Section: General Surgery

Original Research Article

EVALUATION OF ADHERANCE TO GUIDELINES IN ANTIBIOTIC PROPHYLAXIS USE IN ELECTIVE SURGERIES

Charuhasini J[1], Karthick P[2]

[1]Post Graduate, Department of General Surgery, Trichy SRM Medical College and Research Centre, Irungalur, Trichy, Tamil Nadu, India
[2]Professor and Head, Department of General Surgery, Trichy SRM Medical College and Research Centre, Irungalur, Trichy, Tamil Nadu, India

Received : 04/01/2024
Received in revised form : 04/03/2024
Accepted : 20/03/2024

Keywords:
Surgical site infections, Antibiotic prophylaxis, Adherence, General surgeons.

Corresponding Author:
Dr. P. Karthick,
Email: charu3777@gmail.com

DOI: 10.47009/jamp.2024.6.2.223

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2024; 6 (2); 1108-1112

Abstract

Background: Surgical site infections (SSI) pose a significant burden on healthcare systems globally, leading to prolonged hospital stays, increased healthcare costs, and elevated morbidity and mortality rates. Antibiotic prophylaxis plays a pivotal role in preventing SSI by reducing bacterial loads at surgical sites. Despite established guidelines, challenges persist in implementing effective antimicrobial prophylaxis, prompting the need for evaluation and intervention. This study aims to assess the adherence of general surgeons in South India to antimicrobial guidelines regarding surgical prophylaxis. The study seeks to evaluate antibiotic selection, duration, and dosage in diverse surgical conditions, shedding light on adherence patterns and identifying areas for improvement. **Materials and Methods:** A cross-sectional study was conducted in the General Surgery department of a tertiary care hospital in South India. Approval was obtained from the Institutional Ethical Committee. A structured proforma based on hospital and ICMR guidelines was utilized. Patients undergoing elective surgeries were included, while those with specific criteria were excluded. Data analysis focused on antibiotic selection, duration, and adherence to guidelines. **Result:** The study included 126 patients undergoing various surgeries, with different wound classifications. Cefuroxime and Cefazolin were the most commonly used antibiotics, with varying durations of administration. Adherence to antibiotic policies was high for certain surgeries, including breast and thyroid surgeries, but lower for procedures such as varicose vein surgery and appendectomy. Human factors and lack of awareness regarding updated guidelines were identified as challenges to adherence. **Conclusion:** Despite established guidelines, adherence to antimicrobial prophylaxis in surgery varies, highlighting the need for targeted interventions. Our study underscores the importance of continuous education and awareness initiatives to bridge the gap between guidelines and clinical practice. Efforts to improve adherence to antibiotic policies can significantly mitigate the incidence of SSI and improve patient outcomes in surgical settings.

INTRODUCTION

Surgical site infections (SSI) represent the most prevalent nosocomial infections among surgical patients, affecting approximately 15-20% of individuals undergoing surgery globally.[1–4] These infections contribute to prolonged hospital stays, increased rates of rehospitalization, elevated healthcare costs, and heightened morbidity and mortality.[4–8] The primary objective of antibiotic prophylaxis is to mitigate the incidence of SSI by preventing infections originating from organisms colonizing or contaminating the surgical site. The focal point of antibiotic prophylaxis is the surgical wound, where antibiotics are administered to diminish bacterial loads, preventing them from overwhelming the natural host defences and causing infection. Proper perioperative antibiotic prophylaxis usage has the potential to decrease SSI rates by up to 50%.[1,2]

The fundamental principle of antimicrobial prophylaxis in surgery is to attain adequate serum and tissue drug levels that surpass the minimum inhibitory concentrations (MICs) for organisms likely to be encountered during the operation. The choice of an appropriate antimicrobial agent depends on identifying the most probable pathogens associated with a specific surgical procedure.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Optimal timing of antibiotic prophylaxis is considered to be between 30 and 60 minutes before incision. For most surgical operations, a single dose of an antimicrobial agent is deemed sufficient. Prolonged use of prophylactic antimicrobials is linked to the emergence of resistant bacterial strains.[2]

In 2019, the Indian Council of Medical Research introduced an antibiotic policy,[7] to guide physicians and surgeons in managing various medical conditions based on prevailing organisms and sensitivity patterns. These guidelines aim to provide professionals with a standardized, evidence-based approach to the rational, safe, and effective use of antimicrobial agents for preventing SSI. Despite the clear establishment of principles for antimicrobial prophylaxis in surgery and the publication of several guidelines, implementation has been hindered by various factors. Challenges include professionals' difficulty in updating their knowledge, reliance on clinical practices rather than evidence, the absence of policies, and lapses in implementing institutional guidelines and norms.[1,2]

As a response to these challenges, this study was conceived to evaluate the adherence of general surgeons in south India to antimicrobial agent guidelines concerning key aspects of surgical prophylaxis.

MATERIALS AND METHODS

This cross-sectional study took place within the General Surgery department of a tertiary care hospital in South India during the months of August and September 2022. Prior to commencement, the study received approval from the Institutional Ethical Committee. A meticulously designed structured proforma, aligning with the annual antibiotic prophylaxis policy crafted by our hospital's Antimicrobial Stewardship Committee in accordance with ICMR guidelines, was employed. This proforma also considered local prevalent organisms and antibiogram data. Sample size was calculated from a study done by Gaikwad et al in Pune, where 87.3% were adherent to standard guidelines using the formula $4PQ/L^2$ as 114. Hemodynamically stable patients posted for elective surgeries were included in the study. Patients posted for emergency surgeries, patients on previous antibiotic prophylaxis before elective surgical procedure, Immunocompromised patients and those on immunocompromised therapy, patients on own antibiotic prophylaxis and patients with known respiratory and cardiac comorbidities were excluded from the study. Sample size was calculated as 112 participants from the study done by G,[1] ouvea et al, where the mean antibiotic adherence was 87.5% . Subsituting them in the formula $4PQ/L^{2,}$ at a relative precision of 7%.

The investigation focused on documenting the antibiotic selection, duration, and dosage for diverse surgical conditions performed in the department. A thorough review of the case sheets from surgeries conducted between August and September 2022 was conducted to assess the adherence to the antibiotic policy. The findings were meticulously recorded in an Excel spreadsheet and presented in tabular form, showcasing frequencies and percentages for comprehensive analysis.

RESULTS

The study encompassed 126 patients who underwent surgery within the General Surgery department. Almost half of the participants (49.21%) fell into the class I category, denoting Clean Surgical Wounds, while another 45.24% were classified as class II to class IV, encompassing Clean Contaminated, Contaminated, and Dirty surgical wounds. A notable 17.46% of the surgeries involved Inguinal Hernia repair, and 15.08% involved Breast Surgery [Table 1].

Regarding antibiotic administration, 23.81% of study participants received Cefuroxime, while 21.43% were administered Cefazolin. In combination, Cefuroxime and Cefazolin constituted 45.24% of the antimicrobials used in the study population. Additionally, 11.11% of participants received Ceftriaxone [Table 2].

Examining the duration of antibiotic usage, 45.24% of the study population received one or two doses, 17.46% were administered antibiotics for 2-3 days, and 30.95% received antibiotics for 4-5 days [Figure 1].

An evaluation of adherence to the antibiotic policy revealed exemplary compliance for Breast, Liver, and Small Intestine surgeries. Adherence exceeded 90% for Inguinal Hernia surgery, Thyroid surgery, and Fissure and Fistula surgery. It hovered around 85% for Umbilical Hernia, Cholecystectomy (both open and laparoscopic), Gastric and Pancreatic surgeries. However, adherence was below 80% for Varicose Vein surgery, Splenectomy, Colorectal surgery, and Appendectomy [Table 3].

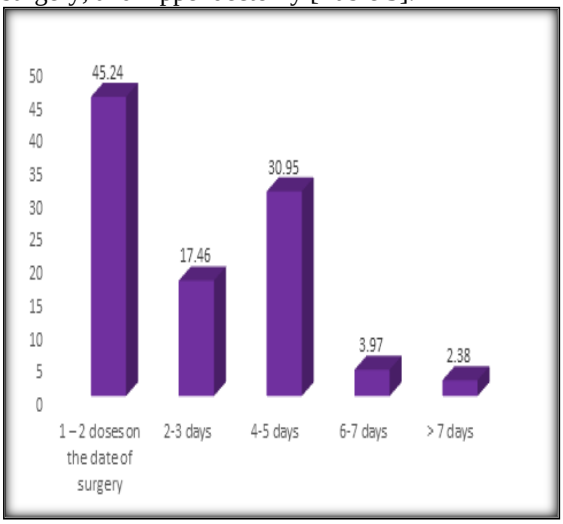

Figure 1: Distribution of study population according to duration of antibiotic prophylaxis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Table 1: Description of preoperative and postoperative data in the study population

Type of surgery	N	%
Class I		
Inguinal hernia repair	22	17.46
Umblical hernia repair	6	4.76
Breast surgery	19	15.08
Thyroid surgery	12	9.52
Varicose vein	3	2.38
Class II – class IV		
Splenectomy	1	0.79
Open cholecystectomy	6	4.76
Laparscopic cholecystectomy	7	5.56
Gastric surgery	12	9.52
Pancreatic surgery	6	4.76
Colorectal surgery	2	1.59
Appendectomy	9	7.14
Liver surgery	1	0.79
Small intestine surgery	2	1.59
Fissure and Fistula	11	8.73
others	7	5.56
Total	126	100

Table 2: Distribution of study population according to Antimicrobials used in surgery

Antimicrobial	N	%
Ceftrixoane	14	11.11
Ampicillin/sulbactum	8	6.35
cefuroxime	30	23.81
cefazolin	27	21.43
Clindamycin	12	9.52
Vancomycin	12	9.52
Cefuroxime + Metronidazole	2	1.59
Aminoglycoside + Metronidazole	2	1.59
Fluroquinolone + Metronidazole	1	0.79
Cefazolin + metronidazole	1	0.79
Ceftriaxone + metronidazole,	11	8.73
Clindamycin + aminoglycoside	6	4.76
Total	126	100

Table 3: Distribution of study population according to adherence to antibiotic policy

Type	N		%
Inguinal hernia repair	22	20	90.91
Umbilical hernia repair	6	5	83.33
Breast surgery	19	19	100.00
Thyroid surgery	12	11	91.67
Varicose vein	3	2	66.67
Splenectomy	1	0	0.00
Open cholecystectomy	6	5	83.33
Laparscopic cholecystectomy	7	6	85.71
Gastric surgery	12	10	83.33
Pancreatic surgery	6	5	83.33
Colorectal surgery	2	1	50.00
Appendectomy	9	7	77.78
Liver surgery	1	1	100.00
Small intestine surgery	2	2	100.00
Fissure and Fistula	11	10	90.91
others	7	6	85.71
Overall	126	110	87.30

DISCUSSION

Antibiotic prophylaxis is designed to minimize the occurrence of Surgical Site Infections (SSI). The goal is to maintain a sufficient concentration of an appropriate antimicrobial agent in the bloodstream, tissues, and surgical wound throughout the entire duration when the incision is open and susceptible to bacterial contamination. The choice and duration of antibiotic prophylaxis should be selected to minimize any adverse effects on the patient's microbiota.[9]

Recognizing human factors as a significant contributor to the non-compliance with prophylaxis protocols is crucial. Physicians have traditionally adhered to their individual guidelines, often influenced by outdated training practices. Despite regular revisions of guidelines, there is a noticeable lack of awareness among doctors regarding these updated versions. Effectively disseminating evidence-based knowledge into clinical practice poses a challenge.[2]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

In our study, a total of 126 patients who underwent surgery in the Department of General Surgery were enrolled as study participants. The distribution of participants across wound classes revealed that nearly half, specifically 49.21%, fell into the category of class I, representing Clean Surgical Wounds. The remaining 50.79% were distributed across class II to class IV, encompassing Clean Contaminated, Contaminated, and Dirty wounds. Specifically, 17.46% of the participants underwent Inguinal Hernia repair, while 15.08% underwent Breast Surgery, as indicated in [Table 1]. These findings resonate with observations made in studies conducted in various regions globally, providing a consistent pattern across different populations.[2,3,5,9]

This distribution of surgical cases is essential for contextualizing the study and understanding the diversity of procedures undertaken within the Department of General Surgery. The representation of different wound classes and surgical interventions contributes to the generalizability of the study's findings and allows for comparisons with similar investigations conducted in various geographic locations. By acknowledging the similarities in patient demographics and surgical procedures with studies from other parts of the globe,[2,3,5,8,9] our study strengthens its foundation and potentially supports the broader applicability of its results.

The findings of the study on antibiotic usage during surgery reveal interesting patterns, reflecting a noteworthy adherence to ICMR guidelines. In this investigation, 23.81% of participants received cefuroxime, and 21.43% were administered cefazolin. Notably, the combined use of cefuroxime and cefazolin accounted for 45.24% of the antimicrobials, indicating a substantial proportion of adherence to recommended antibiotics. [Table 2] The study also sheds light on the duration of antibiotic administration. A significant 45.24% of participants received antibiotics for one or two doses, suggesting a cautious approach in minimizing unnecessary antibiotic exposure. Furthermore, 17.46% were given antibiotics for 2-3 days, and 30.95% received antibiotics for 4-5 days. This distribution aligns with the goal of optimizing antibiotic use while ensuring adequate coverage during the critical postoperative period. Comparative analysis indicates that 91.3% of participants in the class I category who needed one or two doses of cefuroxime or cefazolin received, a proportion considered fair in comparison to other studies. This observation is encouraging, as these antibiotics are recommended by ICMR guidelines for surgical prophylaxis.[7] The study's focus on these specific antibiotics demonstrates a commendable alignment with evidence-based practices.

Moreover, the duration of antibiotic therapy in this study appears balanced, with a substantial percentage receiving antibiotics for a short duration (one or two doses). This contrasts positively with other studies.[10,11] reflecting a prudent and guideline-concordant approach to antibiotic administration during surgery.

The antibiotic adherence across different surgical procedures in our study exhibits a varied pattern, reflecting a nuanced implementation of antibiotic policies. Notably, breast, liver, and small intestine surgeries demonstrated impeccable adherence to the antibiotic policy, with rates exceeding 90%. Similarly, inguinal hernia surgery, thyroid surgery, and procedures for fissure and fistula displayed commendable adherence, surpassing the 90% threshold. For umbilical hernia, cholecystectomy (open and laparoscopic), gastric, and pancreatic surgeries, the adherence rates were approximately 85%, indicating a generally positive compliance.

However, a moderate level of adherence, around 85%, was noted for certain procedures like umbilical hernia, cholecystectomy (open and laparoscopic), gastric, and pancreatic surgeries. While this level of adherence is satisfactory, it suggests room for improvement, possibly through targeted interventions and education to enhance compliance.

The antibiotic policy adherence dipped below 80% for varicose vein surgery, splenectomy, colorectal surgery, and appendectomy. These lower adherence rates may warrant further investigation into the reasons behind suboptimal compliance, allowing for tailored strategies to address specific challenges in these surgical contexts.

Overall, the study reports a commendable 87.30% adherence to the antibiotic policy. This result aligns with findings from Gul et al,[12] in Malaysia (87%), Castella et al,[13] and Pitallis et al,[11] in Italy (84%), and Malavud et al,[14] in France (91.9%). The consistency with international studies reflects a global trend in antibiotic policy adherence, emphasizing the need for standardized practices across diverse healthcare settings.

Conversely, poor adherence rates were observed in studies conducted by Napolitana et al,[15] in Italy (25.5%), Mahdaviazad et al,[16] in Iran, and Khan et al,[6] in Pakistan (9.5%). These discrepancies underscore the importance of understanding and addressing regional variations and contextual factors influencing antibiotic prescribing practices.

It's noteworthy that the study's adherence rate of 87.30% contrasts with the low adherence reported by Musmar et al,[17] in Palestine (2%) and a recent study from the United States of America (60%) by cabral et al,[18] These variations may be attributed to differences in healthcare systems, cultural practices, and local antibiotic use policies.

CONCLUSION

Although the principles of antimicrobial prophylaxis in surgery are clearly established and guidelines for various conditions have been published, the implementation of these guidelines is not in accordance in many instances. Our study provides a comprehensive analysis of antibiotic prophylaxis

ISSN (O): 2687-5365; ISSN (P): 2753-6556

adherence, shedding light on critical aspects of surgical practices and antibiotic usage. The overarching goal of antibiotic prophylaxis, aimed at minimizing Surgical Site Infections (SSI), was well-recognized in our findings. Our results underscored the impact of human factors on non-compliance with prophylaxis protocols, revealing traditional adherence patterns influenced by outdated training practices. The challenge of disseminating evidence-based knowledge into clinical practice, as evidenced by the lack of awareness regarding updated guidelines among physicians, emphasizes the ongoing need for effective educational strategies in healthcare settings.

REFERENCES

1. Gouvêa M, Novaes C de O, Pereira DMT, Iglesias AC. Adherence to guidelines for surgical antibiotic prophylaxis: a review. The Brazilian Journal of Infectious Diseases. 2015 Sep;19(5):517–24.
2. Tourmousoglou CE, Yiannakopoulou ECh, Kalapothaki V, Bramis J, Papadopoulos J St. Adherence to guidelines for antibiotic prophylaxis in general surgery: a critical appraisal. Journal of Antimicrobial Chemotherapy. 2007 Nov 22;61(1):214–8.
3. Sohil Ahmed Khan, Padma G. M. Rao, Anand Rao, Gabriel Rodrigues. y and evaluation of antibiotic Survey and evaluation of antibiotic prophylaxis usage in surgery wards of prophylaxis usage in surgery wards of prophylaxis usage in surgery wards of tertiary level institution before and after tertiary level institution before and after tertiary level institution before and after the implementation of clinical guidelines the implementation of clinical guidelines. Indian J Surg. 2006;68(3):150–6.
4. Ng RS. surgeon's adherence to guidelines for surgical antimicrobial prophyllaxis- a review. Australasian Medical Journal. 2012 Nov 1;5(10):534–40.
5. Abdel-Aziz A, El-Menyar A, Al-Thani H, Zarour A, Parchani A, Asim M, et al. Adherence of Surgeons to Antimicrobial Prophylaxis Guidelines in a Tertiary General Hospital in a Rapidly Developing Country. Adv Pharmacol Sci. 2013;2013:1–6.
6. Khan Z, Ahmed N, Zafar S, ur Rehman A, Khan FU, Saqlain M, et al. Audit of antibiotic prophylaxis and adherence of surgeons to standard guidelines in common abdominal surgical procedures. Eastern Mediterranean Health Journal. 2020 Sep 1;26(9):1052–61.
7. Indian Council of Medical Research. Treatment Guidelines for Antimicrobial Use in Common Syndromes. Indian Council of Medical Research. 2019;0(0).
8. Vazin A, Hatami-Mazinani N, Alemzadeh E, Dehghani F, Mahi-Birjand M. Compliance with Antibiotics Prophylaxis Guideline in Surgical Patients in ICUs of a Teaching Referral Hospital. Health Serv Insights. 2022 Jan 11;15:117863292211364.
9. Wright JD, Hassan K, Ananth C V., Herzog TJ, Lewin SN, Burke WM, et al. Use of Guideline-Based Antibiotic Prophylaxis in Women Undergoing Gynecologic Surgery. Obstetrics & Gynecology. 2013 Dec;122(6):1145–53.
10. Stone PW, Braccia D, Larson E. Systematic review of economic analyses of health care-associated infections. Am J Infect Control. 2005 Nov;33(9):501–9.
11. Pittalis S, Ferraro F, Piselli P, Ruscitti LE, Grilli E, Lanini S, et al. Appropriateness of Surgical Antimicrobial Prophylaxis in the Latium Region of Italy, 2008: A Multicenter Study. Surg Infect (Larchmt). 2013 Aug;14(4):381–4.
12. Gul YA, Hong LC, Prasannan S. Appropriate antibiotic administration in elective surgical procedures: still missing the message. Asian J Surg. 2005 Apr;28(2):104–8.
13. Castella A, Charrier L, Legami V Di, Pastorino F, Farina EC, Argentero PA, et al. Surgical Site Infection Surveillance Analysis of Adherence to Recommendations for Routine Infection Control Practices. Infect Control Hosp Epidemiol. 2006 Aug 21;27(8):835–40.
14. Malavaud S, Bonnet E, Atallah F, El Farsaoui R, Roze J, Mazerolles M, et al. Évaluation des pratiques professionnelles : audit portant sur l'antibioprophylaxie en urologie. Progrès en Urologie. 2008 Jun;18(6):395–401.
15. Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF. Evaluation of the Appropriate Perioperative Antibiotic Prophylaxis in Italy. PLoS One. 2013 Nov 13;8(11):e79532.
16. Mahdaviazad H, Masoompour SM, Askarian M. Iranian surgeons' compliance with the American Society of Health-System Pharmacists guidelines: Antibiotic prophylaxis in private versus teaching hospitals in Shiraz, Iran. J Infect Public Health. 2011 Nov;4(5–6):253–9.
17. Musmar SM, Ba`ba H, Owais A. Adherence to guidelines of antibiotic prophylactic use in surgery: a prospective cohort study in North West Bank, Palestine. BMC Surg. 2014 Dec 9;14(1):69.
18. Cabral SM, Harris AD, Cosgrove SE, Magder LS, Tamma PD, Goodman KE. Adherence to Antimicrobial Prophylaxis Guidelines for Elective Surgeries Across 825 US Hospitals, 2019–2020. Clinical Infectious Diseases. 2023 Jun 16;76(12):2106–15..

ISSN (O): 2687-5365; ISSN (P): 2753-6556