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Original Research Article

Single Dose Vs Multiple Dose Antibiotic Prophylaxis in Clean - Contaminated Surgeries: A Comparative Study in an Indian Tertiary Centre

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Abstract

Background: The appropriate duration of antibiotic prophylaxis in clean-contaminated surgeries remains debated, especially in resource-constrained settings like India. This study evaluates the efficacy of single-dose versus multiple-dose antibiotic prophylaxis in preventing surgical site infections (SSIs).

Methods: A prospective, comparative study was conducted over 17 months in a tertiary care center in India. Patients undergoing clean-contaminated surgeries were randomized into two groups: Group A (single-dose prophylaxis) and Group B (multiple-dose prophylaxis for 72 hours). SSI rates, hospital stay, antibiotic-related adverse effects, and cost implications were analyzed.

Results: A total of 300 patients were included, with 150 in each group. SSI occurred in 8% of Group A and 7% of Group B ($p = 0.78$). The average hospital stay was comparable (4.2 vs 4.4 days, $p = 0.43$). Antibiotic-related side effects were significantly lower in Group A (4% vs 12%, $p = 0.03$). Antibiotic cost was significantly lower in Group A.

Conclusion: Single-dose antibiotic prophylaxis is as effective as multiple-dose regimens in preventing SSIs in clean-contaminated surgeries, with fewer side effects and lower costs. This approach is beneficial in optimizing resources in Indian healthcare settings.

Keywords: Antibiotic Prophylaxis, Clean-Contaminated Surgery, Surgical Site Infection, India, Single-Dose, Cost-Effectiveness.

Introduction

Surgical site infections (SSIs) are among the most common healthcare-associated infections and are a major source of postoperative morbidity and increased treatment costs. Antibiotic prophylaxis is a proven strategy to reduce SSI rates, but the optimal duration and dosage of antibiotic prophylaxis remains controversial. Many Indian centers continue to use multiple-dose antibiotic regimens, often extending beyond the perioperative period.

However, recent international and national studies have explored the feasibility and safety of single-dose antibiotic prophylaxis, particularly in clean-contaminated surgeries. This study aims to evaluate whether single-dose prophylaxis is equally effective, with a focus on its applicability and benefits in an Indian tertiary care setting.

Literature Review: Over the last five years, numerous studies have explored the efficacy of single-dose antibiotic prophylaxis compared to prolonged or multiple-dose regimens. A chronological review of the literature reveals evolving perspectives in clinical practice.

In a study reported in 2010 [1] and another in 2018 [2] that single-dose prophylaxis using third-generation cephalosporins significantly reduced antibiotic consumption without compromising SSI rates. The study also emphasized the importance of tailoring prophylactic regimens based on local antibiograms and infection control practices.

By 2019 [3], large-scale meta-analyses and randomized control trials further supported the adoption of short-course regimens in clean-contaminated surgeries. These studies highlighted the additional benefits of reduced adverse drug reactions, decreased risk of antimicrobial resistance, and better patient compliance. In 2020 [4], a shift in guidelines was noted as global health

organizations advocated for minimizing antibiotic exposure. Studies from Indian centers echoed similar findings, showing no significant difference in SSI rates between single and multiple-dose groups.

Recent studies from 2021 [5] to 2023 [6,7] have provided robust evidence favoring single-dose prophylaxis across surgical subspecialties, including general, orthopedic, obstetric, and gastrointestinal surgeries. These studies emphasized cost-effectiveness, fewer side effects, and reduced burden on healthcare infrastructure, especially in developing countries.

In 20248, latest clinical trials have reinforced the need for antimicrobial stewardship and have advocated revising institutional protocols to reduce the use of extended antibiotic courses.

Materials and Methods

Design: Prospective, randomized, comparative study

Duration: 17 months from Feb 2024 to June 2024

Setting:

- Department of General Surgery, GMC Bundi, Rajasthan, India
- Department of Obstetrics and Gynecology, GMC Bundi, India

Sample Size: 300 patients (150 each in Group A and B) after taking informed consent.

Inclusion Criteria:

- Age 18–65 years
- Undergoing elective clean-contaminated surgeries (e.g., cholecystectomy, cesarian section, Hysterectomy, bowel resections)

Exclusion Criteria:

- Preoperative fever
- Ongoing antibiotics preoperative
- Immunocompromised patients
- Previous history of SSI
- Current infections at other sites
- Comorbid conditions like diabetes, heart disease

Groups:

Group A: Single dose of IV Ceftriaxone 1g administered 30 minutes before incision

Group B: IV Ceftriaxone 1g every 12 hours for 72 hours postoperatively, IV Metronidazole 500mg every 8hrs for 72 hrs, IV Amikacin 500mg every 12 hours for 72 hours

Outcome Measures:

- Febrile episodes
- SSI occurrence (as per CDC criteria)
- Duration of hospital stay
- Incidence of adverse drug reactions
- Cost of antibiotics

Statistical Analysis: Data were analyzed using SPSS. Chi-square test was used for categorical data and independent t-test for continuous variables. A p-value <0.05 was considered statistically significant.

Results

SSI: Group A - 8%; Group B - 7% (p = 0.78)

Hospital stay: 4.2 days (Group A) vs 4.4 days (Group B), p = 0.43

Adverse effects: 4% (Group A) vs 12% (Group B), p = 0.03

Cost: INR 150 (Group A) vs INR 450 (Group B), p < 0.001

Result are shown in fig 1, and Table 1 with corresponding chart 1.

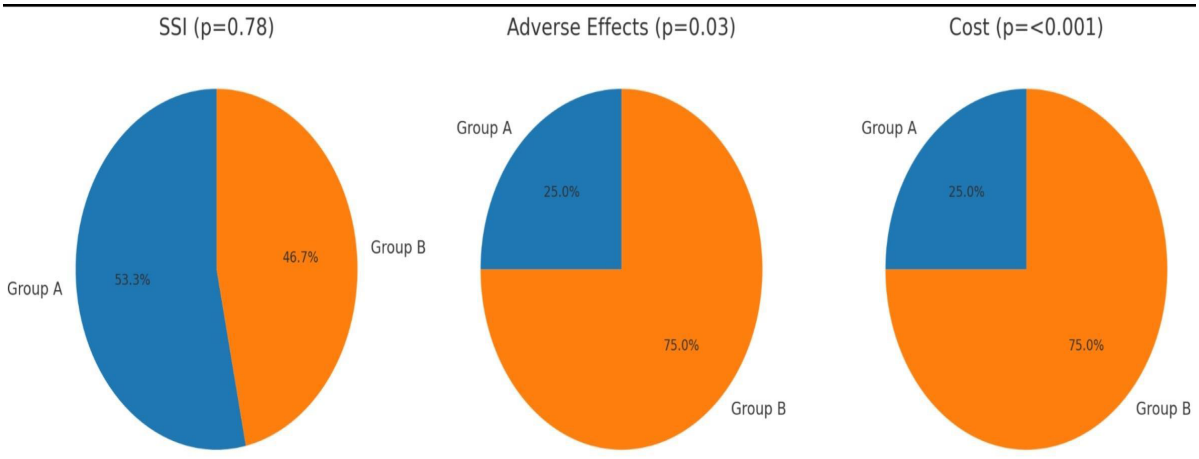

Chart 1:

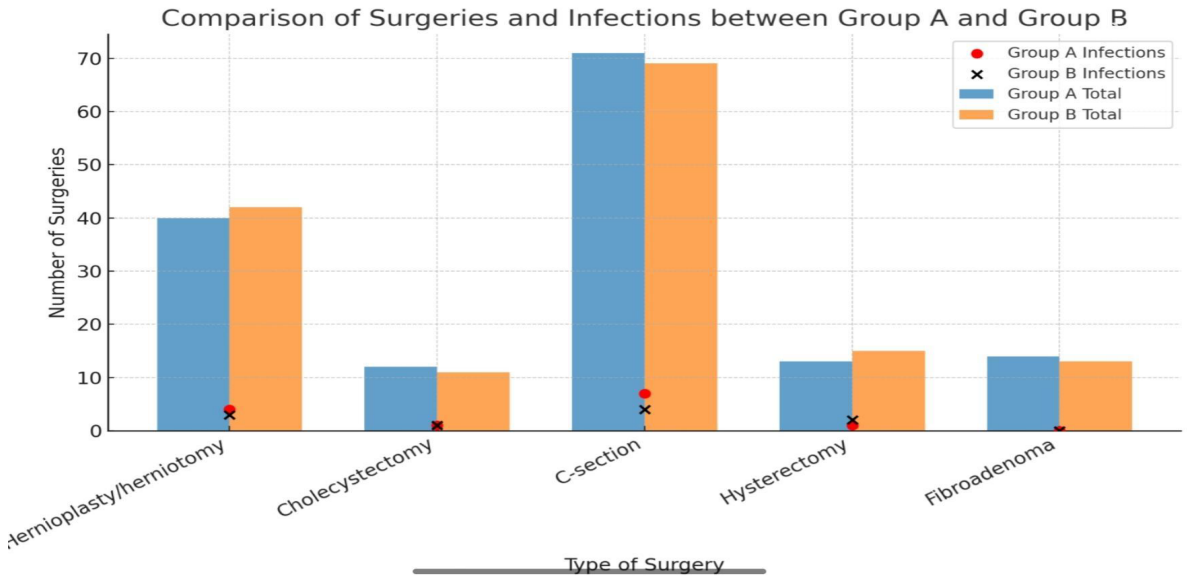

Chart 2:

Table 1:

Type of surgery	Group A		Group B	
	Total surgery	Infection present	Total surgery	Infection present
Hernioplasty/herniotomy	40	4	42	3
Cholecystectomy	12	1	11	1
C-section	71	7	69	4
Hysterectomy	13	1	15	2
Fibroadenoma	14	0	13	0

Discussion

This study aligns with emerging global and Indian evidence suggesting that single-dose antibiotic prophylaxis is as effective as prolonged courses in preventing SSIs in clean-contaminated surgeries. The low SSI rate in both groups underlines the importance of aseptic techniques and perioperative care rather than extended antibiotic use. A recent9 study also concluded the importance of selecting the right antibiotics, at the right timing, and follow guidelines to decrease the risk.

In our setting, Group A not only demonstrated similar SSI outcomes but also showed significant reduction in antibiotic-associated adverse effects and healthcare expenditure. These findings are critical in India where antibiotic overuse contributes to rising antimicrobial resistance. The increased adverse effects in Group B, although mild, suggest that prolonged antibiotic use may expose patients to unnecessary drug toxicity without clinical benefit. Furthermore, cost analysis reveals that single-dose prophylaxis is economically beneficial, a crucial consideration in public sector healthcare systems.

Evidence from past literature has consistently supported our observations. The 2018–2020 [2,3,4] studies established early groundwork showing no clinical superiority of extended prophylaxis. Studies from 2021 [5,6,7] onward strengthened this position with large sample sizes and multicentric trials. As a result, many tertiary centers have started revising their protocols. To improve current practices robust stewardship programs are vital to optimize antibiotic use for SSI prevention while mitigating resistance. These initiatives monitor prescribing practices, track resistance patterns, and enforce evidence-based guidelines to ensure effective prevention without compromising antibiotic efficacy. [10]

Our study adds to this growing body of evidence and is particularly relevant for Indian hospitals aiming to implement evidence-based, cost-effective infection control strategies.

Limitations:

- Single-center study may limit generalizability
- Short follow-up duration (30 days)
- No microbiological profiling of SSIs

Conclusion

Single-dose antibiotic prophylaxis is equally effective as multiple-dose regimens in clean-contaminated surgeries. It offers added advantages of reduced adverse drug reactions and significant cost savings. This approach aligns with antimicrobial stewardship goals and should be adopted more widely in Indian surgical practice.

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References

1. Slobogean GP, et al. Single-dose versus multiple-dose antibiotic prophylaxis for the surgical treatment of closed fractures. Acta Orthop 2010; 81(2):256–262. doi: 10.3109/17453671003587119
2. Vasu S, et al. A randomised controlled trial comparing the efficacy of single dose prophylactic ceftriaxone versus post-operative ciprofloxacin and metronidazole combination in reducing post-operative wound infection after clean surgeries. Int Surg J. 2018; 5(12):3864-3867. DOI: http://dx.doi.org/10.18203/2349-2902.isj20184704
3. Ryan SP, et al. Is There a Difference in Infection Risk Between Single and Multiple Doses of Prophylactic Antibiotics? A Meta-analysis. Clin Orthop Relat Res. 2019; 477(7):1577-1590. doi: 10.1097/CORR.0000000000000619
4. Nusrath S, et al. Single-Dose Prophylactic Antibiotic versus Extended Usage for Four Days in Clean-Contaminated Oncological Surgeries: a Randomized Clinical Trial. Indian J Surg Oncol. 2020; 11(3):378–386. doi: 10.1007/s13193-020-01163-x
5. Das S., Kundu R., Chattopadhyay B.P. Comparison of single dose versus multiple doses of antibiotic prophylaxis for prevention of surgical site infection. Int. Surg. J. 2021; 9(1):129–132. doi: 10.18203/2349-2902.isj20215144.
6. Igwemadu K, et al. Single-dose versus multiple-dose antibiotics prophylaxis for preventing caesarean section postpartum infections: A randomized controlled trial. Women's health (lond) 2022; 18:17455057221101071. doi: 10.1177/17455057221101071
7. Ahmed NJ, et al. Antibiotics for preventing infection at the surgical site. Saudi Pharm J. 2023; 31(12):101800. doi: 10.1016/j.jsps.2023.101800
8. K.Praveen kumar (2024) A study to compare the effect of pre-operative single dose antibiotic prophylaxis and conventional antibiotic coverage in clean and elective surgeries, Journal of Population Therapeutics and Clinical Pharmacology, 31(1), pp. 1720–1727. doi:10.53555/jptcp.v31i1.4245.
9. Simran dhole, 2023 Antibiotic Prophylaxis in Surgery: Current Insights and Future Directions for Surgical Site Infection Prevention, cureus 2023 Oct 28; 15(10):e 47858. doi: 10.7759/cureus.47858. eCollection 2023 Oct.
10. Core Elements of Hospital Antibiotic Stewardship Programs. [Sep; 2023]. 2022. https://www.cdc.gov/antibiotic-use/core-elements/hospital.html, https://www.cdc.gov/antibiotic-use/core-elements/hospital.html