Frontiers in Health Informatics
ISSN-Online: 2676-7104
www.healthinformaticsjournal.com
2024; Vol 13: Issue 8
Open Access

A Comparative Study of Laparoscopic vs. Open Cholecystectomy at Tertiary Care Hospital

Sikandar Iqbal[1], Abbas Ali Raza[2], Ummesalma Muhammad Rehan[3], Muhammad Abid Aziz[4*], Dr Muhammad Kashif[5], Dr Mashhood Alam Khan[6]

[1]Consultant General Surgeon, District Head Quarter Hospital, Dassu Uper Kohistan, Pakistan
[2]Assistant Professor of Surgery, MTI Mardan Medical Complex, Mardan, KPK, Pakistan
[3]Assistant Professor of Surgery Department, General Medicine Practice Program, Batterjee Medical College, Jeddah KSA
[4*]Registrar, Surgical Unit, DHQ Teaching Hospital, Mardan, Pakistan
[5]Associate Professor of General Surgery, Gajju Khan Medical College, Swabi, Pakistan
[6]Demonstrator, Khyber Girls Medical College, Peshawar, Pakistan

Cite this paper as: Sikandar Iqbal, Abbas Ali Raza, Ummesalma Muhammad Rehan, Muhammad Abid Aziz, Dr Muhammad Kashif, Dr Mashhood Alam Khan (2024). A Comparative Study of Laparoscopic vs. Open Cholecystectomy at Tertiary Care Hospital. *Frontiers in Health Informatics*, *13 (8) 3664-3670*

ABSTRACT

Introduction: Cholecystectomy, a common gallbladder surgery, which can be performed laparoscopic or open depending on the situation. This study sought to evaluate, in a high care hospital in Mardan, Pakistan, the clinical and financial results of laparoscopic versus open cholecystectomy.

Methodology: 113 persons in all underwent gallbladder surgery. Of these, 45 underwent open operation and 68 underwent laparoscopic surgery. Data on elements including age, surgery length, blood loss, hospital stay, post-operative complications, and expenses were compiled. To examine the outcomes, we applied cost comparisons, chi-square tests, and t-tests among other statistical tools.

Results: Comparatively to the open group, the laparoscopic group had much shorter operating time (50 ± 15 minutes vs. 90 ± 20 minutes, $p < 0.0001$) and less blood loss (50 ± 10 ml vs. 150 ± 30 ml,). Laparoscopic patients had also far shorter hospital stays (2 ± 0.5 days vs. 5 ± 1 day, $p = 0.0001$). With 13.2% in the laparoscopic group instead of 35.6% in the other group ($p = 0.0103$), the risk of complications was reduced in the open surgery group. With a considerable difference shown by $p < 0.0001$, the average cost for laparoscopic cholecystectomy was substantially less

Conclusion: Laparoscopic cholecystectomy provides clear benefits compared to open cholecystectomy. It takes less time to operate, generates less blood loss, requires a shorter hospital stay, has fewer difficulties following surgery, and is more cost-effective. These data suggest that laparoscopic cholecystectomy is the best choice for gallbladder treatment since it gives superior health results and saves money.

Keywords: Laparoscopic cholecystectomy, open cholecystectomy, operative time, blood loss, hospital stay, postoperative complications, cost-effectiveness, gallbladder disease

Introduction

Particularly cholelithiasis, gallbladder illnesses seriously tax healthcare systems all around [1]. The best course of action

for symptomatic gallstones and related problems such cholecystitis, biliary colic, and pancreatitis [2] is still a cholecystectomy—the surgical removal of the gallbladder. Thanks to developments in minimally invasive surgery, laparoscopic cholecystectomy (LC), which is currently the recommended approach for gallbladder removal in many institutions, has supplanted the more conventional open surgical technique [3]. Although both laparoscopic and open cholecystectomy are common choices, the patient's condition, the surgeon's expertise, and the resources available—especially in specialist hospitals—define which one to employ [4].

By offering so many advantages over conventional open surgery, laparoscopic cholecystectomy has revolutionized surgery. Less discomfort following surgery, shorter hospital stays, faster recovery, and better-looking scars comprise these advantages [5]. LC does have certain negatives, too, including costly equipment expenses, a difficult learning curve for clinicians, and the possibility of consequences including damage to the bile duct. After surgery, open cholecystectomy can cause more pain and requires more time to heal from [6]. Still, it's a reliable approach, particularly in challenging circumstances when laparoscopic surgery might not be feasible [7].

Limited resources and variations in medical training in poor nations can influence the surgical approach chosen. Often handling both normal and complicated gallbladder cases, tertiary care hospitals treat a lot of patients with a range of medical problems. This makes it crucial to evaluate in these institutions the benefits and disadvantages of laparoscopic and open cholecystectomy operations. To guide wise selections based on evidence, one should carefully evaluate patient outcomes including operation time, complications following surgery, and expenses [8].

Research on the benefits and drawbacks of laparoscopic and open cholecystectomy abound. More region-specific data is still needed, though, particularly in light of resource-strapped healthcare systems like those seen in many tertiary care hospitals around Pakistan. Rich nations, where advanced laparoscopic tools and trained surgical teams are readily available, have seen many research conducted. This disparity indicates that we need studies examining how these mechanisms operate in environments with varying degrees of resources and expertise. Moreover, evaluating these approaches in terms of clinical results and cost-effectiveness in such environments can offer insightful information to help to enhance the provision of healthcare.

Regarding the outcomes of laparoscopic and open cholecystectomy in sophisticated healthcare institutions, Pakistan has not much data. This study intends to solve this by considering the benefits and challenges of every approach.

Methodology

Study Design and Setting: This retrospective comparison study was performed at different tertiary care hospitals of Pakistan, with a varied patient population. The study took place between July 2023 and July 2024. The study examined medical and surgical records of patients undergoing laparoscopic or open gallbladder surgery.

Sample size Calculation: Open Epi tools helped to ascertain the 113 sample size. A 95% confidence level, a 5% margin of error, and predicted variations in incidence rates between laparoscopic and open cholecystectomy from past studies were Considered. We enlarged the sample size to let for potential lost data, thereby ensuring the reliability of the study.

Sampling Technique: The study used Consecutive sampling to include all eligible patients who underwent cholecystectomy during the study period. two groups were made from the patients: one who underwent laparoscopic cholecystectomy (n=68) and the other who underwent open cholecystectomy (n=45).

Inclusion and Exclusion Criteria: Patients ages 18 to 65 undergoing gallbladder removal for gallbladder inflammation or painful gallstones made up this study. The analysis covered both urgent and planned operations. Patients were exluded if their medical records were insufficient or if they had malignancies or other major medical problems that would make operation impossible. The study also excluded cases whereby laparoscopic to open cholecystectomy changed during the operation. This was done to ensure fair comparison between the two surgical forms.

Data collection: It involved patiently gathering patient information from hospital records using a designated approach. The study examined basic information such age and gender, statistics about the procedure including how long it took

and how much blood was lost, results after surgery including pain levels, any complications that emerged, how long patients were in the hospital, and expenditures. Surgeon's competence level and case complexity determined the grouping of surgery data.

Study Outcomes: The primary outcomes evaluated were operative time, postoperative complications, and length of hospital stay. Secondary outcomes included postoperative pain and overall cost-effectiveness.

Statistical Analysis: SPSS version 26 was applied for data processing. Descriptive statistics that is, averages and standard deviations for continuous values and frequencies as well as percentages for categories were calculated. Laparoscopic and open cholecystectomy group results were compared using inferential statistics. For binary data we applied the chi-square test; for continuous data we applied the independent t-test. One considered critical a p-value less than 0.05.

Ethical Considerations: The Institutional Review Boards of the hospitals approved the study. A waiver for patient permission was acquired due to the retrospective nature of the investigation. Patient confidentiality was preserved throughout the research procedure.

Results

The study included 113 patients, 68 undergoing laparoscopic cholecystectomy and 45 undergoing open cholecystectomy. The mean age of the laparoscopic group was 40 ± 10 years, while the mean age of the open cholecystectomy group was 45 ± 12 years, indicating a significant age difference between the groups ($t=-2.87$ $p=0.0049$). The laparoscopic group had a slightly younger population, which could have implications on recovery time, though age alone does not determine surgical outcome.

The gender distribution was similar across both groups, with 45.6% of patients in the laparoscopic group being male and 42.2% in the open group. The difference in gender distribution was not statistically significant ($\chi2=0.025$ $p=0.874$), confirming that both groups were balanced in terms of gender. The demographic characteristics of the study population are summarized in Table 1.

Table 1: Demographic Characteristics

Characteristic	Laparoscopic (n=68)	Open (n=45)	p-value
Mean Age (years)	40 ± 10	45 ± 12	0.0049
Male (%)	45.6% (31)	42.2% (19)	0.874
Female (%)	54.4% (37)	57.8% (26)	0.874

The laparoscopic group had a significantly shorter mean operative time (50 ± 15 minutes) compared to the open group (90 ± 20 minutes), which was statistically significant ($p<0.0001$). This indicates that laparoscopic cholecystectomy is a quicker procedure, likely due to the minimally invasive nature of the surgery and smaller incisions.

Blood loss was significantly smaller in the laparoscopic group (50 ± 10 ml) compared to the open group (150 ± 30 ml), with a very strong statistic difference ($p<0.0001$). This difference comes from the less invasive techniques used in laparoscopy. These techniques generally harm nearby organs less and create smaller cuts. Less blood loss means a lower risk of complications after surgery. Figure 1 displays the operation time and the amount of blood lost.

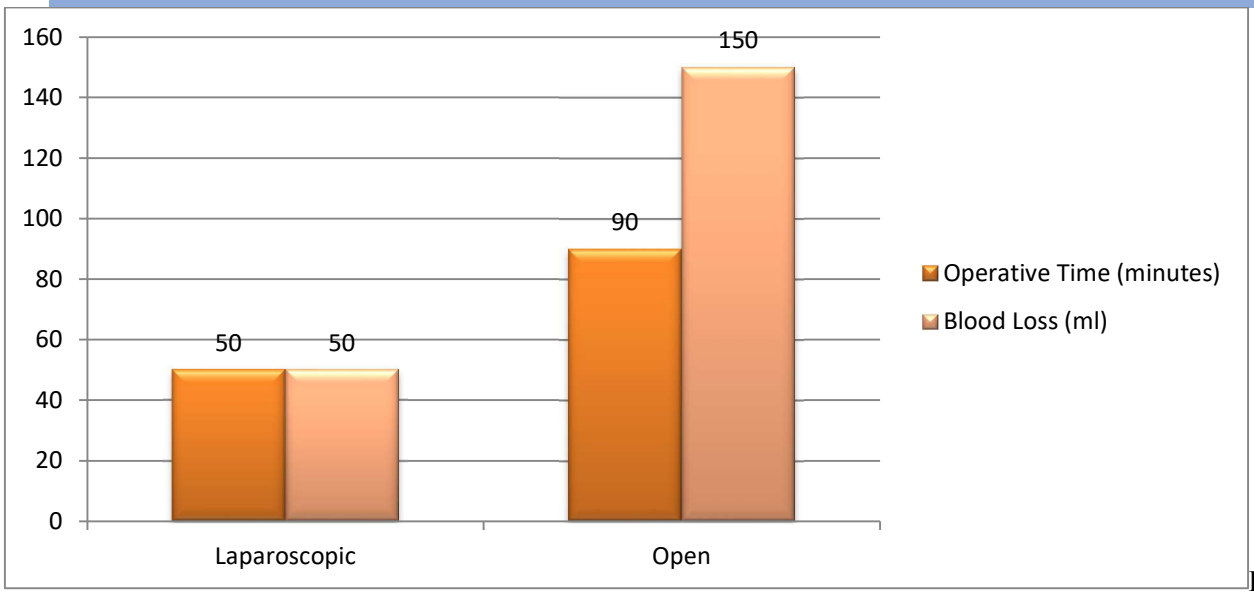

Figure 1: Operative Time and Blood Loss

While the open group stayed for almost five days, the laparoscopic group stayed in the hospital on average two days. With $p < 0.0001$, this difference is really noteworthy. This result is consistent with previous research showing that laparoscopic operations typically enable patients to heal faster, therefore enabling them to return to their regular activities and go home sooner. Shorter hospital stays reduce the expenses of protracted hospital visits, so saving money as well as helping patients. An essential indication of recovery is shown in Table 2 by the hospital stay.

Table 2: Length of Hospital Stay

Parameter	Laparoscopic (n=68)	Open (n=45)	p-value
Length of Stay (days)	2 ± 0.5	5 ± 1	<0.0001

Following surgery, the group undergoing an open cholecystectomy experienced greater issues. Figure 2 demonstrates that whilst only 13.2% of patients who had laparoscopic cholecystectomy had issues, 35.6% of patients who had open cholecystectomy had complications. The statistics ($\varphi 2=6.59$ $p=0.0103$) revealed this difference to be noteworthy. In the open group, adhesions (5.5%), bile leakage (8.9%), and wound infections (10.4%) ranked most often occurring issues. With wound infections (4.4%), bile leakage (3.0%), and minor abdominal hemorrhage (2.2%), the laparoscopic group experienced less complications overall. This difference indicates that laparoscopic techniques are superior since they reduce the possibility of infections and cause less damage to tissue, hence addressing less issues following surgery..

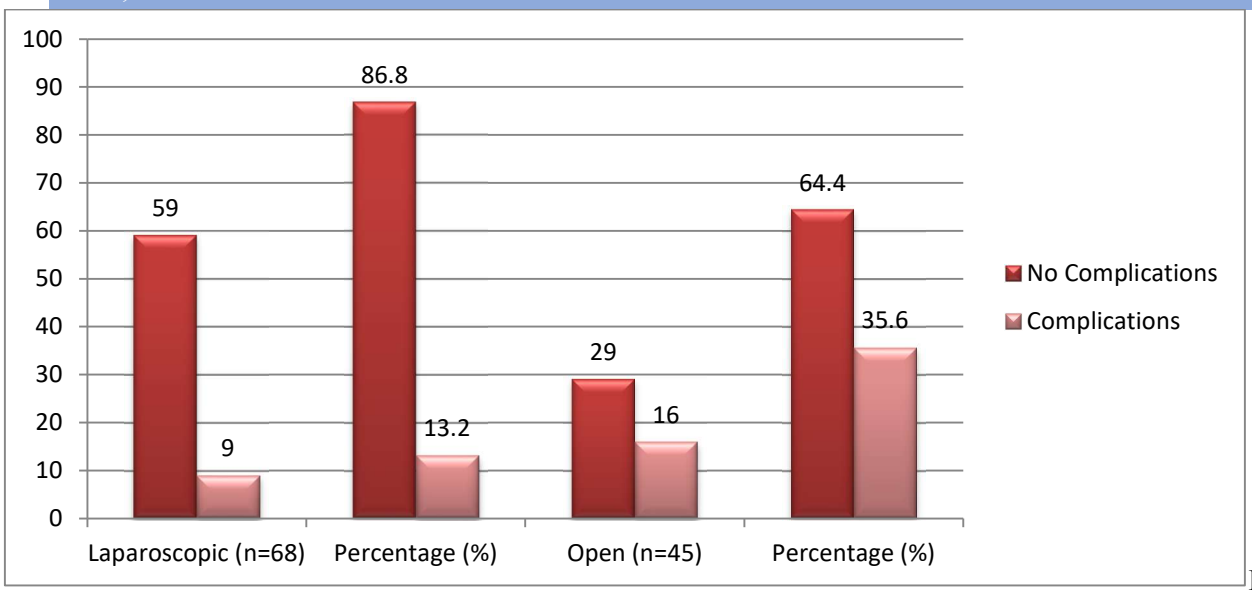

Figure 2:

Postoperative Complications

Examining the whole cost, including the surgery, hospital stay, and recovery care, Table 3 shows the specifics. Indicating a 30% cost savings, the laparoscopic group had a notably lower overall average cost (500 ± 50 USD) than the open cholecystectomy group (700 ± 100 USD). This is mostly due to laparoscopic cholecystectomy produces less problems and shorter hospital stays. For both individuals and healthcare systems, cost control is crucial; thus, laparoscopic cholecystectomy is a more reasonable option particularly in areas with low resources.

Table 3: Cost Analysis

Parameter	Laparoscopic (n=68)	Open (n=45)	Cost Reduction
Average Cost (USD)	500 ± 50	700 ± 100	30%

Discussion

This study aimed to assess, in a cohort of 113 patients, the results of laparoscopic against open cholecystectomy. Compared to open cholecystectomy, the results show significant advantages of laparoscopic cholecystectomy including less total expenses, less operating time, less blood loss, faster recovery, less postoperative problems. Especially with reduced patient morbidity and healthcare costs, the results confirm the growing data suggesting laparoscopic cholecystectomy as the best approach for gallbladder excision [9].

The results of this investigation coincide with the general body of knowledge contrasting laparoscopic to open cholecystectomy [10]. Because of its less invasive nature, laparoscopic cholecystectomy is well-known for reducing operation time and bleeding risk. This study shows that the mean operative time (50 minutes) of the laparoscopic group was significantly lower than that of the open group (90 minutes), so supporting most of the body of current research showing that, particularly as surgeons become more proficient with the technique, laparoscopic operations usually require less time. Apart from accelerating healing, the reduced running time influences the distribution of hospital resources.

Further supporting past studies showing the advantages of laparoscopic surgery in lowering bleeding is the observed lower blood loss in the laparoscopic group—50 ml compared to 150 ml in the open group [12]. Key factors affecting this outcome are minimized incisions and less tissue disturbance; so, laparoscopic cholecystectomy becomes a more safe choice for patients with comorbidities that can increase their risk of hemorrhage.

One clear benefit is the shorter hospital stay in the laparoscopic cohort—two days vs to five days in the open cohort. Usually, patients having laparoscopic operations had faster recovery, less post-operative pain, and fewer occurrences of

complications. A shorter hospital stay not only saves the healthcare system a lot of money but also reduces the risk of infection for patients. Comparable findings from many research show that laparoscopic cholecystectomy usually results in shorter hospital stays than open surgery [13].

With 13.2% having problems compared to 35.6% in the open group, the laparoscopic group showed a lower complication rate in line with the reduced risk of infection and other complications connected to the minimally invasive approach. With laparoscopic surgery, postoperative difficulties such adhesions, bile leakage, and wound infection are less common generally because of smaller incisions and less harm to surrounding tissues. This is in line with the body of current research showing that laparoscopic operations have reduced complication rates over open surgeries [14, 15].

The cost analysis of this study supports the trend in laparoscopic cholecystectomy toward economy. The average cost in the laparoscopic cohort, 500 USD instead of 700 USD for open surgery, indicates savings on hospital admissions, postoperative treatment, and complications. Although initially more expensive due to specialized equipment, laparoscopic cholecystectomy finally leads in major cost savings through reduced hospital stays and complications, therefore making it more economically viable over time [16].

Limitations and Future Suggestions: This research has certain shortcomings. Although the sample size was sufficient, it may have been larger to guarantee more dependability in the findings. The study also took place at a single tertiary care facility in Mardan, Pakistan, so restricting the external validity to other areas or healthcare environments. Long-term effects—such as the likelihood of the condition resurfacing or later complications—were not examined. These allow one to compare several surgical techniques. Furthermore absent from the study were patient contentment or quality of life, which are crucial factors determining surgical techniques. Future research should remedy these weaknesses by including a larger group of patients from various regions, tracking them over a longer period to check for recurring concerns and late complications, and looking at results that matter to consumers. Stronger and more complete evidence can emerge from cost-effective studies examining both direct and indirect costs as well as from RCTs in which the results are evaluated without knowledge of the group the subjects belong to.

Conclusion

This study reveals that compared to open cholecystectomy, laparoscopic cholecystectomy offers many advantages. Among these advantages are reduced bleeding, a shorter operation time, faster recuperation, fewer complications following surgery, and less overall expense. Particularly considering patient outcomes and cost savings, our findings reveal that laparoscopic surgery is the optimal approach for gallbladder removal. Even with their restrictions, the study emphasizes that better patient care and optimum use of healthcare resources depend on utilizing less invasive techniques.

References

1. Akulwar AV, Kamble A, Bhatt N, Mahakalkar C. A comparative analysis between laparoscopic and open cholecystectomy at a tertiary care hospital in patients with acute cholecystitis. Indian Journal of Forensic Medicine & Toxicology. 2021 May 17;15(3):894-9.
2. Hussain NH, Ranjan A, Alam K. A comparative study of the outcome of open cholecystectomy and laparoscopic cholecystectomy at a tertiary centre. Pain (VAS).;3(2.6):0-5.
3. Thomas J, Oommen AN, Mathew J, Abhijith V, Joy RR. Outcomes of early and interval laparoscopic cholecystectomy for acute cholecystiti s at a teaching hospital in Kerala: A prospective observational comparative study. J Med Sci Res. 2023;11(2):66-71.
4. Pateriya A, Agrawal MP, Samar SK. Open versus laparoscopic cholecystectomy: a comparative study on patient parameters. International Surgery Journal. 2021 May 28;8(6):1767-71.
5. Kumar A, Sharma SK, Srivastava M, Kibria T. Complication and Outcome of Laparoscopic vs Open Cholecystectomy: A Retrospective Study. Res. J. Med. Sci. 2023 Nov 30;17:228-32.

6. De Silva KP, Kumara MM, Kumarasinghe JP, Wijenayaka DA, Deshapriya GV, Shankinie AK, Dahanayaka RA, Kasturi CT, Mullage SC, Vithana J, Jayawardana K. A comparison of incidents and complications among patients who underwent laparoscopic vs open cholecystectomy. Galle Medical Journal. 2024 Nov 28;29(1).
7. Bhangui EH, Naniwadekar RG, Katkar A. Comparison Of Open Cholecystectomy And Laparoscopic Cholecystectomy. Journal of Pharmaceutical Negative Results. 2022 Oct 3:388-91.
8. Shaikh AH, Tandur AE, Sholapur S, Vangal G, Bhandarwar AH, Ghosh A, Rathod A. Laparoscopic versus open appendectomy: a prospective comparative study and 4-year experience in a tertiary care hospital. The Surgery Journal. 2022 Jul;8(03):e208-14.
9. Begum N. A comparative study of patient satisfaction in conventional versus laparoscopic cholecystectomy in a teaching hospital in Assam.
10. Ray U, Dhar R. A Retrospective Analysis of Short-Term Outcomes of Robotic and Laparoscopic Cholecystectomy: An Indian Tertiary Care Comparative Experience. Cureus. 2024 Sep 12;16(9):e69295.
11. Rudrawar N, Kiran HC, Chatterjee A, Sharma P. GENDER BASED STUDY (MALE VS FEMALE) Of LAPAROSCOPIC CHOLECYSTECTOMY-A RETROSPECTIVE OBSERVATIONAL STUDY IN A TERTIARY CARE CENTRE. International Journal of Medicine & Public Health. 2024 Jul 1;14(3).
12. Javed A, Shashikiran BD, Aravinda PS, Agarwal AK. Laparoscopic versus open surgery for the management of post-cholecystectomy benign biliary strictures. Surgical endoscopy. 2021 Mar;35:1254-63.
13. Kale T. A Hospital Based Comparative Study of Open Cholecystectomy with Respect to Laparoscopic Cholecystectomy. EC Gastroenterology and Digestive System. 2021;8:58-63.
14. Jebakumar J, Priya SS. Comparison of Surgical Outcomes in Early and Delayed Cholecystectomy in a Tertiary Care Hospital. Journal of Evolution of Medical and Dental Sciences. 2020 Aug 3;9(31):2228-33.
15. Pawanjit VA. COMPARATIVE STUDY OF OPEN VERSUS LAPAROSCOPIC APPENDECTOMY IN A TERTIARY CARE TEACHING HOSPITAL. Int J Acad Med Pharm. 2023;5(2):557-60.

Behera U, Panda S, Behera S, Nayak DR. Biliary tract injury during open and laparoscopic cholecystectomy and Management: An observational study at the tertiary care Teaching Hospital. Pakistan Heart Journal. 202