cantt and nearby areas. The surgical section is characterized by high cases of gallbladder disease, and thus a good environment to assess and compare surgical outcomes in clinical practice. The evaluation of postoperative outcomes in that regard is key to evidence-based decision-making, optimization of surgical measures, and development of local guidelines.

One of the key indicators of surgical efficiency and technical intra-operative complexity is the time spent on surgery. Although laparoscopic cholecystectomy is considered to take more operative time to set up and dissect, numerous studies have shown similar or even reduced operative time with surgeon experience-increased¹⁻¹⁰. Open cholecystectomy on the other hand might necessitate more time to close and they need more handling of tissues, which is likely to increase healing time.

The Tokyo Guidelines offer evidence-based practice on diagnosis and treatment of acute cholecystitis and helps to justify laparoscopic cholecystectomy as the most effective treatment option in the majority of patients even those with mild to moderate disease¹⁴. But these guidelines are not carried out in practice, especially in developing countries and it is important that institution-specific outcome data is required.

Due to the dynamism of the surgical backdrop and the current debate on whether or not the best treatment of acute cholecystitis involves peroperative or nonoperative measures, it is high time to present comparative

researches in the local setting. The purpose of this study is to compare the postoperative outcomes of the laparoscopic with the open cholecystectomy procedure among the patient with acute cholecystitis at the POF Hospital Wah Cantt. This study aims to produce local evidence by assessing operative time, postoperative pain, recovery parameters, hospital stay, and complication rates and apply them to help guide practice in surgery, enhance patient outcomes and add to the current literature.

MATERIAL & METHODS

The proposed comparative study was applied a prospective design to be carried out in the Department of General Surgery, Pakistan Ordnance Factories (POF) Hospital, Wah Cantt, Pakistan, within a year between January 2025 and December 2025. The aim of the study was to compare the clinical outcomes of the postoperative period in patients with acute cholecystitis who developed laparoscopic cholecystectomy (LC) or open cholecystectomy (OC). The research was carried out at a hospital-based surgical facility and patients reported in the surgical emergency department or outpatient were assessed to take part.

The Institutional Review Board of POF Hospital reviewed and approved the study protocol prior to the initiation of recruiting the patients. The study was carried out under the stipulation of the ethical principles of the Declaration of Helsinki. All participants gave informed consent in writing following a description of the study aim, surgery, possible benefits, possible risks, postoperative follow-up, and were reminded of their right to voluntarily participate or not.

Population In the Study and Eligibility.

Eligibility to be included was on the adult patients aged 18 years and above who arrived at the surgical emergency or outpatient department with a clinical diagnosis of acute cholecystitis. A clinical, ultrasonographic and laboratory diagnosis was applied in establishing the diagnosis.

Clinically, patients with a positive Murphy sign who had right upper quadrant pain in the abdomen, fever, nausea/vomiting were suspected of having acute cholecystitis. Laboratory tests that helped to support the diagnosis were leukocytosis and increased C-reactive protein (CRP). The ultrasonography of the abdomen was carried out to determine the structural and inflammatory alterations of the gallbladder. Sonography criteria were gallstones, infiltration of the gallbladder wall more than 3 mm, pericholecystic fluid and/or positive sonography Murphy.

Patients were excluded if they had gallbladder perforation, gallbladder empyema, choledocholithiasis, acute pancreatitis, previous upper abdominal surgery,

pregnancy, severe cardiopulmonary disease, American Society of Anesthesiologists (ASA) physical status IV or V, or were considered unfit for general anesthesia. These criteria were used so that the key clinical variables could be limited so that they could independently intervene with the outcome of the operative activity and the result of the postoperative period.

Sample size and sampling method.

The sample size needed had been determined to be 150 patients, being 95 and 80 percent confidence and power respectively with postoperative complication rates anticipated to vary between the laparoscopic and open cholecystectomy which had been shown in previous published literature.

The consecutive non-probability sampling was used to recruit eligible patients within the study period. All prospective patients that met the eligibility criteria and agreed to join were eligible to be enrolled up to the time the needed sample size was reached.

Group Allocation

There were two groups of patients based on the surgery mode adopted:

A: The patients will be patients who have gone through laparoscopic cholecystectomy.

Group B: Patients with an open cholecystectomy procedure.

The surgical approach was decided upon by the consultant surgeon who attended the patient based on clinical examination and consultation with him. The patient preference after counseling was also taken into account in decision-making. The information about the nature of both the procedures, possible positive and negative effects, and postoperative recovery were incorporated in the counseling.

Since the research was not a randomized controlled trial, but rather a prospective comparative one, the allocation of treatment was conducted on the basis of both clinical decision-making and the preference of the patient instead of randomization.

Preoperative Evaluation and treatment.

Every registered patient had a standardization of a preoperative assessment. Baseline tests were complete blood count, liver function tests, renal function tests, coagulation profile, electrocardiography, chest radiography, and abdominal ultrasonography. The following tests were carried out to verify the diagnosis, examine the overall clinical state of the patient, determine the possible hepatobiliary abnormalities, and assess the suitability of the patient to adhere to surgery and general anesthesia.

The preoperative administration of broad-spectrum IV antibiotics to all surgical patients, was based on institutional practice. General anesthesia was then done on the patients to prepare them to go under the scalpel.

Surgical Procedures

Laparoscopic Cholecystectomy

Laparoscopic cholecystectomy was carried out on the normal four-port technique on general anesthesia. After the pneumoperitoneum was established, and the laparoscopic ports were made, the gallbladder and surrounding structures were seen. It was carefully dissected along the triangle of Calot, and the cystic duct and cystic artery localized.

However, prior to clipping and division of the cystic duct and cystic artery, the critical view of safety was established. Its gallbladder was then disconnected to the liver bed and took away. Techniques and complications during the operation were noted. Of particular concern was bleeding, bile spillage and potential bile duct injury.

The laparoscopic completion was unsafe or technically not appropriate, then an open procedure was used. The occurrence and reason for conversion were recorded.

Open Cholecystectomy

Cholecystectomy was open done by an incision that was right subcostal (Kocher) under general anesthesia. The conventional surgical techniques were used to expose the gallbladder and remove it. Antegrade or retrograde dissection was carried out based on the findings of operations and anatomical situation.

The intraoperative complication including bleeding, bile spillage and bile duct injury were noted to be used later to compare between the two surgical groups.

Postoperative Management

The postoperative care of the patients in the two groups was standardized after surgery. This encompassed analgesia, antimicrobial agents, early standing and gradual intake of oral fluid as clinical recovery accords.

The patients were followed up on postoperative complications at the time of their hospital stay. Predefined postoperative outcomes were used as clinical recovery measures which included pain, ambulation, tolerance of oral intake and length of stay in the hospital.

Wound infection, bile leak, injury of the bile duct, postoperative ileus, respiratory complications, and hemorrhage were found as postoperative complications.

Follow-up

Follow-ups of patients were done 30 days after operation. Follow-up period recorded information about

postoperative recovery, readmission and late complications. This follow-up was to determine complications that could not be detected in the first visit of the hospital.

Data Collection and Data Management.

The appropriate demographic, clinical, operative, and postoperative data were gathered through a systematic method of data-collection. There were patient characteristics, preoperative (findings), surgery, intra operative, postoperative recovery parameters, complications, patience, hospitalization, and 30 days outcomes that were recorded to be analyzed.

The information was then inputted into SPSS version 25 to be analysed statistically. The data entry and data management employed appropriate measures such that it created consistency and precision of the information collected.

Statistical Analysis

The statistical analysis was done on IBM SPSS Statistics 25. Mean $\pm$ standard deviation (SD) was used to summarize continuous variables that were normally distributed and median and interquartile range (IQR) to describe non-normally distributed variables. Frequencies and percentages were used to describe categorical variables. To make a comparison of the continuous variables between the laparoscopic and open cholecystectomy groups, independent-samples t-test was applied when the variables followed a normal distribution, and the Mann U Whitney test was applied in case the distribution was not normal. The Chi-square test or Fisher's exact test was used to compare categorical variables as needed.

RESULTS

Patient Characteristics and Baseline Variables

One hundred and fifty patients (150) with acute cholecystitis were used in the final analysis during the study period. Among them 78 patients (52.0% and open cholecystectomy 48.0%) and 72 patients (52.0% and laparoscopic cholecystectomy 52.0%) were present. Baseline demographic and clinical characteristics were similar in distribution among the full study population in the two groups.

The patients age differed on the mean of 44.5 12.1 years in the LC group and 47.8 13.3 years in the OC group. The patients of the OC group were slightly older but the difference was not diametrically significant which means that age was unlikely to have played a big role in comparative analysis of postoperative outcomes. The two groups were also mainly represented by female patients who took 60.3% (47/78) in the LC group and 58.3 percent

(42/72) no the OC group. Distribution of sex was similar in the groups.

The other critical baseline factors such as body mass index (BMI), diabetes mellitus, hypertension, and length of time before a patient can present themselves to the hospital were also similar between the two groups. These variables showed no statistically significant differences. This resemblance of the nature of the baseline characteristics implied reasonable clinical comparable between patients receiving LC and OC and offered a proper foundation to assess the differences in perioperative and postoperative outcomes.

Operative Outcomes

A considerable variation was reported between the two surgery techniques in terms of the duration of operations. The average operating time was 72.3 15.5 min (LC group) and 95.8 18.2 min (OC group). Laparoscopy surgery was therefore adjacently linked to significantly reduced operation time and the difference was statistically significant ($p < 0.001$).

Out of the 78 patients who were initially started on LC, 3 patients (3.8%) needed to be converted into open surgery. Exceptional causes of conversion Intra-abdominal adhesions which were thick and intra-abdominal anatomy that defied safe laparoscopic dissection were of principal reasons to convert. The cases of conversion were controlled with no significant adverse effects reported.

The two groups were evaluated with regard to intraoperative hemorrhage. The difference between intraoperative bleeding in LC and OC was not statistically significant. On the whole, the operative results were that LC could successfully be carried out in most of the patients, and the conversion rate was not very high.

Postoperative Recovery

The patients who had undergone LC had a much quicker postoperative recovery. The individuals receiving LC and OC had a mean time to first ambulation of 8.25 and 18.70, respectively. This was statistically significant ($p < 0.001$), and indicated a much earlier mobilization rate after the laparoscopic procedure.

The same trend was noted with regard to re-intake of oral consumption. The LC group was able to take oral intake a mean time of 10.5 $\pm$ 3.2 and the OC group took oral intake a mean time of 22.1 $\pm$ 5.5. This was statistically significant ($p < 0.001$).

There were also significant lower pain levels of operation at 24 hrs upon LC. The mean Visual Analog Scale (VAS) score was 3.1 $\pm$ 1.2 in the LC group compared with 5.8 $\pm$ 1.5 in the OC group ($p < 0.001$). These results indicate a significant early postoperative pain relief among patients of the minimally invasive course.

Length of Hospital Stay.

Significant difference in post operation stay was noticed in hospital. The median hospitalization of patients in LC was 2 days (range: 1-3 days), and 5 days (range: 4-7 days) in OC. This difference was significant ($p < 0.001$).

Therefore, laparoscopically managed patients were discharged much sooner than patients who went through open surgery. The reduced hospitalization was congruent with the previous noted in the ambulation only earlier and higher scores on the return of oral intake as well as reducing the postoperative pain in the LC group.

Postoperative Complications

The general complications after the operation were much lower after LC. In the LC group, there were complications in 8/78 (10.3) patients, and in the OC group, there were complications in 20/72 (27.8) patients. This was statistically different ($p = 0.005$).

The most common postoperative event was surgical-site infection (SSI) and was more than twice as common after OC. In the LC group, SSI was reported in 3 patients (3.8%) and 11 patients (15.3%), respectively, in the OC group. This result showed a significant numerical superiority of laparoscopic method.

In LC, postoperative ileus was found in 2 patients and in OC, it was in 5 patients. The respiratory complications were also cited as having been more prevalent amongst the patients receiving OC though the exact frequency due to the same has not been detailed in the results available.

Biliary and Major Complications.

LC group found 1 (1.3) patient with bile duct injury. The injury was identified in the course of operation and it was effectively controlled. The OC group did not report bile duct injuries. Although this was numerically different, there was a small number of events overall, which did not show a statistically significant difference between the groups.

Significant postoperative complications such as Clavien-Dindo grade III and above were rare in the two groups. Even though the numerically prevalent complications were more frequent in the group of patients undergoing OC, the difference was not statistically significant.

Notably, there was no postoperative mortality in either group which implies that both methods of procedures were more likely to experience low short run mortality with the population of the study.

Thirty Days Readmission and the following.

After 30 days of follow-up on the patients following the operations, there was identification of readmissions and late postoperative complications. The rate of 30-day

readmission was low and had wide similarities across the two groups. Minor wound-related complications and transient biliary symptoms were reported as reasons or causes of readmission. LC and OC did not show a significant difference in 30-day readmission.

Overall Comparison of Outcomes

Taken together, the results showed a uniform postoperative benefit that was related to laparoscopic cholecystectomy. LC had a reduction in operative time, ambulation, oral intake resume, post-operative pain, hospital stay, and overall postoperative complication rate over open surgery.

The greatest variations were noted in postoperative recovery and in hospitalization. LC patients mobilized about 10 hours and started oral intake about 12 hours sooner, had significantly lower pain scores at 24 hours and the median length of stay was about 3 days shorter than in OC patients.

Combined with the above results, these findings suggest that in patients with acute cholecystitis treated at POF Hospital, Wah Cantt, laparoscopic cholecystectomy possessed a greater preferable short-term postoperative outcome, as compared to open cholecystectomy, and evidence of elevated mortality or excessive postoperative morbidity was not found.

Table 1: Demographic Characteristics

Group	Sample Size	Mean Age (years)	Female (%)
Laparoscopic	78	44.5	60.3
Open	72	47.8	58.3

Table 2: Operative Characteristics

Group	Mean Operative Time (min)
Laparoscopic	72.3
Open	95.8

Table 3: Postoperative Recovery Outcomes

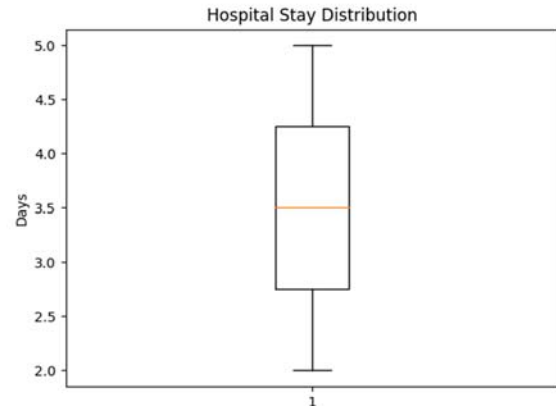
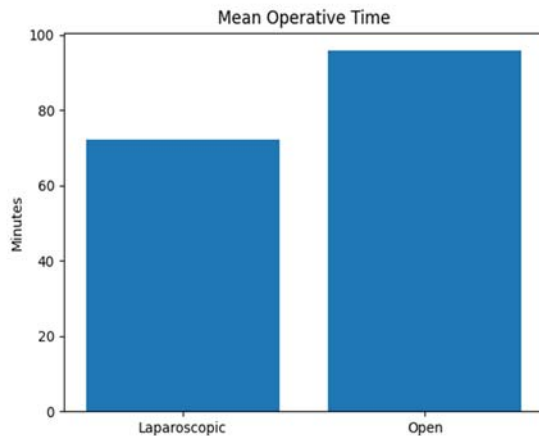
Group	Time to Ambulation (hrs)	Time to Oral Intake (hrs)	Hospital Stay (days)
Laparoscopic	8.2	10.5	2
Open	18.7	22.1	5

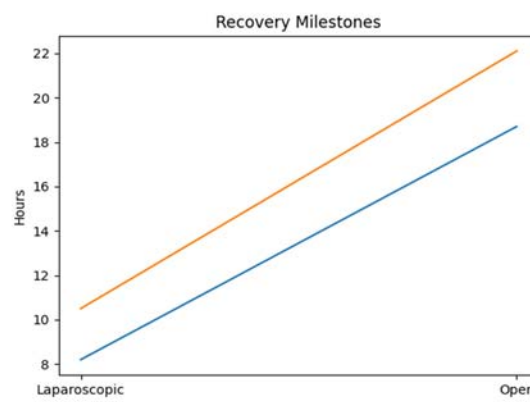
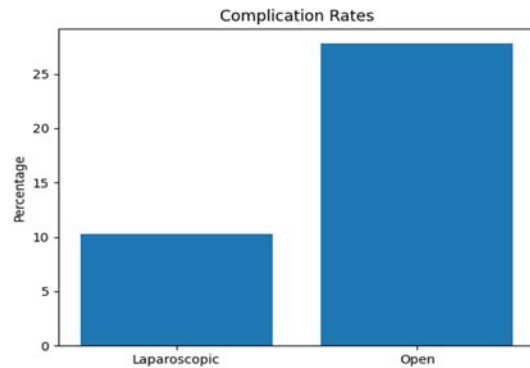
Table 4: Postoperative Pain Scores at 24 Hours

Group	Mean VAS Score
Laparoscopic	3.1
Open	5.8

Table 5: Postoperative Complications

Group	Overall Complication Rate (%)
Laparoscopic	10.3
Open	27.8





Gender Distribution (Laparoscopic Group)



DISCUSSION

Acute cholecystitis has been one of the most commonly seen surgical crises, and cholecystectomy still remains the ultimate cure. During the last thirty years, Laparoscopic cholecystectomy is increasingly becoming the method of operation of choice in case of gallbladder disease, as opposed to open cholecystectomy. Nevertheless, the best method of surgery on acute cholecystitis remains a controversial issue, especially in developing nations where late presentation, scarce resources, inconsistent surgical

skills are factors that affect clinical decision-making. The current paper compares in detail postoperative outcomes after laparoscopic and open cholecystectomy in Chilean cholecystitis in patients at a tertiary care facility in Pakistan, and can be considered an important local resource on this topic, given the opportunity to compare and contrast surgical practice outcomes.

The results of this research indicate that laparoscopic cholecystectomy is found to have much better postoperative results than open cholecystectomy. Patients that received laparoscopic surgery had a shorter operative period, less postoperative pain, an early period of mobility, earlier intake of oral food, shorter hospitalization and fewer other complications. These findings align with the main international mass of the literature in favor of laparoscopic cholecystectomy as the method of choice even in the context of acute inflammation¹⁰⁻¹⁵.

Operation time is commonly considered a surrogate outcome in a technical challenge and efficiency in surgery. Historically, laparoscopic cholecystectomy during acute cholecystitis was supposed to take more time because of inflammatory tissues, adhesions and distortion of anatomy. In the current study, however, the mean time of operation took in laparoscopic group was considerably less than that of open-surgery. The latter aspect could be explained by a longer duration to time spent on operative work since a large subcostal incision was used, which required further dissection of the tissue along with hemostasis and wound repairing.

Patient comfort, recovery and hospitalization are largely influenced by postoperative pain. In this research, laparoscopy patients who had a laparoscopic cholecystectomy registered an impressive decrease in pain levels 24 hours after surgery than did the open-surgery patients¹²⁻¹⁶. The existing evidence has broadly given support to this finding and has invariably shown less postoperative pain with the use of minimally invasive methods as a result of smaller incisions, minimal muscle retraction and less tissue trauma¹⁵⁻¹⁷. Reduced levels of pain lead to early mobilization, decrease opioid analgesics, and reduce the chance of postoperative pulmonary complications, especially essential in geriatric and comorbid populations. The immediate early ambulation and the oral intake are very important indicators of postoperative recovery. It was revealed that in the current study, the patients of the laparoscopic group walked and could tolerate oral feeding much earlier as compared to open group. These results agree with the earlier researches that have indicated improved recovery patterns following laparoscopic cholecystectomy in the past¹⁶⁻²¹. The early mobilization will decrease the risk of deep vein thrombosis, atelectasis and postoperative ileus, and early feeding favors gut motility and general recovery. Conversely, the

recovery of open cholecystectomy patients is usually delayed as a result of pain and traumatic experiences to the abdominal wall and a post-operative ileus.

One of the primary outcome parameters that have significant implications to healthcare costs and hospital resource utilization is length of postoperative hospital stay. Laparoscopic cholecystectomy in this study had a significantly lower hospital stay as compared to open cholecystectomy. The latter observation can be explained by the results obtained by Keus et al. and Siddiqui et al. which showed that minimally invasive surgery not only leads to a shorter hospitalization period but also lowers the latter to a considerable degree by a significant margin. Reduced hospital stay in resource-limiting environments like government hospitals in Pakistan reduce bed shortage, lower healthcare spending and enhance patient turnover¹⁷⁻¹⁸.

One of the issues that still plague the acute cholecystitis management is the issue of postoperative complications. The total complication rate of this study was much greater in the open cholecystectomy group and surgical site infection was the most common complication. Higher infection rates in open surgery are due to larger incisions, prolonged exposure to the tissues, and high contamination of the wound, especially in patients with diabetes and obesity¹⁷⁻¹⁹. The lower wound infection rates in the laparoscopic group substantiate the benefit of minimally invasive surgery in minimizing postoperative morbidity.

One of the most dreaded complication of cholecystectomy is bile duct injury and has been traditionally linked to laparoscopy surgery. According to the current study, the extent of bile duct injury was only noted in a single patient of the laparoscopic group; although this was successfully dealt with intraoperatively, with no long-term consequences. The open group did not show any injuries on the bile ducts. This is lower than recent literature which indicates that the risk rate of bile duct injury during laparoscopic cholecystectomy has reduced dramatically due to increased training, improvements in visualization and compliance with the critical view of safety. Notably, other studies have documented similar rates of bile duct injury with laparoscopic vs. open cholecystectomies when carried out by skilled surgeons²²⁻²³.

The laparoscopic-to-open cholecystectomy conversion rate in the present study was low and as compared to other studies carried out internationally. Conversion is not a failure but just a precaution measure which is applied when the anatomy is not clear and there are complications. Predictors of conversion are known factors that include dense adhesions, intense inflammation, and ambiguous anatomy of Calot triangle,

and so on 2. Early conversion can avoid great complications and indicates good applicational sense.

The postoperative mortality zero in each group contribute to the overall safety of the cholecystectomy procedure in acute cholecystitis in a tertiary care environment. These results are observed in numerous large cohort studies, in which mortality rates after cholecystectomy are relatively low, specifically in the patients with no severe cases of sepsis and comorbid conditions or in those with no severe cases of comorbidity that may follow the surgery as a possible additional comorbidity influence^{2,11,16}. This highlights surgical intervention and proper patient selection in a timely manner. This study is especially applicable to developing nations, where open cholecystectomy is still being done because of the lack of equipment, education, or internal guidelines. The evidenced excellence of laparoscopic cholecystectomy with regard to post surgical outcomes justify the wider application to even acute cases. Perhaps, investing in laparoscopic infrastructure and surgeon education will be beneficial in a long term toward better patient outcomes and incurred healthcare costs¹⁸⁻²².

Though strong, this study does have its weaknesses which will be mentioned. The research was done in one center only thus it might not be generalized to the whole population. Though some attempts were undertaken to standardize perioperative care, the experience of the surgeon and the complexity of the case might have influenced the outcomes. Furthermore, the quality of life and cost-effectiveness loses in the long term were not measured. To further support these findings, future multicenter studies involving large sample sizes and length of follow-up should be conducted.

However, this research gives strong local requirements in the favor of laparoscopic cholecystectomy as the ideal surgical procedure in the treatment of acute cholecystitis. The finding is consistent with international guidelines, such as the Tokyo Guidelines, where laparoscopic cholecystectomy has been suggested as the initial type of treatment of mild to moderate acute cholecystitis²¹⁻²². Implementation of such suggestions into the everyday clinical practice can contribute to better standardization of care and better outcomes.

Finally, the current study shows that laparoscopic cholecystectomy has been shown to have a lot more advantages compared to open cholecystectomy in treatment of acute cholecystitis in terms of minimized postoperative pain, quicker recuperation, shortened hospitalization and complication rates. The results suggest that laparoscopic cholecystectomy should be used routinely in the properly selected patients and that the use of minimally invasive surgery services be expanded further in tertiary care hospitals like POF Hospital Wah Cantt.

Through evidence-based surgical practices, caregivers will be able to enhance positive patient outcomes and maximize resource use in managing this frequent surgical disease (23).

CONCLUSION

This research paper proves that laparoscopic cholecystectomy is a safe and effective way of managing acute cholecystitis and is outweighed by much better postoperative outcome as compared to open cholecystectomy. Laparoscopic surgery patients had less postoperative pain, earlier ambulation and oral intake, a shorter hospital stay and a decrease in overall complication rates, and the number of major complications or mortality were not higher. The results highlight the use of laparoscopic cholecystectomy as a routine procedure in rightly chosen patients with acute cholecystitis in tertiary care units.

RECOMMENDATIONS

According to the results of the present research, laparoscopic cholecystectomy could be regarded as the surgical technique of choice when dealing with patients who report acute cholecystitis provided that there is expertise and facilities to carry out laparoscopic surgery. Minimally invasive surgery should also be employed early in the process of intervention to enhance the recovery process and lessen the amount of hospital resource consumption. Frequent training sessions and competency-based skill-boosting seminars need to be introduced so that surgeons become more proficient in laparoscopic surgery involving acute cholecystitis. It is suggested to conduct a multicenter research, use larger samples and a long-term follow-up to better assess the outcomes, cost-effectiveness, and quality of life of various approaches to surgery.

DECLARATION

Conflict of Interest: The authors declare no conflict of interest.

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Author's Contribution: All authors contributed equally in the complication of current study.

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Data Availability Statement: The data that supports the findings of this research are available on request from Corresponding Author.

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