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ORIGINAL ARTICLE

Single Preoperative Dose Versus Conventional Multidose Antibiotic Prophylaxis In Elective Laparoscopic Cholecystectomy

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ABSTRACT

Introduction: Even with all the progress made in minimally invasive surgery, surgical site infection (SSI) still ranks among the more troublesome complications following laparoscopic cholecystectomy. Antibiotic prophylaxis is standard practice, but how long it should be continued is still up for debate. Giving more antibiotics than necessary only adds to healthcare costs, raises the chance of adverse drug reactions, and feeds into the wider problem of antimicrobial resistance which is why it's worth asking whether a single preoperative dose can hold its own against the conventional multidose approach.

Objectives: To compare rates of surgical site infection and other postoperative outcomes between patients given a single preoperative antibiotic dose and those given the conventional multidose regimen during elective laparoscopic cholecystectomy.

Methods: This randomized controlled comparative study was carried out in the Department of General Surgery, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan. One hundred patients undergoing elective laparoscopic cholecystectomy were enrolled and split evenly into two groups of 50. Group A was given a single preoperative intravenous dose of cefotaxime and sulbactam (1.5 g), while Group B received the conventional multidose prophylaxis regimen. Patients were tracked for four weeks after surgery to catch any surgical site infection or other complications. Data were analysed in SPSS, with $p<0.05$ taken as significant.

Results: Baseline age and clinical characteristics were similar across both groups. Surgical site infection turned up in 12% of the single-dose group compared with

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6% of the multidose group, though this gap didn't reach statistical significance (p=0.295). Surgery took an average of 26.9 ± 2.1 minutes in the single-dose group versus 26.7 ± 2.5 minutes in the multidose group (p=0.692), and hospital stays averaged 3.14 ± 0.96 days and 3.10 ± 1.12 days respectively (p=0.852). Postoperative complications were much the same in both groups (p=0.27).

Conclusion: A single preoperative antibiotic dose held up just as well as conventional multidose therapy in terms of both efficacy and safety in elective laparoscopic cholecystectomy. In uncomplicated cases, there seems little reason to continue antibiotics after surgery, since skipping the extra doses doesn't appear to raise the risk of surgical site infection.

KEYWORDS

• Laparoscopic Cholecystectomy • Antibiotic Prophylaxis • Surgical Site Infection • Single-Dose Antibiotic • Multidose Antibiotic • Postoperative Complications

INTRODUCTION

Laparoscopic cholecystectomy has taken over as the go-to surgical treatment for symptomatic gallstone disease, thanks to the reduced postoperative pain, shorter hospital stays, quicker recovery, and better cosmetic outcome it offers compared with the open approach.[1-4] But even with these advantages, surgical site infection (SSI) remains a persistent problem afterward, adding to patient morbidity, driving up healthcare spending, extending hospital stays, and slowing recovery.[5-7] Keeping SSI rates down is therefore a core part of good perioperative care. Giving antibiotics before the incision is made cuts down on bacterial contamination during the operation and lowers the odds of a wound infection developing afterward.[8-10] Yet practice around how long that prophylaxis should continue still differs quite a bit from surgeon to surgeon some are happy to stop after a single preoperative dose, while others keep prescribing further doses after surgery hoping to drive infection risk down even more. Prolonged prophylaxis has long been seen as the "safer" choice, but a growing body of evidence suggests that continuing antibiotics after an uncomplicated laparoscopic cholecystectomy doesn't really add much benefit.[11-15] What it does add is unnecessary cost, a greater chance of adverse drug reactions, and a contribution to antimicrobial resistance concerns that have pushed antibiotic stewardship and more rational antimicrobial use higher up the surgical agenda.[16-18] A number of randomized trials and systematic reviews have already shown that single-dose and multidose regimens produce broadly similar SSI rates in elective laparoscopic cholecystectomy.[13-15,19] Still, differences in patient populations, healthcare settings, and surgical protocols mean practice hasn't caught up everywhere, and data from Indian surgical centres specifically remain sparse. It was against this backdrop that the present randomized controlled comparative study was carried out, comparing SSI rates and other postoperative outcomes between patients receiving a single preoperative antibiotic dose and those on the conventional multidose regimen during elective laparoscopic cholecystectomy.

AIM AND OBJECTIVES

Aim: To compare rates of surgical site infection between patients given a single preoperative prophylactic antibiotic dose and those given conventional multidose antibiotic therapy in elective laparoscopic cholecystectomy.

Objectives:

1. To compare the incidence of surgical site infection after elective laparoscopic cholecystectomy between patients receiving a single preoperative antibiotic dose and those receiving conventional multidose prophylaxis
2. To compare postoperative outcomes, complications, duration of surgery, and length of hospital stay between the two groups.

MATERIALS AND METHODS

Study Design: Randomized controlled comparative study.

Study Duration: November 2025 to July 2026.

Study Setting: Department of General Surgery, Sardar Patel Medical College and Associated Group of Hospitals, Bikaner, Rajasthan.

Study Population: Patients admitted for elective laparoscopic cholecystectomy during the study period.

Sample Size and Sampling Technique: The sample size was worked out from previously reported[19] SSI rates of 4.4% and 3.3%. At 80% power and a 5% significance level, this would have called for 416 patients per group, but given the time constraints, the study was run as a time-bound pilot instead. A total of 100 patients were therefore included, 50 to a group, chosen through simple random sampling.

Randomization and Group Allocation: Group A (Single-Dose Group): Given a single preoperative intravenous dose of cefotaxime and sulbactam (1.5 g). Group B (Conventional Multidose Group): Given the conventional multidose regimen, combining preoperative and postoperative antibiotic administration.

Inclusion Criteria:

- Patients diagnosed with gallstone disease and scheduled for elective laparoscopic cholecystectomy.
- Patients cleared for surgery on pre-anaesthetic evaluation.
- Patients willing to give written informed consent.

Exclusion Criteria:

- Allergy to cefotaxime or sulbactam.
- Emergency laparoscopic cholecystectomy.
- Conversion to open cholecystectomy.
- ASA Grade III or above.
- Common bile duct stones, intrahepatic biliary stones, or previous biliary tract surgery.
- Cholangitis, obstructive jaundice, or biliary pancreatitis.
- Recent ERCP or acute cholecystitis.

Data Collection: Patient demographics, body weight, ASA grade, intraoperative findings, operative duration, postoperative complications, surgical site infection, and hospital stay were all logged on a proforma prepared ahead of the study. Every patient was followed for four weeks after surgery, through outpatient visits and telephone check-ins.

Ethical Considerations: The study began only after clearance from the Institutional Ethics Committee. Written informed consent was taken from every participant before enrolment, and patient information was kept confidential throughout.

Statistical Analysis: Data were entered in Microsoft Excel and analysed in SPSS (version 29.0, trial version). Continuous variables were expressed as mean ± standard deviation, and categorical variables as frequencies and percentages. Student's t-test, the Chi-square test, and Fisher's exact test were used as appropriate, with $p<0.05$ taken as statistically significant.

Table 1: Baseline Demographic and Clinical Characteristics of Study Participants (n = 100)

Variable	Single Dose (n=50)	Conventional Dose (n=50)	Total
Age			
<30 years	4	9	13
30–40 years	11	12	23
41–50 years	14	12	26
51–60 years	10	10	20
>60 years	11	7	18
Sex			
Female	40	38	78
Male	10	12	22
Weight			
<50	0	1	1
50–60	29	26	55
61–70	12	16	28
71–80	7	5	12
>80	2	2	4
ASA			
Grade I	34	32	66
ASA Grade II	16	18	34
Bile/Gallbladder spillage			
No	43	43	86
Yes	7	7	14

Table 2: Comparison of Surgical Site Infection and Postoperative Complications Between Study Groups

Outcome	Single Dose (n=50)	Conventional Dose (n=50)	p-value
Surgical site infection	6 (12%)	3 (6%)	0.295
Superficial wound infection	6 (12%)	3 (6%)	0.27
Intra-abdominal collection	3 (6%)	1 (2%)	0.27
Total complications	9 (18%)	4 (8%)	0.27

Table 3: Comparison of Operative and Recovery Outcomes Between Study Groups

Variable	Single Dose	Conventional Dose	p-value
Mean duration of surgery (minutes)	26.9 ± 2.1	26.7 ± 2.5	0.692
Mean hospital stay (days)	3.14 ± 0.96	3.10 ± 1.12	0.852
SSI incidence (%)	12%	6%	0.295

RESULTS

A hundred patients undergoing elective laparoscopic cholecystectomy were enrolled and divided evenly into the two groups of 50. Baseline demographics and clinical characteristics matched up well between them. Most patients fell in the 41–50 year bracket (26%), with the 30–40 year group close behind (23%). Women made up 78% of the study population, in keeping with the well-documented higher prevalence of gallstone disease among females. The majority weighed between 50 and 60 kg and were classified as ASA Grade I. Bile or gallbladder spillage came up in 14% of procedures, spread evenly across both groups. The main outcome of interest surgical site infection occurred in 6 patients (12%) in the single-dose group and 3 patients (6%) in the multidose group. Though numerically higher in the single-dose arm, this difference didn't reach statistical significance (p=0.295). Postoperative complications overall were uncommon in either group. Superficial wound infection came up most often, followed by intra-abdominal collection, and no infections at distant sites were recorded during the study period. The overall complication rate ran slightly higher in the single-dose group, but again this fell short of significance (p=0.27). Surgery lasted an average of 26.9 ± 2.1 minutes in the single-dose group against 26.7 ± 2.5 minutes in the multidose group (p=0.692), and hospital stay averaged 3.14 ± 0.96 days versus 3.10 ± 1.12 days (p=0.852). Taken together, these results suggest the antibiotic regimen chosen made little difference to how long surgery took or how long patients stayed in hospital afterward.

DISCUSSION

This randomized controlled study set out to see how a single preoperative antibiotic dose stacks up against the conventional multidose regimen in patients having elective laparoscopic cholecystectomy, focusing on surgical site infection (SSI), postoperative complications, operative duration, and hospital stay.

Demographic Distribution The two groups matched closely on age, sex, weight, and ASA grading, which gave the comparison a solid baseline to work from. Most patients fell in the 41–50 year age bracket (26%), and women made up 78% of the cohort a pattern that fits with the well-known tendency for gallstone disease to be more common in women, largely down to hormonal and metabolic factors. Zafar *et al.,* Islam *et al.,* Bhargava *et al.,* and Kumar

et al. reported much the same demographic skew in their own laparoscopic cholecystectomy cohorts.[12,13,15,21]

Surgical Site Infection (SSI) Across the whole cohort, SSI came up in 9% of patients. Broken down by group, it occurred in 12% of the single-dose arm and 6% of the multidose arm, but the gap was not statistically significant

(p = 0.295) suggesting the two regimens do about equally well at keeping postoperative infection at bay. This lines up with Chaudhary et al., who found comparable SSI rates between single-dose and multidose groups.[14] Kumar *et al.,* Sutariya *et al.,* Gupta *et al.,* Naser *et al.,* Patel et al., Islam et al., and Zafar et al. all reported similar results, with none of them finding any real advantage to continuing antibiotics after surgery.[11-13,18-21]

Postoperative Complications Superficial wound infection was the complication seen most often in this study (9%), followed by intra-abdominal collection (4%), with no distant infections recorded. Complications ran a little higher in the single-dose group, but the difference wasn't statistically meaningful.

Bhargava *et al.* and Patel *et al.* reported

similarly — no significant gap in wound complications between single-dose and multidose regimens.[11,15]

Duration of Surgery Operative time averaged 26.9 ± 2.1 minutes in the single-dose group and 26.7 ± 2.5 minutes in the multidose group, with no significant difference between them ($p = 0.692$), pointing to the antibiotic regimen having little bearing on how long surgery takes. Islam *et al.* and Zafar *et al.* reported the same lack of difference in operative time between single- and multiple-dose groups.[12,13]

Length of Hospital Stay Patients in this study stayed an average of 3.14 ± 0.96 days (single-dose) and 3.10 ± 1.12 days (multidose), again with no significant difference ($p = 0.852$), and most were discharged within 2–4 days. Islam *et al.*, Zafar *et al.*, and Chaudhary et al. reported comparable hospital stays between the two regimens.[12-14] Bhargava *et al.* did note a slightly shorter stay with single-dose prophylaxis, though not one they considered clinically meaningful.[15]

Clinical Implications Taken together, these findings suggest a single preoperative antibiotic dose works just as well as the conventional multidose approach in preventing SSI after elective laparoscopic cholecystectomy. That supports the broader push toward antibiotic stewardship, less unnecessary antibiotic exposure, lower costs, and a smaller contribution to antimicrobial resistance. Sutariya *et al.*, Gupta *et al.*, Smith *et al.*, Ahmed *et al.*, and Zafar *et al.* have all drawn similar conclusions, recommending single-dose prophylaxis as a safe and effective strategy for uncomplicated laparoscopic cholecystectomy.[12,16-20] Overall, this study adds to a body of evidence showing that a single preoperative antibiotic dose does the job just as well as a full multidose course in preventing surgical site infection and other postoperative complications after elective laparoscopic cholecystectomy and supports cutting back on postoperative antibiotic use in uncomplicated cases without putting patient outcomes at risk.

Strengths and Limitations:

This study's strengths lie in its randomized design, equal allocation between groups, and prospective follow-up for postoperative complications. On the limitations side, it was conducted at a single centre, the sample size is relatively small, and high-risk patients were excluded. Microbiological culture and antibiotic resistance patterns were also not systematically assessed.

CONCLUSION

Single-dose preoperative antibiotic prophylaxis proved just as effective and safe as conventional multidose therapy in patients undergoing elective laparoscopic cholecystectomy, with no significant differences in surgical site infection, postoperative complications, operative duration, or hospital stay. These results back the rational use of a single preoperative antibiotic dose in uncomplicated elective laparoscopic cholecystectomy and reinforce the broader principles of antibiotic stewardship aimed at cutting down unnecessary antimicrobial exposure.

REFERENCES

1. Asad U, Wang CF, Jones MW. Laparoscopic cholecystectomy. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026.
2. Pak M, Lindseth G. Risk factors for cholelithiasis. Gastroenterol Nurs. 2016;39(4):297-309.
3. Mannam R, Sankara Narayanan R, Bansal A, Yanamaladoddi VR, Sarvepalli SS, Vemula SL, et al. Laparoscopic cholecystectomy versus open cholecystectomy in acute cholecystitis: a literature review. Cureus. 2023;15(9):e45704.
4. Prakash P, Jaiswal S, Choudhary S, Kumar B. Comparative outcomes of laparoscopic versus open cholecystectomy in an Indian tertiary center. Int J Acad Med Pharm. 2025;7(4): 156-159.
5. Rezaei AR, Zienkiewicz D, Rezaei AR. Surgical site infections: a comprehensive review. J Trauma Inj. 2025;38(2):71-81.
6. Kirkland KB, Briggs JP, Trivette SL, Wilkinson WE, Sexton DJ. The impact of surgical-site infections in the 1990s: attributable mortality, excess length of hospitalization, and extra costs. Infect Control Hosp Epidemiol. 1999;20(11):725-730.
7. Tahir MF, Mughal S, Nadeem A, Khan M, Hannat R, Amin MHJ. Reducing the burden of surgical site infections in low- and middle-income countries: challenges and recommendations. Ann Med Surg (Lond). 2025;87(8):5335-5337.

8. Eckmann C, Aghdassi SJS, Brinkmann A, Pletz M, Rademacher J. Perioperative antibiotic prophylaxis—indications and modalities for the prevention of postoperative wound infection. Dtsch Arztebl Int. 2024;121(7):233-242.
9. Crader MF, Varacallo MA. Preoperative antibiotic prophylaxis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026.
10. Garnier M, Saint-Genis Q, Roger C, Guilhaumou R, Leone M, Boisson M. Perioperative antimicrobial prophylaxis and surgical site infection prevention: what clinicians and researchers must know. Anaesth Crit Care Pain Med. 2025;44(6):101600.
11. Patel D, Tripathi S, Dey A, Mittal T, Malik VK. Efficacy of single-dose versus triple-dose perioperative antimicrobial prophylaxis in patients undergoing laparoscopic cholecystectomy. Curr Med Res Pract. 2024;14(3):111-116.
12. Zafar MA, Butt MQ, Ghani U, Azeem MT, Farooq MZ, Malik IF. Antibiotics in laparoscopic cholecystectomy: outcomes in single versus multiple dose prophylaxis in terms of surgical site infections. Pak Armed Forces Med J. 2024;74(6):1481-1485.
13. Islam M, Khan MMR, Anwar SM, Khan HA, Asifuddoula, Karim S. Single dose prophylactic versus multiple dose antibiotics for reducing surgical site infection in elective laparoscopic cholecystectomy. Chattagram Maa-O-Shishu Hosp Med Coll J. 2024;23(1):34-36.
14. Chaudhary R, Sharma S, Chaudhary S, Thakur S, Shukla A, Sharma M. A prospective study comparing single with multiple antibiotic prophylaxis dose in elective cholecystectomy. Ann Int Med Dent Res. 2015;1(1):29-33.
16. Bhargava S, Singh R, Banga P. To compare the effectiveness of a single dose of preventive antibiotic with the use of empirical postoperative antibiotics in preventing surgical site infection. Int J Life Sci Biotechnol Pharma Res. 2024;13(2):293-298.
17. Smith JP, Samra NS, Ballard DH, Moss JB, Griffen FD. Prophylactic antibiotics for elective laparoscopic cholecystectomy. Am Surg. 2018;84(4):576-580.
18. Ahmed NJ, Haseeb A, AlQarni A, AlGethamy M, Mahrous AJ, Alshehri AM, *et al*. Antibiotics for preventing infection at the surgical site: single dose versus multiple doses. Saudi Pharm J. 2023;31(12):101800.
19. Gupta KP, Singh DP. Efficacy of single dose versus multiple dose of pre-operative antibiotic: teaching hospital based study. Acad J Surg. 2020;3(2):25-29.
20. Sutariya PK, Thekdi PI. Single dose versus multiple dose prophylactic antibiotic in laparoscopic cholecystectomy: a comparative study. Int Surg J. 2016;3(6):2349-2353.
21. Naser SM, Banerjee A, De U, Mandal S, Mandal A. Single dose versus multiple dose prophylactic antibiotic to prevent early port-site infection in elective laparoscopic cholecystectomy. Int J Contemp Med Res. 2019;6(6):F28-F34.
22. Kumar S, Ranjan SK. A study to evaluate the efficacy of single dose versus multiple dose of pre-operative antibiotic. Academia Journal of Surgery. 2019;2(2):30-34.