ORIGINAL ARTICLE

# A Quasi-Experimental Study Comparing Outcomes of Open Versus Laparoscopic Appendectomy in Complicated Appendicitis at a Tertiary Care Center, Multan

Sajjad Ahmad Ansari[1*], Hira Malik[1], Muhammad Ahsan Mustafa[2], Javed Ur Rehman[1], Nadia Riaz[1], Saima Kanwal[1]

**ABSTRACT**

**Objective:** To compare the outcome of laparoscopic versus open appendectomy in patients with complicated appendicitis.

**Study Design: A** Quasi-experimental study.

**Place and Duration of Study:** The study was conducted at the Department of General Surgery, Combined Military Hospital (CMH), Multan, Pakistan, from June 2022 to July 2023.

**Methods:** A total of 168 patients were divided into two equal groups: open appendectomy (Group A) and laparoscopic appendectomy (Group B). Appendectomies were performed as per group. Postoperatively, patients were followed for one month. The observed variables included Surgical Site Infection (SSI), length of hospital stay, time taken to regain bowel function, mean operative time, and blood loss.

**Results:** The occurrence of surgical site infection post-operatively was 11 (13.1%) patients in Group A, while Group B had a lower rate of 5(6%) ($P$=0.115). The mean operative time differed significantly between the two groups, with Group A 43.57 ± 3.27 minutes and Group B 58.49 ± 5.83 minutes ($P$ < 0.001). The mean loss of blood in Group A was 15.01 ± 5.012 ml, compared to 9.98 ± 3.79 ml in Group B ($P$ < 0.001). The time taken for patients to regain bowel function was 3.18 ± 0.679 days in Group A and 3.13 ± 0.555 days in Group B ($P$ = 0.620). Lastly, the length of hospital stay was 5.05 ± 0.820 days in Group A and 4.31 ± 0.514 days in Group B ($P$ < 0.001).

**Conclusion:** Laparoscopic appendectomy demonstrated lower rates of surgical site infection; however, this difference was not statistically significant. It was associated with significantly reduced blood loss and shorter hospital stay.

**Keywords:** *Appendicitis, Laparoscopic, Surgical Site Infection.*

***How to cite this:*** *Ansari SA, Malik H, Mustafa MA, Rehman J, Riaz N, Kanwal S. A Quasi-Experimental Study Comparing Outcomes of Open Versus Laparoscopic Appendectomy in Complicated Appendicitis at a Tertiary Care Center, Multan. Life and Science. 2026; 7(2): 203-209. doi: http://doi.org/10.37185/LnS.1.1.964*

This work is licensed under a Creative Commons Attribution-NonCommercial 4.0 International license. (https://creativecommons.org/licenses/by-nc/4.0/). Non-commercial uses of the work are permitted, provided the original work is properly cited.

## Introduction

Among surgical emergencies, acute appendicitis remains one of the most common conditions, with a lifetime incidence of approximately 8.6% in males and 6.7% in females.[1] It predominantly affects individuals between 10 and 30 years of age, with an overall incidence ranging from 7% to 9%. A significant proportion of cases (13%–20%) present as complicated appendicitis, characterized by perforation, gangrene, or abscess formation, with a higher risk of perforation observed in males compared to females.[2]

Advances in clinical scoring systems and imaging modalities, including ultrasonography and computed tomography, have improved diagnostic accuracy.[3] However, a considerable number of patients still present with complicated disease at the time of diagnosis. Prompt surgical intervention remains the cornerstone of management to reduce morbidity and mortality. In selected cases, particularly those with localized abscess formation, conservative management with antibiotics, image-

[1]*Department of Surgery*
*Combined Military Hospital (CMH), Multan, Pakistan*
[2]*Department of Surgery*
*Combined Military Hospital (CMH), Bahawalpur, Pakistan*
*Correspondence:*
*Dr. Sajjad Ahmad Ansari*
*Assistant Professor, Surgery*
*Combined Military Hospitals (CMH), Multan, Pakistan*
*E-mail: saansari786@gmail.com*
*Received: June 25, 2025; 1st Revision Received: Dec 15, 2025*
*2nd Revision Received: Mar 11, 2026; Accepted: Mar 16, 2026*

guided drainage, and interval appendectomy may be appropriate.[4]

Laparoscopic appendectomy (LA), initially introduced by Semm in the 1980s, has become popular over traditional open appendectomy (OP) in uncomplicated cases because of its several reported benefits, like minimal invasiveness, shorter hospital stays, better cosmesis, and superior peritoneal cavity visualization.[5,6]

Previous studies have suggested LA is associated with decreased infectious complications, pain intensity, and hospital stay. Even in pregnancy, the laparoscopic appendectomy is comparable to open appendectomy in obstetrical outcomes, but with shorter operative time and a shorter hospital stay.[7-9]

This study focused on patients with complicated appendicitis to determine which procedure (open versus laparoscopic) had a lower wound infection rate. It is hoped that this study will help in clinical decision-making in the management of complex appendicectomies. The objective of this study was to compare the outcome of laparoscopic versus open appendectomy in patients with complicated appendicitis.

## Methods

The quasi-experimental study was conducted at the General Surgery Department, Combined Military Hospital (CMH), Multan, Pakistan, from June 2022 to July 2023. The Institutional Ethical Review Committee granted permission to conduct this study, vide letter no: 13/Trg/2021, dated 18th October 2021. Using the WHO sample size calculator, a total sample size of 168 patients was calculated with 84 patients in each group by taking the incidence of surgical site infection as 10.77% in the laparoscopic technique compared to a 27.69% with the open technique, level of significance 5%, and power of test at 80%.[10] Convenience Sampling was used, a non-probability sampling method.

Complicated appendicitis was defined as perforation, gangrene, abscess, or generalized peritonitis confirmed intraoperatively or radiologically.[10,11]

Patients with complicated appendicitis, as per the operational definition, with an illness duration of 2-7 days and ASA classification I-II, aged 20-60 years, were included. Patients with uncomplicated appendicitis, appendiceal mass, previous abdominal surgery within the last 5 years, an American Society of Anaesthesiologists (ASA)/WHO Physical Status score ≥ 3 or severe systemic comorbidities, contraindications to laparoscopic surgery such as obesity (BMI > 30 kg/m$^2$), conversions from laparoscopic to open method, pregnancy, immunocompromised state (e.g. regular use of steroids), and allergies were excluded.

Written Consent was obtained from all participants. Patients were allocated non-randomly; patients were assigned to the open (Group A) and laparoscopic appendectomy (Group B) groups. Nurses recorded baseline characteristics (i.e., age, gender, and BMI) on a pre-designed proforma. All patients were assessed at 3rd, 7th, 14th & 30th postoperative day for the surgical site infection which is defined as an infection occurring within one month at or near the operative site, or within one year if an implant is inserted.[12] The outcomes assessed were port-site/surgical-site infection, length of hospital stay, time till bowel function is regained, average operative time, and blood loss. All surgical procedures were performed by an experienced consultant general surgeon. Outcomes were assessed by an independent consultant surgeon, and data were recorded by a resident surgeon.

Antibiotics were administered as per institutional protocol. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 26.0 for Windows. Descriptive statistics were used for qualitative data (sex and surgical site infection) as frequencies and percentages, and quantitative variables (age, length of hospital stay, time to regain bowel function, and operative time) as means and standard deviations. We used independent-sample t-test to compare the duration of hospital stay and operative time between the two groups, and Chi-Square test to analyze categorical data, such as surgical site infection. Stratification was used to qualitatively control for potential effect modifiers, such as age and sex, using post-stratification Chi-Square test. The level of significance was $P<0.05$.

## Results

Out of the total 168 participants, 153 (91.07%) were<40 years old, and the remaining 15 (8.93%) comprised the> 40 years' age group. In Group A, 76 of

84 patients (90.5%) were under 40, and 8 (9.5%) were over the age of 40 ($P$ = 0.787), while in Group B, 77 of 84 (91.7%) were <40, and 7 (8.3%) were >40. The ASA level of the two groups was comparable and showed no significant difference. The difference in SSI between groups was not statistically significant ($P$=0.115). Duration of surgery, blood loss, and length of hospital stay showed a statistically significant difference between Group A and Group B (Table 1).

The stratification of the SSI with respect to gender revealed no significant difference, as shown in Table 2.

Statistically significant difference was found on stratification of SSI with respect to age, showing a higher chance of SSI in the older age group, as shown in Table 3.

**Table 1: Comparison of parameters among the two groups**

| Variable | | Study Groups | | *Test*-value | *P*-value |
|---|---|---|---|---|---|
| | | Group A Open | Group B Laparoscopic | | |
| Gender, N (%) | Male | 57 (67.9%) | 56 (66.7%) | 0.027 | 0.869 |
| | Female | 27 (32.1%) | 28 (33.3%) | | |
| Age, N (%) | Up to 40 years | 76 (90.5%) | 77 (91.7%) | 0.073 | 0.787 |
| | Greater than 40 Years | 8 (9.5%) | 7 (8.3%) | | |
| ASA Grade, N (%) | Grade I | 72 (85.7%) | 69 (82.1%) | 0.397 | 0.529 |
| | Grade II | 12 (14.3%) | 15 (17.9%) | | |
| Surgical site infection, N (%) | Yes | 11 (13.1%) | 5 (6%) | 2.847 | 0.115 |
| | No | 73 (86.9%) | 79 (94%) | | |
| Duration of surgery (minutes, mean ± SD) | | 43.57 ± 3.27 | 58.49 ± 5.83 | 20.433 | <0.001 |
| Blood loss (millilitres, mean ± SD) | | 15.01 ± 5.012 | 9.98 ± 3.790 | 7.345 | <0.001 |
| Regain of bowel function (days, mean ± SD) | | 3.18 ± 0.679 | 3.13 ± 0.555 | 0.497 | 0.620 |
| length of hospital stay (days, mean ± SD) | | 5.05 ± 0.820 | 4.31 ± 0.514 | 6.989 | <0.001 |

**Table 2: Stratification of SSI with respect to gender**

| Group | Gender | Surgical Site Infection | | *Test* value | *P*-value |
|---|---|---|---|---|---|
| | | No | Yes | | |
| Laparoscopic | Male (N=56) | 53 (63.1%) | 3 (3.6%) | 0.106 | 0.744 |
| | Female (N=28) | 26 (31%) | 2 (2.4%) | | |
| Open | Male (N=57) | 49 (58.3%) | 8 (9.5%) | 0.138 | 0.711 |
| | Female (N=27) | 24 (28.6%) | 3 (3.6%) | | |

**Table 3: Stratification of SSI with respect to age groups**

| Group | Age Group | Surgical Site Infection | | *Test* value | *P*-value |
|---|---|---|---|---|---|
| | | No | Yes | | |
| Laparoscopic | Up to 40 years | 74 (88.1%) | 3 (3.6%) | 6.979 | 0.008 |
| | More than 40 years | 5 (6%) | 2 (2.4%) | | |
| Open | Up to 40 years | 69 (82.1%) | 7 (8.3%) | 10.582 | <0.001 |
| | More than 40 years | 4 (4.8%) | 4 (4.8%) | | |

## Discussion

The main focus of this study was the outcomes of open versus laparoscopic appendectomy in patients with complicated appendicitis, with particular attention to patients' demographics, incidence of surgical site infection, intraoperative blood loss, operative time, bowel function recovery, and length of hospital stay. This information will provide valuable insights into the pros and cons of each surgical technique, as well as crucial factors to

consider for clinical practice. The demographic parameters of the patients in both groups were similar, with no significant differences in gender distribution, age, or ASA grades. This similarity is important because it means that any variations in surgical outcomes can be attributed more to the type of surgery than to confounding demographic factors. The overall incidence of SSIs was 16 (9.52%) in this study, with 11 (13.1%) patients in the open technique group and 5 (6%) in the laparoscopic technique group. Although a lower SSI rate was observed in the laparoscopic group, the difference was not statistically significant. Not surprisingly, these results are consistent with the literature on the subject, showing that less invasive laparoscopic surgery, which reduces human exposure to internal tissues through smaller incisions, likely carries a lower risk of infection. Nevertheless, the lack of statistical significance suggested that other factors might be attributed to the risk of SSI, warranting further investigation in larger studies.

Mohamed et al.[13] found a threefold increase in surgical site infection with open appendectomy(OA) compared with laparoscopic appendectomy(LA). The data also showed that the incidence of organ/space SSIs was comparable between groups, indicating that LA was more effective in preventing SSIs at the surface level. A meta-analysis was conducted by Jayalal et al.[14] on 4924 patients on SSI in laparoscopic vs open appendectomy. In his study, SSI in laparoscopic appendectomy had an incidence of 4.8 (95% prediction interval: 0.0–9.3) per 100 appendectomies, as compared to open appendectomy, which showed a higher incidence of 10.5 (95% prediction interval: 0–23.3) per 100 appendectomies. Supporting these findings, Poprom et al.[15] conducted an umbrella review of meta-analyses and showed that laparoscopic appendectomy compared to the open technique has a decreased risk of SSIs, with risk ratios of 0.56 (95% CI, 0.47–0.67) in adults and 0.40 (95% CI, 0.25–0.65) in children. However, the laparoscopic technique was also associated with an increased risk of intra-abdominal abscesses (IAA), with risk ratios of 1.20 (95% CI, 0.88–1.63) in adults and 1.05 (95% CI, 0.61–1.80) in children, indicating a benefit-risk balance of different complication types. A similar study conducted by Khan et al.[16] showed a statistically significantly higher chance of surgical site infection among the open groups 12 (10.9%) as compared to the laparoscopic appendectomy group 2 (1.8%) ($P$ <0.05).

Our study also found that the mean length of hospital stay was shorter in the laparoscopic group than in the open group (4.31 ± 0.514 days vs. 5.05 ± 0.820 days, $P$<0.001). A study done by Arfat et al.[17] on perforated appendix showed an increase in length of hospitalization, 3.23±0.63 days among open appendectomy vs 2.57±0.77 days in laparoscopic appendectomy, with a significant $P$ value <0.001. The quicker recovery and shorter hospital stay associated with LA can be attributed to smaller incisions, reduced postoperative pain, and fewer wound complications, as noted by several studies.[17-19] These benefits contribute to lower overall treatment costs and positive patient feedback. On the other hand, it was also reported that patients with complicated appendicitis are likely to have a hospital stay of more than 3 days compared to the uncomplicated variety.[20]

A significant difference in surgical duration was observed between the two groups. The mean duration of surgery was significantly longer in the LA group (58.49 ± 5.83 min) than in the OA group (43.57 ± 3.27 min, $P$<0.001). This difference may be explained by the learning curve associated with laparoscopic surgery and the technical demands of minimally invasive procedures. This result is consistent with other studies that have reported longer overall operative times for laparoscopic procedures due to technical difficulties and the learning curve associated with minimally invasive techniques. Although laparoscopic surgery has longer operative times, the advantages, such as less postoperative pain and shorter recuperation times, may outweigh the longer surgical times for many patients. Such similar studies done by Güler et al.[21] shows duration of surgery in open appendectomy as 38.4±9.0 min verses lap appendectomy as 39.9±9.5 min with $P$ value of 0.269. Similarly, a study done by Seqsaqa et al.[22] shows longer duration of surgery in lap appendectomy with a $P$ value of <0.001. Sabry et al.[23] also shows increase in duration during lap appendectomy (109.1±16.71 min) as compared to open appendectomy (91.40±11.99 min). Another study done by Jailani et al.[24] on 712 patients with complicated appendicitis also revealed similar

results (*P*-value <0.001).

There was a significant difference in blood loss between the two groups (15.01 ± 5.012 ml in the OA group vs. 9.98 ± 3.790 ml in the LA group; *P*<0.001). This result is consistent with the Takami et al.[25] study, which revealed mean blood loss in the OA group, 74.79±168.55 ml versus 29.64±62.97 ml in LA group, with a significant difference (*P*=0.018), which is due to smaller incisions and more accurate surgical maneuvers in laparoscopy due to better visualization of the surgical field and better control of bleeding points if occurs. A similar study was done among the paediatric group by Makkadafi et al.[26], who showed significantly less blood loss in the LA group as compared to the OA group (*P* value <0.05). Due to effective handling and advanced devices such as the Ligasure sealing device, there is reduced blood loss in the LA group.[27]

There was no significant difference between the two groups in the time required for return of bowel function, with a mean interval of 3.18 ± 0.679 days in the OA group and 3.13 ± 0.55 days in the LA group (*P*=0.620). A study by Basukala et al.[28] on appendectomy showed no statistically significant difference in the return of bowel function between the two groups (*P*-value 0.096). Postoperative ileus inhibits gut motility and delays the return of bowel habits, usually caused by inflammatory responses and inhibitory neural pathway activation due to bowel handling and surgical trauma.[29]

The data revealed interesting trends when split by gender and age group. Analysis of the male patients indicated that they had a higher rate of SSIs in the OA group than in the LA group, although this difference was not significant. With respect to age, increased SSI rates were observed in both groups with advancing age. These findings support the attention to patient-level factors in SSI risk assessment. They suggest that laparoscopic benefits may be more evident in certain patient subgroups, particularly a lower risk of SSI, but further studies are necessary to validate these conclusions. This study has certain limitations. Firstly, the relatively small sample size may limit the generalizability of the findings to larger populations. Secondly, as the study was conducted at a single institution, the results may not be fully applicable to other settings with different patient populations, resources, and surgical practices. Thirdly, variability with respect to surgeons' expertise and experience can affect the results. Fourthly, the use of non-probability convenience sampling may introduce significant selection bias and limit the generalizability of the findings, as participants were not randomly selected. Finally, intraoperative findings may differ among patients, introducing variability that could affect the results. These factors should be considered when interpreting the study findings.

## Conclusion

Laparoscopic appendectomy was associated with significantly less blood loss and shorter hospital stay, although operative time was longer. No statistically significant difference in surgical site infection was observed

**Acknowledgment**: None

**Conflict of Interest:** The authors declared no conflict of interest.

**Grant Support and Financial Disclosure:** None

### REFERENCES

1. Akbulut S, Koç C, Şahin TT, Şahin E, Tuncer A, Demyati K, et al. An investigation into the factors predicting acute appendicitis and perforated appendicitis. Turkish Journal of Trauma & Emergency Surgery. 2021; 27: 432-42. doi: 10.14744/tjtes.2020.60344
2. Echevarria S, Rauf F, Hussain N, Zaka H, Ahsan N, Broomfield A, et al. Typical and atypical presentations of appendicitis and their implications for diagnosis and treatment: a literature review. Cureus. 2023; 15: e37024. doi: 10.7759/cureus.37024
3. Teng TZJ, Thong XR, Lau KY, Balasubramaniam S, Shelat VG. Acute appendicitis–advances and controversies. World Journal of Gastrointestinal Surgery. 2021; 13: 1293-307. doi: 10.4240/wjgs.v13.i11.1293
4. Bom WJ, Scheijmans JC, Salminen P, Boermeester MA. Diagnosis of uncomplicated and complicated appendicitis in adults. Scandinavian Journal of Surgery. 2021; 110: 170-9. doi: 10.1177/14574969211008330
5. Ibraheem M, Sayed AA, Raafat I. A comparative study of laparoscopic and open appendectomy. The Medical Journal of Cairo University. 2021; 89: 155-61.
6. 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: 10.1016/j.sopen.2021.08.001
7. Köhler F, Hendricks A, Kastner C, Müller S, Boerner K, Wagner JC, et al. Laparoscopic appendectomy versus antibiotic treatment for acute appendicitis—a systematic review. International Journal of Colorectal Disease. 2021; 36: 2283-6. doi: 10.1007/s00384-021-03927-5

8. Lipping E, Saar S, Rull K, Tark A, Tiiman M, Jaanimäe L, et al. Open versus laparoscopic appendectomy for acute appendicitis in pregnancy: a population-based study. Surgical Endoscopy. 2023; 37: 6025-31. doi: 10.1007/s00464-023-10075-0
9. Nazir A, Farooqi SA, Chaudhary NA, Bhatti HW, Waqar M, Sadiq A. Comparison of open appendectomy and laparoscopic appendectomy in perforated appendicitis. Cureus. 2019; 11: e5105. doi: 10.7759/cureus.5105
10. Mariage M, Sabbagh C, Grelpois G, Prevot F, Darmon I, Regimbeau JM. Surgeon's definition of complicated appendicitis: a prospective video survey study. Euroasian Journal of Hepato-Gastroenterology. 2019; 9: 1-4. doi: 10.5005/jp-journals-10018-1286
11. Mekakas A, Nagorni EA. Complicated appendicitis: A surgical controversy concerning. Doubts, problems and certainties about acute appendicitis. IntechOpen. 2022. doi: 10.5772/intechopen. 97270. Available at: https://www.intechopen.com/chapters/76293
12. Gouda NS. Surgical site infection. Journal of Pioneering Medical Sciences. 2025; 14: 21-33. doi: 10.47310/jpms/2025140303
13. Mohamed AE, El-Moneim A, Abd El-Hamid A, Emam MA. Comparative study between open surgical technique versus laparoscopic appendectomy in complicated appendicitis. Al-Azhar International Medical Journal. 2022; 3: 76-81. doi: 10.21608/aimj.2022.108248.1687
14. Jayalal JA, Raj SE, Baghavath PR. Surgical site infections after appendectomy in the Indian subcontinent: a meta-analysis. European Journal of Cardiovascular Medicine. 2024; 14: 557-62. doi: 10.5083/ejcm
15. Poprom N, Wilasrusmee C, Attia J, McEvoy M, Thakkinstian A, Rattanasiri S, et al. Comparison of postoperative complications between open and laparoscopic appendectomy: An umbrella review of systematic reviews and meta-analyses. Journal of Trauma and Acute Care Surgery. 2020; 89: 813-20. doi: 10.1097/ta. 0000000000002878
16. Khan MS, Khattak IA, Jamil T, Saqib M, Hussain SA, Younis S. Comparison of laparoscopic appendectomy with open appendectomy with respect to surgical site infection. Pakistan Journal of Medical & Health Sciences. 2022; 16: 695-9. doi: 10.53350/pjmhs22168695
17. Arfat Y, Rauf I, Awan MY, Al Hassan R, Rauf A, Tahir NB. Is laparoscopic appendectomy recommended in perforated appendicitis? Pakistan Armed Forces Medical Journal. 2024; 74: 1319-23. doi: 10.51253/pafmj.v74i59473
18. Alganabi M, Biouss G, Pierro A. Surgical site infection after open and laparoscopic surgery in children: a systematic review and meta-analysis. Pediatric Surgery International. 2021; 37: 973-81. doi: 10.1007/s00383-021-04911-4
19. Gu Q, Hua Y. Perforated appendicitis treated with laparoscopic appendicectomy or open appendicectomy: A meta-analysis. Journal of Minimal Access Surgery. 2023; 19: 348-54. doi: 10.4103/jmas.jmas_158_22
20. Alotaibi AM, Alfawaz M, Felemban L, Moshref L, Moshref R. Complicated appendicitis increases the hospital length of stay. Surgery Open Science. 2022; 9: 64-8. doi: 10.1016/j.sopen.2022.05.006
21. Güler Y, Karabulut Z, Çaliş H, Şengül S. Comparison of laparoscopic and open appendectomy on wound infection and healing in complicated appendicitis. International Wound Journal. 2020; 17: 957-65. doi: 10.1111/iwj.13347
22. Seqsaqa M, Rozeik AE, Khalifa M, Ashri HN. Laparoscopic versus open appendectomy in complicated appendicitis in children: a single center study. Egyptian Pediatric Association Gazette. 2020; 68: 26. doi: 10.1186/s43054-020-00034-y
23. Sabry AA, Menesy M, Kassem M, Elkeleny MR. The outcomes of laparoscopic versus open appendectomies for complicated appendicitis. The Egyptian Journal of Surgery. 2023; 42: 736-44. doi: 10.4103/ejs.ejs_160_23
24. Jailani RF, Jafri NA, Henry G, Sagap I. Laparoscopic or open appendectomy: Which approach is the best for complicated appendicitis? World Journal of Laparoscopic Surgery. 2021; 14: 1-4. doi: 10.5005/jp-journals-10033-1430
25. Takami T, Yamaguchi T, Yoshitake H, Hatano K, Kataoka N, Tomita M, et al. A clinical comparison of laparoscopic versus open appendectomy for the treatment of complicated appendicitis: historical cohort study. European Journal of Trauma and Emergency Surgery. 2020; 46: 847-51. doi: 10.1007/s00068-019-01086-5
26. Makkadafi M, Mariana N, Ahmadwirawan MP, Pangerang AM, Lihawa NF. Comparison of laparoscopic versus open appendectomy outcomes in pediatric patients: a retrospective single-institution review. Frontiers in Health Informatics. 2025; 14: 503.
27. Yu G, Han A, Wang W. Comparison of laparoscopic appendectomy with open appendectomy in treating children with appendicitis. Pakistan Journal of Medical Sciences. 2016; 32: 299-304. doi: 10.12669/pjms.322.9082
28. Basukala S, Thapa N, Bhusal U, Shrestha O, Karki S, Regmi SK, et al. Comparison of outcomes of open and laparoscopic appendectomy: A retrospective cohort study. Health Science Reports. 2023; 6: e1483. doi: 10.1002/hsr2.1483
29. Mannava S, Vogler A, Markel T. Pathophysiology and management of postoperative ileus in adults and neonates: a review. Journal of Surgical Research. 2024; 297: 9-17. doi: 10.1016/j.jss.2024.02.001

**Author Contributions**

**SAA:** Conception, design of the work, and approval for final submission
**HM:** Data acquisition, curation, statistical analysis, and approval for final submission
**MAM:** Validation of data, interpretation, write-up of results, and approval for final submission
**JR:** Writing the original draft, proofreading, approval for final submission, and approval for final submission
**NR:** Manuscript writing for methodology design investigation, and approval for final submission
**SK:** Revising, editing, supervising for intellectual content, and approval for final submission
**SAA is the nominated guarantor and takes full responsibility for the overall content and integrity of the work**

.....