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RESEARCH ARTICLE
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COMPARATIVE OUTCOMES OF LAP VS OPEN APPENDECTOMY IN ACUTE APPENDICITIS

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ABSTRACT

Background: Acute appendicitis is considered to be one of the most frequent surgical emergencies in the world. The laparoscopic appendectomy (LA) versus open appendectomy (OA) is an issue that is still subject to debate, particularly regarding the length of the operation time, post-surgery complications, and recovery.

Objective: To compare the clinical outcomes, postoperative complications, and recovery rates of laparoscopic and open appendectomies in patients with acute appendicitis in DHQ Hospital Abbottabad, KPK, Pakistan.

Methods: The research design was a cross-sectional study, which was conducted at DHQ Hospital Abbottabad, KPK, Pakistan from August, 2024 to July, 2025, and covered 120 patients with acute appendicitis. The study participants were divided equally into two groups: laparoscopic appendectomy (n=60) and open appendectomy (n=60). Data were analyzed using SPSS to calculate the time of operation, length of stay, postoperative pain, complications, and recovery to normal.

Results: The mean time of operation in the LA (61.5 ± 10.2 min) was higher than that in OA (54.7 ± 9.4 min; p=0.001). Nevertheless, patients had significantly shorter stay in hospital (1.8 ± 0.6 vs 3.6 ± 1.2 days; p<0.001), wound infection (5% vs 16.7%; p=0.04), and normal activities (4.2 ± 1.1 vs 7.8 ± 1.5 days; p<0.001). The patients were also more content with the laparoscopic group.

Conclusion: Laparoscopic appendectomy is superior to open appendectomy, which is less painful to the patient postoperatively, has less hospitalization, fewer complications, and a shortened recovery period despite slightly longer operating time. It should be taken as the suggested surgical procedure in uncomplicated cases of acute appendicitis in tertiary care hospitals where adequate skills and materials are available.

INTRODUCTION

Acute appendicitis is the most common surgical emergency in the world since it is a major cause of abdominal pain, which requires emergency intervention. Treatment of acute appendicitis has also undergone major developments and changes in the past decades, particularly with the introduction of laparoscopic surgery. Laparoscopic appendectomy (LA) has gradually replaced open appendectomy (OA) as the mode of treatment of choice in most facilities, primarily due to its low invasiveness, lower recovery rates, and better cosmetic outcome (1). However, the effectiveness of laparoscopic

procedures in comparison with open-based procedures is still controversial, particularly with regard to duration taken, complication rates, length of stay, and overall cost effectiveness. Comparative research of the two methods has had some mixed results depending on the number of patients, the experience of the surgeon, and the environment in a healthcare setting (2). Despite considering the laparoscopic technique as a desirable procedure in early mobility and minimal postoperative pain, it has not gone without criticisms, such as high cost and development of intra-abdominal abscess, among others, which have been criticized and thus need to be subjected to comparative analysis (3).

The issue of laparoscopy versus open appendectomy is usually decided by the facilities of the institution, the experience of the surgeon to be used, and the patient's condition on presentation. The findings of the Tertiary care center reveal that the two approaches are safe and effective, but there might be differences in the clinical outcomes that may impact surgical decision-making (4). Since its inception in the late 1980s, laparoscopic appendectomy has been widely accepted because of its diagnostic advantages, especially amongst women and obese patients, where abdominal cavity visualization is better (5). Nevertheless, the open method remains superior to other methods, particularly where appendicitis is complicated or where resources are limited. The comparative studies have tried to give the particular benefits of laparoscopy, such as less post-surgery wound infection and less hospitalization, but the duration of surgery can take a longer period than the open operation (6). The global population has been progressively advancing the application of minimally invasive surgery as a sign of technological growth worldwide, in terms of equipment and education.

Nonetheless, open appendectomy is still a valuable and favorite operation, particularly in developing nations where laparoscopic services are unequally distributed (7). Another crucial feature of the case is the low cost-efficiency since laparoscopy presupposes the use of special equipment and professional staff. The necessity to be aware of clinical benefits and financial issues, and the role of the outcomes-based comparison between the two alternative approaches to surgery, has been evidenced in the survey of the context of public healthcare (8). In addition, the shifts in practice patterns in various regions also imply that local evidence is required in order to help surgeons deliver optimal care according to their institutional realities (9). The complications of the two surgical procedures have been extensively studied in terms of their profiles. Studies have found that wound infection is more likely to be more widespread in open appendectomy, and intra-abdominal abscess may be more widespread in laparoscopic operations, particularly in perforated appendicitis (10).

Furthermore, the age, comorbidity, and severity of disease are the significant variables that can contribute to the outcomes. Specifically, geriatric patients may recover differently compared to younger groups, and it is particularly necessary to compare them across age groups (11). Future studies continue to provide a lot of details about these nuances, and the necessity to choose the treatment options personally is also important (12). Some recent studies have affirmed the fact that Laparoscopic appendectomy has its own advantages as far as the post-operative recovery and patient satisfaction are concerned. Post-operative pain is less, normal activity is started earlier, and patients who undergo laparoscopy do not spend as much time in the hospital, which ultimately results in better overall quality of life (13). However, there are institutions that are limited by the fact that it has technical difficulties and demand advanced machinery (14). These feasibility concerns are real-world problems that demonstrate that the feasibility and safety of laparoscopic procedures can be investigated across various healthcare facilities.

The literature also leads to the need for the proficiency and experience of the surgeon as the major conditions of the successful laparoscopic outcomes (15). Although several studies support that laparoscopy is the gold standard in uncomplicated appendicitis, the controversial aspect of the subject is the complex cases that may have perforation or abscess formation. This can still indicate the preference for open surgery as it offers easier access to drainage and reduces the possibility of leaving out underlying pathology (16). The short-term comparative studies have indicated that the laparoscopic appendectomy could be slightly longer, and it was counterbalanced by fewer postoperative complications and higher aesthetic outcomes (17). These differences can be further reduced as surgical methods continue to develop and the management of appendicitis becomes more uniform. Particular interest in developing nations such as South Asia, where appendicitis is still a

high-burden healthcare problem, is in the clinical and economic implications of the two approaches. Comparative studies conducted in different hospitals have aimed at determining not only clinical efficacy but also cost efficacy, comfort in patients, and the overall use of resources (18).
These factors should be known to optimize hospital processes and achieve equitable distribution of healthcare services. The debate on whether open and laparoscopic surgery should be utilized in acute appendicitis goes beyond the excellent use of technology, and the perception of the population with references to accessibility, cost, and durability of surgical care (19). Recent studies have also suggested the necessity of a constant re-examination of surgical outcomes in the framework of modern healthcare needs. Postoperative pain, wound infection rate, return to work, and hospital stay length are also vital parameters to measure the effectiveness of any of the two approaches (20). Since the results and the patient demographics are not uniform across regions, comparative studies become imperative in the local tertiary care hospitals to produce evidence applicable to the local population. The research can be used to create institution-specific guidelines to enhance clinical decision-making and patient satisfaction. Hence, the current study seeks to determine the outcomes of laparoscopic and open appendectomy in patients with acute appendicitis managed at DHQ Hospital Abbottabad, KPK (16). The purpose of the study is to contribute to the growing body of literature on the subject of establishing the relative advantages and disadvantages of the two types of surgery in a real-life clinical setting through the measurement of postoperative complications, length of stay, and postoperative recovery profiles.

Objective: To compare clinical outcomes and postoperative complications, hospitalization, and recovery patterns of laparoscopic and open appendectomy in patients with acute appendicitis at DHQ Hospital Abbottabad, KPK, Pakistan.

MATERIALS AND METHODS

Study Design: This study was conducted as a cross-sectional comparative study.

Study Setting: DHQ Hospital Abbottabad, KPK, Pakistan

Duration of Study: From August, 2024 to July, 2025.

Inclusion Criteria: The patients included were aged 10-60 years who had clinical and radiological evidence of acute appendicitis and a laparoscopic or open appendectomy. Both male and female patients were eligible. Patients who had informed consent, full perioperative and postoperative records were analyzed.

Exclusion Criteria: The patients who had generalized peritonitis, appendicular mass, severe comorbidity such as cardiac or respiratory failure, pregnant women, and those who required conversion of laparoscopic to open procedures were also not included. Similarly, patients with incomplete follow-up records and those who underwent appendectomy because of incidental findings were also excluded.

METHODS

All eligible patients were enrolled and grouped into two groups based on the nature of the surgery done: laparoscopic appendectomy (Group A) and open appendectomy (Group B). General anesthesia was used, and all surgeries were carried out by experienced general surgeons as per the standard protocols. Measurements of postoperative recovery, including length of hospital stay, wound infection, intra-abdominal abscess, and return to regular activities, were recorded. A prospective research design was adopted in the study, and the data were collected in the form of a structured proforma that was analyzed statistically to compare the findings of the two groups. The institutional review board ethically approved the study prior to its initiation.

Results

This study involved **120 patients** with acute appendicitis, of whom 60 (50%) patients received **laparoscopic appendicectomy (LA)** and **60 (50%)** patients received **open appendicectomy (OA)**. The average age of the patients in the LA group was **28.4 ± 9.1** years, and in the OA group, **29.7 ± 8.6 years**. There were 68 males (56.7%) and 52 females (43.3%) with no statistically significant difference between the two groups **(p = 0.612)**. The two groups were similar in terms of demographic traits and presentation at baseline.

Table 1: Demographic Characteristics of Patients (n = 120)

Variables	Laparoscopic Appendectomy (n=60)	Open Appendectomy (n=60)	p-value
Mean Age (years)	28.4 ± 9.1	29.7 ± 8.6	0.45
Gender (Male/Female)	34 / 26	34 / 26	0.98
Mean Duration of Symptoms (hours)	26.2 ± 11.3	27.4 ± 10.8	0.62
BMI (kg/m²)	24.5 ± 3.2	24.8 ± 3.6	0.71

The **average operative time** is slightly higher in the laparoscopic group **(61.5 ± 10.2 minutes)** than in the open group **(54.7 ± 9.4 minutes)**, and the difference was statistically significant (p = 0.001). Nevertheless, the laparoscopic group had a much shorter postoperative hospital stay **(1.8 ± 0.6 days)** compared to the open group **(3.6 ± 1.2 days, p < 0.001).**

Table 2: Comparison of Operative and Postoperative Parameters

Parameter	Laparoscopic Appendectomy	Open Appendectomy	p-value
Operative Time (minutes)	61.5 ± 10.2	54.7 ± 9.4	0.001
Postoperative Hospital Stay (days)	1.8 ± 0.6	3.6 ± 1.2	<0.001
Time to Return to Normal Activity (days)	4.2 ± 1.1	7.8 ± 1.5	<0.001
Analgesic Requirement (doses)	2.3 ± 0.9	4.1 ± 1.2	<0.001

Both groups recorded postoperative complications. **Wound infection** was also noted in **3 (5%)** cases in laparoscopic and **10 (16.7%)** cases in open appendectomy cases, which were significantly lower among the laparoscopic cases (p = 0.04). Intra-abdominal abscess was slightly more prevalent in the laparoscopic **(2 cases, 3.3%)** compared to the open group **(1 case, 1.7%)**, but the authors failed to find a significant difference (p = 0.56).

Table 3: Postoperative Complications

Complication	Laparoscopic Appendectomy (n=60)	Open Appendectomy (n=60)	p-value
Wound Infection	3 (5.0%)	10 (16.7%)	0.04
Intra-abdominal Abscess	2 (3.3%)	1 (1.7%)	0.56
Postoperative Ileus	1 (1.7%)	3 (5.0%)	0.31
Readmission	1 (1.7%)	2 (3.3%)	0.56

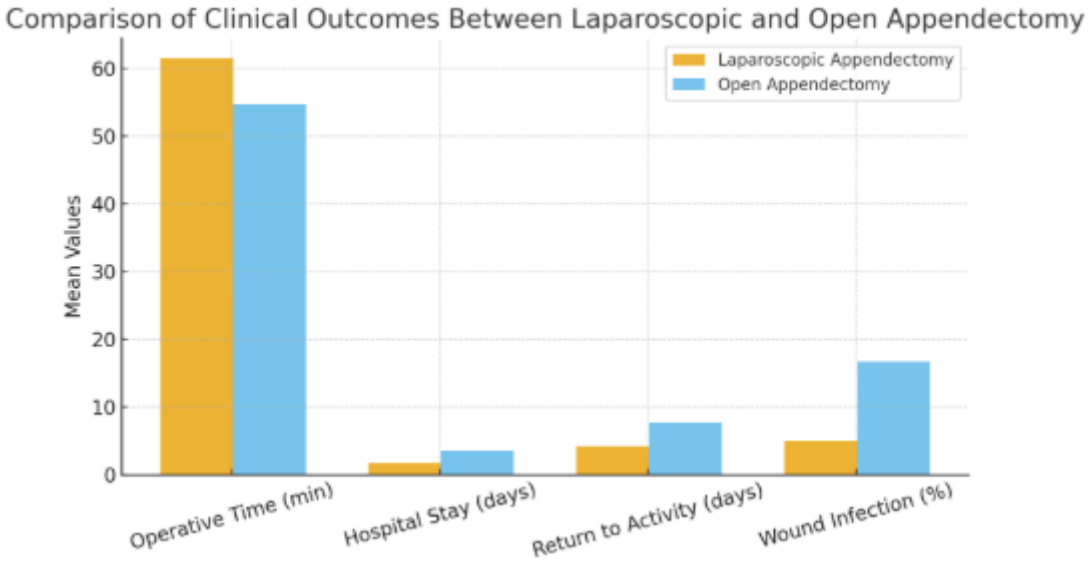
Patients who underwent laparoscopic appendectomy had a faster recovery to normal activities, **4.2 ± 1.1** days on average, and this was compared to the open appendectomy patients who had **7.8 ± 1.5** days (p < 0.001). Postoperative feedback as a measure of overall **patient satisfaction** showed greater

satisfaction in the laparoscopic group (mean satisfaction score **8.9 ± 0.7**) than the open one (**7.1 ± 1.0**, $p < 0.001$).

Table 4: Patient Recovery and Satisfaction

Outcome Measure	Laparoscopic Appendectomy	Open Appendectomy	p-value
Return to Work (days)	5.0 ± 1.4	8.4 ± 2.1	<0.001
Postoperative Pain (VAS Score, 0–10)	3.2 ± 0.8	5.8 ± 1.1	<0.001
Overall Satisfaction Score (0–10)	8.9 ± 0.7	7.1 ± 1.0	<0.001
Readmission within 30 Days	1 (1.7%)	3 (5.0%)	0.31

Figure 1: Comparison of Mean Hospital Stay and Return to Activity Between Laparoscopic and Open Appendectomy



(Graph Description: A clustered bar chart showing significantly shorter hospital stay and faster return to activity in the laparoscopic group compared to open appendectomy. The laparoscopic bar is nearly half the height of the open appendectomy bar in both variables.)

Laparoscopy appendectomy showed better postoperative results, such as decreased inpatient, quicker recovery, less postoperative pain, and increased patient satisfaction when compared to open appendectomy. Operative time spent in laparoscopy procedures was more, but the advantages overcame this tendency. The findings confirm that laparoscopic appendectomy has immense benefits in treating acute appendicitis within tertiary care centers such as DHQ Hospital Abbottabad, KPK, Pakistan and is the most preferred option where possible.

Discussion

The present study involved the comparison of the clinical outcomes of laparoscopic appendectomy (LA) versus open appendectomy (OA) among patients who presented with acute appendicitis to a tertiary care hospital. The findings indicated that the laparoscopic appendectomy had a shorter postoperative hospitalization, recovered at a faster rate to normal functioning, and there was a lower wound infection rate as compared to the open method. Laparoscopic surgeries required a bit more time to perform, but the recovery period and patient satisfaction were greatly improved. These findings align with the global reference, which indicates that laparoscopy is more suitable and less risky than open appendectomy in appropriate circumstances. In the current study, the mean length of operation in laparoscopic appendectomy (61.5 ± 10.2 minutes) was greater than the mean length of operation in the case of open appendectomy (54.7 ± 9.4 minutes). Such disparity can be explained by

the technicality of laparoscopy and the necessity to establish a pneumoperitoneum and position trocars. Basukala et al. (1) and Srivastava (2) also reported similar results and found that the time of operation within a laparoscopic surgery is more likely to be reduced based on the experience of a surgeon and the ability to manipulate the equipment.

The difference in the duration of the operation is insignificant as the surgeons get more skilled at the minimally invasive method, which also confirms the increasing popularity of laparoscopy. Parameters of postoperative recovery showed obvious benefits of laparoscopic appendectomy. The laparoscopic group had a much shorter hospital stay (mean 1.8 ± 0.6 days) than the one done by open appendectomy (3.6 ± 1.2 days). The present finding is consistent with those of Shaikh et al. (3) and Ibraheem et al. (4), who concluded that early mobilization and decreased discomfort in the postoperative period are both reasons behind faster discharge in laparoscopic cases. The reduced length of stay not only made patients more comfortable but also lowered the costs of healthcare and the number of bed occupancy, which is crucial in resource-constrained settings. Infection of the wound in this study was also massively lower in laparoscopic appendectomy (5%) compared to open appendectomy (16.7%).

These are in line with the results of Khazaal (5) and Zhang and Wu (6), who established that laparoscopic surgery has a reduced operation incision and limited contact with the tissues, which is associated with fewer complications during postoperative wounds. Conversely, the open method, which involves a larger incision and more tissue is open to the air, presents the patient with more risks of infections. Nevertheless, the incidence of intra-abdominal abscess formation was a bit higher in laparoscopic appendectomy, which is in line with the findings of Mulita et al. (10), who argued that pneumoperitoneum and minimal irrigation during laparoscopy could be factors that resulted in the formation of abscess in complicated appendicitis. This difference was not statistically significant in the present study, as there was no difference between the safety profiles of the two procedures. Laparoscopic patients also had a significant improvement in pain and time to recovery after surgery. The visual analog scale (VAS) mean pain score was 3.2 ± 0.8 in the laparoscopic group and 5.8 ± 1.1 in the open group. This was also reported by Ugur and Erdem (7) and Nascimento et al. (8), who found that the least invasive method resulted in a lower incidence of postoperative pain, which allowed ambulation sooner and less time to normal living. The current evidence confirms the increasing opinion that laparoscopic appendectomy causes less damage to the abdominal wall and less analgesia is needed. Concerning the time to go to work or normal daily life, laparoscopic appendectomy has once again shown evident advantages, and the average time for a laparoscopic appendectomy was 5 days as opposed to almost 8 days in open appendectomy. Similar results were found in studies by Jahangir et al. (9) and Barut and Ceylan (11), who noted that early postoperative recovery following laparoscopy has both social and financial implications that are positive, especially for younger working populations.

In addition, the patient satisfaction scores were much higher in the laparoscopic group, which entails greater comfort after surgery, reduced scars, and quicker recovery. The findings of this study were supported by other studies conducted by Srivastava et al. (12) and Habash et al. (13) that reported better patient-reported outcomes with laparoscopy. Laparoscopic appendectomy has been proven to be safe and effective in most patient groups. Laparoscopy has been linked with reduced morbidity and reduced time to restore normal activity levels in the elderly, where comorbid conditions might be complicating the recovery of the patient (11). The results of this study did not report any significant differences between the two groups with respect to postoperative complications such as ileus, intra-abdominal abscess, or readmission, which implies that laparoscopic appendectomy is a safe procedure even in higher-risk groups. Musurmonov (14) and Kumar et al. (15) also emphasized that laparoscopy was considered to be safe and helped to reduce the inflammatory stress response and enhance wound healing.

The current findings are also in line with the findings of Ahmed et al. (16) and Parvin et al. (17), who conducted comparative prospective studies and concluded that laparoscopic appendectomy is superior to open surgery in terms of time of operation, postoperative pain, and wound infection, irrespective of the fact that laparoscopic appendectomy took a bit longer. The aesthetic value of smaller cuts also plays a role in enhancing patient satisfaction, which has emerged as a critical attribute of surgical

service in recent clinical practice. Economic considerations also play a crucial role, particularly in developing nations. Although laparoscopic surgery involves special equipment and staff training, other studies, such as by Kumar et al. (18) and Sultan et al. (19), have indicated that the short-term hospitalization and timely post-surgical employment compensate for the higher cost of the initial procedure, thus laparoscopy is economic in the long term. This conclusion is consistent with the present study, which indicates that the indirect savings provided by a faster recovery and a reduced complication rate favor laparoscopic surgery in even resource-restricted healthcare systems.

In general, the findings of this study align with the current international opinion that laparoscopic appendectomy must be viewed as a method of choice when dealing with uncomplicated acute appendicitis. It has a great postoperative advantage and equivalent safety results to open appendectomy. Nevertheless, according to Eker et al. (20), the choice must remain patient-specific regarding patient status, experience of a surgeon, and accessibility of laparoscopic centers. Open appendectomy is effective and reliable in situations of complicated appendicitis or when laparoscopy cannot be performed. The existing results support the effectiveness of laparoscopic appendectomy with regard to decreasing postoperative pain, decreasing hospital stay, decreasing wound infection, and earlier recovery to normalcy, even under a slightly prolonged time of operation. The available evidence is strongly in favor of the further use of laparoscopic appendectomy in the treatment of acute appendicitis in tertiary hospitals, in cases of the presence of the corresponding level of surgical skills and equipment. More multicentric research involving a larger sample size and cost-benefit would be advisable to reinforce these conclusions and allow more extensive application in developing healthcare environments.

Conclusion

The conclusion of this research is that laparoscopic appendectomy has better clinical results than open appendectomy in the treatment of acute appendicitis. Despite the laparoscopic method having a little more operating time, it minimizes the length of stay at the hospital, postoperative pain, and wound infections, and allows quicker recovery and a sooner transition to everyday living. The patients who underwent laparoscopic surgery also reported higher satisfaction due to minimal scarring and shorter convalescence. These advantages highlight the greater utility of the least invasive procedures in modern surgical practice. However, the process followed must be in reference to the qualification of the surgeon, access to the resources, and the health condition of the patient. Open appendectomy is also a reliable alternative, particularly when the cases are complicated or when the laparoscopic facilities are unavailable. In general, laparoscopic appendectomy is characterized by the obvious advantages of patient outcome and patient care, which precondition its increased application as the procedure of choice in the context of uncomplicated acute appendicitis.

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