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Research Article

Evaluating Prophylactic measures for the prevention of Surgical site infection. A Multicentric Study

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ABSTRACT

Background: Surgical site infection (SSI) is still a leading cause of postoperative morbidity, prolonging hospital stay and healthcare expenditure. Although evidence-based guidelines are available, prophylactic practices remain inconsistent between centers and specialties.

Methods: A prospective multicentric observational study was conducted over twelve months in three tertiary care hospitals. A total of 620 patients undergoing elective and emergency surgeries across general, orthopedic, neurosurgical, and colorectal specialties were included. Data were collected on antibiotic prophylaxis, skin preparation, hair removal, and preoperative bowel preparation where applicable. Compliance with World Health Organization (WHO) and Centers for Disease Control and Prevention (CDC) guidelines was evaluated.

Results: Of 620 patients, 94.3% were treated with perioperative antibiotics, of which 71.8% were given within 60 minutes of incision. Yet 28.2% received delayed administration, and 18.8% had antibiotics for more than 48 hours. Chlorhexidine-alcohol was utilized in 75.8% for skin preparation, and 24.2% had povidone-iodine. Hair removal was achieved in 45.2% of the procedures, mostly by clippers (68.5%). Overall incidence of SSI was 9.3%, which was highest among colorectal (14.4%) and neurosurgical (10%) procedures. Non-compliance with prophylactic practices recommended was strongly linked with increased SSI incidence ($p < 0.05$).

Conclusion: The present study emphasizes remarkable variability in the follow-up of SSI prevention practices, especially antibiotic timing and skin preparation procedures. Specific interventions like education, routine audits, and strict institutional policies are crucial to increase compliance and decrease SSI rates among surgical specialties.

Keywords: Surgical site infection, Antibiotic prophylaxis, Infection control, Multicentric study, Perioperative care, Preventive measures

I. INTRODUCTION

Surgical site infection (SSI) remains the most frequent postoperative problem, significantly contributing to patient morbidity, length of hospital stay, and healthcare costs [1]. Improved perioperative care and aseptic practice

aside, SSI prevention continues to elude us due to inconsistency in adherence with evidence-based guidelines and organisational policies [2,3].

Prophylactic measures have been proposed, including appropriate perioperative antibiotic administration, optimal timing and dose, meticulous surgical site preparation, and adherence to antiseptic practice [1,4]. Despite this, departures from guidelines continue to the present day, as demonstrated by surveys of different surgical specialties and nations [3,5–7]. These divergences recognize the need for structured evaluation of current prophylactic practice in real-life, multicenter settings.

Prior research has emphasized the significance of perioperative antibiotic prophylaxis in reducing SSIs, although variation exists in prescribing regimens, duration of treatment, and compliance with in-house protocols [2,5,6]. Similarly, practices such as preoperative bowel preparation for colorectal surgery and compliance with skin antiseptic guidelines remain contentious points requiring up-to-date consensus [4,7]. Also, cross-national comparisons have shown that sociocultural and resource determinants may influence adherence to SSI prevention protocols, further warranting multicentric evaluations [8].

Keeping such issues in view, the current study has tried to evaluate prophylactic regimens employed for SSI prevention in more than one center with a goal of deciding on areas of breakdown in practice, adherence to present guidelines, and providing evidence towards streamlining uniform preventive strategies.

II. METHODS

Study Design and Setting

The study was planned as a prospective, observational, multicentric study over twelve months in tertiary care hospitals. Hospitals were chosen based on surgical volume and the presence of infection control policies. Institutional ethical standards were followed by all hospitals, and the study was approved by the appropriate ethics committees before the study was started.

Study Population

The research involved adult patients who were subjected to elective and emergency procedures in the general surgery, orthopedics, neurosurgery, and colorectal departments. Patients with systemic infections prior to surgery or those on antibiotics for other reasons before surgery were excluded to reduce confounding effects. X patients were recruited after informed consent.

Data Collection

Data were collected using a standardized proforma developed by the study investigators. Information was obtained regarding demographic characteristics, comorbidities, surgical procedure type, wound classification, and perioperative care. Specific focus was placed on prophylactic measures employed, including timing, choice, and duration of antibiotic administration, methods of skin preparation, hair removal techniques, and use of preoperative bowel preparation where applicable.

Assessment of Prophylactic Measures

Prophylaxis practices were compared with internationally accepted standards, such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC). The compliance was determined by comparing the actual practice with the suggested standard. Deviations in adherence between centers and surgical specialties were observed to detect areas of drift.

Outcome Measures
The main outcome variable was prophylactic protocol adherence for SSI prevention. Secondary outcomes were incidence of SSI at 30 days postoperatively, length of hospital stay, and readmission because of infection. Inpatient records and follow-up clinic visits were used to ensure proper assessment of infection rates after surgery.

Statistical Analysis
Data was processed by SPSS software (version X). Continuous variables are represented by mean ± standard deviation, whereas categorical variables are illustrated as frequency and percentage. Group comparisons were conducted employing the chi-square test or Fisher's exact test for categorical data and Student's t-test for continuous data. A p-value of less than 0.05 was regarded as statistically significant.

III. RESULTS

Study Population
A total of 620 patients who were undergoing different surgical operations were enrolled in the study in three tertiary care facilities. Among them, 340 (54.8%) were men and 280 (45.2%) were women, with a mean age of 46.7 ± 12.5 years. Most patients received general surgical procedures (n = 240, 38.7%), then orthopedic (n = 170, 27.4%), neurosurgical (n = 120, 19.3%), and colorectal surgeries (n = 90, 14.5%). Baseline demographics and clinical features are shown in Table 1.

Table 1. Demographic and Clinical Profile of Study Participants

Variable	Total (n = 620)
Mean Age (years)	46.7 ± 12.5
Male (%)	340 (54.8%)
Female (%)	280 (45.2%)
Diabetes Mellitus (%)	112 (18.1%)
Hypertension (%)	156 (25.2%)
Obesity (BMI ≥ 30) (%)	98 (15.8%)
ASA Grade III–IV (%)	72 (11.6%)

Prophylactic Measures
Perioperative antibiotic prophylaxis was given to 585 patients (94.3%), and 35 (5.7%) did not receive prophylaxis. Of the patients receiving antibiotics, most (n = 420, 71.8%) received the first dose of

antibiotics within 60 minutes of incision, as per guideline recommendations. Still, 165 patients (28.2%) had delayed administration or received antibiotics after incision. Prolonged use of antibiotics for more than 48 hours was seen in 110 patients (18.8%), indicative of non-compliance with standard procedures.

Preparation practices for the skin differed among centers: 470 patients (75.8%) were prepared with chlorhexidine-alcohol, and 150 (24.2%) were prepared with povidone-iodine. Hair removal was done in 280 patients (45.2%), of which the most common method was by clippers (68.5%) versus razors (31.5%). Adherence to prophylactic practice is elaborated in Table 2.

Table 2. Prophylactic Measures Adopted Across Centers

Prophylactic Measure	Frequency (n, %)
Antibiotic given within 60 min	420 (71.8%)
Antibiotic given after incision	95 (15.3%)
Prolonged use (>48 h)	110 (18.8%)
Chlorhexidine-alcohol skin prep	470 (75.8%)
Povidone-iodine skin prep	150 (24.2%)
Hair removal with clippers	192 (30.9%)
Hair removal with razor	88 (14.3%)
No hair removal	340 (54.8%)

Surgical Site Infection Rates

In general, SSIs presented in 58 patients (9.3%). The incidence was highest in colorectal surgery (14.4%), neurosurgery (10%), general surgery (8.7%), and orthopedic surgery (6.5%). Non-adherence to antibiotic timing and extended prophylaxis were strongly correlated with higher SSI rates ($p < 0.05$). A graphical illustration of SSI rate by surgical specialty is provided in Figure 1.

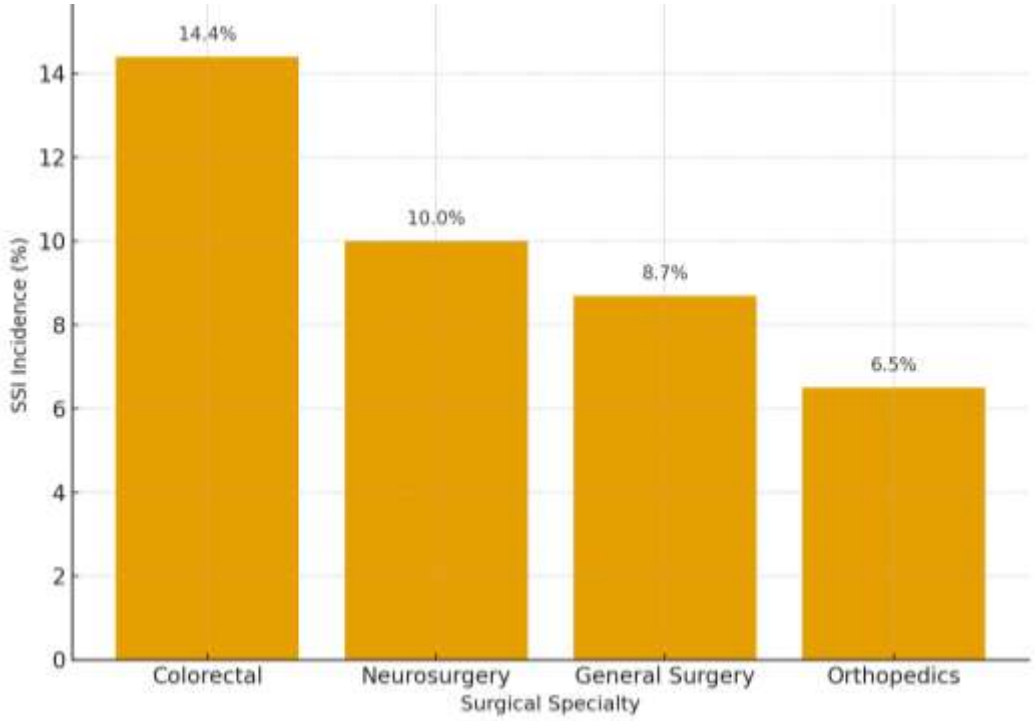

Figure 1. Incidence of Surgical Site Infections Across Surgical Specialties

Figure 1 depicting SSI rates: Colorectal 14.4%, Neurosurgery 10%, General Surgery 8.7%, Orthopedics 6.5%.

IV. DISCUSSION

The current multicentre study points to variable compliance with prophylactic regimens to prevent surgical site infection with significant gaps in the timing of antibiotics, the duration of prophylaxis and consistency in skin preparation regimens. Despite perioperative antibiotics in the majority of patients, nearly one-third received delayed or prolonged antibiotics, both of which were linked with increased SSI rates. This observation reinforces the ongoing problem of translating guidelines to uniform clinical practice.

Our findings found the greatest incidence of SSI in colorectal surgery, consistent with earlier evidence which demonstrated that these types of operations inherently involve higher infection risks because of bacterial contamination and technical difficulty [9]. Likewise, Hübner et al. underscored that multifactorial occurrence of SSI in colon surgery is not only determined by patient comorbidities but also by surgeon-dependent and hospital-related factors [9]. In our population, patients who were treated for colorectal operations had 14.4% infection rate, as per reports internationally, indicating necessity of strict perioperative strategies in the subgroup.

The finding of extended prophylaxis in 18.8% of them is contrary to CDC and WHO recommendations to stop within 24–48 hours [14]. These practice differences have also been observed in other audits, such as Khan et al., where high non-compliance with the timing and duration of prophylactic antibiotics in abdominal surgery was reported [15]. Oliveira and Gama also noted that there was a gap in surgical teams' compliance with SSI prevention protocols, affirming that standardized protocols are usually applied in a non-uniform manner in actual practice [13].

Our investigation also revealed that chlorhexidine-alcohol was the most common agent used for skin preparation, corroborating evidence supporting its over povidone-iodine superiority in minimizing bacterial colonization and SSI risk [14]. Yet, almost one-quarter of patients were still treated with povidone-iodine, indicating nonuniform acceptance of new practices. Beckmann et al. also reported that despite being high-risk cardiac procedures, variability in compliance with preventive measures continues to exist, leaving "room for improvement" in prevention of infection [10].

The prevalence of SSI among elderly and high-risk patients in our study also resonates with Agodi et al., who underscored that older age and co-morbid conditions strongly predispose to infection, requiring tighter prophylactic practice in these groups [12]. Furthermore, Chesney et al. stressed that surgeons' awareness and perceptions of older surgical patients are still inconsistent, impacting the quality of perioperative care [11].

In total, our results reaffirm the well-established principles in the CDC guidelines [14], but reflect the continued challenge towards full compliance. Although recommendations are clear globally, heterogeneity in clinical practice continues to be noted between centers and specialties, as well as in global trends [9–15]. This emphasizes the need for intensified education, surveillance mechanisms, and institutional inspections to assure uniform compliance with SSI prevention guidelines and ultimately enhance surgical outcomes.

V. CONCLUSION

This multicentre survey illustrates that although the majority of surgical teams use prophylactic methods for preventing surgical site infections, high heterogeneity remains with respect to following established guidelines, especially in the timing and duration of antibiotic coverage and selection of skin preparation. The increased SSI rate in colorectal and neurosurgical operations emphasizes the requirement for specialty-targeted interventions in those high-risk disciplines. These results highlight the need for regular implementation of universal protocols, periodic audits, and training of surgeons to close the gap between clinical practice and evidence-based guidelines and hence enhance patient safety and surgical results.

VI. REFERENCES

1. Diana M, Hübner M, Eisenring MC, Zanetti G, Troillet N, Demartines N. Measures to prevent surgical site infections: what surgeons (should) do. *World J Surg*. 2011;35(2):280-288. doi:10.1007/s00268-010-0862-0

2. Matsuda S, Ikawa F, Ohba H, et al. Questionnaire Survey Regarding Prevention of Surgical Site Infection after Neurosurgery in Japan: Focus on Perioperative Management and Administration of Surgical Antibiotic Prophylaxis. *Neurol Med Chir (Tokyo)*. 2019;59(6):197-203. doi:10.2176/nmc.oa.2018-0328

3. Eskicioglu C, Gagliardi AR, Fenech DS, et al. Surgical site infection prevention: a survey to identify the gap between evidence and practice in University of Toronto teaching hospitals. *Can J Surg*. 2012;55(4):233-238. doi:10.1503/cjs.036810

4. Battersby CLF, Battersby NJ, Slade DAJ, Soop M, Walsh CJ. Preoperative mechanical and oral

antibiotic bowel preparation to reduce infectious complications of colorectal surgery - the need for updated guidelines. *J Hosp Infect*. 2019;101(3):295-299. doi:10.1016/j.jhin.2018.12.010

5. Yang Z, Zhao P, Wang J, et al. DRUGS system enhancing adherence of Chinese surgeons to antibiotic use guidelines during perioperative period. *PLoS One*. 2014;9(8):e102226. Published 2014 Aug 22. doi:10.1371/journal.pone.0102226

6. Anil U, Badri A, Pham H, et al. Perioperative Antibiotic Utilization by Orthopedic Surgeons in Arthroscopic Surgery A Survey of Practice Patterns. *Bull Hosp Jt Dis (2013)*. 2020;78(2):97-100.

7. Gupta KK, Vatish D, Xavier V, Maliyil J, Manu M. Comparing Surgeon Adherence with World Health Organization Antiseptic Guidelines for Surgical Site Preparation in the United Kingdom and India. *Surg Infect (Larchmt)*. 2020;21(7):634-638. doi:10.1089/sur.2020.084

8. Shaikh I, Olabi B, Wong VM, Nixon SJ, Kumar S. NICE guidance and current practise of recurrent and bilateral groin hernia repair by Scottish surgeons. *Hernia*. 2011;15(4):387-391. doi:10.1007/s10029-011-0797-x

9. Hübner M, Diana M, Zanetti G, Eisenring MC, Demartines N, Troillet N. Surgical site infections in colon surgery: the patient, the procedure, the hospital, and the surgeon. *Arch Surg*. 2011;146(11):1240-1245. doi:10.1001/archsurg.2011.176

10. Beckmann A, Doebler K, Schaefer E, Koetting J, Gastmeier P, Graf K. Sternal surgical site infection prevention - is there any room for improvement?. *Eur J Cardiothorac Surg*. 2011;40(2):347-351. doi:10.1016/j.ejcts.2010.12.016

11. Chesney TR, Pang G, Ahmed N. Caring for Older Surgical Patients: Contemporary Attitudes, Knowledge, Practices, and Needs of General Surgeons and Residents. *Ann Surg*. 2018;268(1):77-85. doi:10.1097/SLA.0000000000002363

12. Agodi A, Quattrocchi A, Barchitta M, et al. Risk of surgical site infection in older patients in a cohort survey: targets for quality improvement in antibiotic prophylaxis. *Int Surg*. 2015;100(3):473-479. doi:10.9738/INTSURG-D-14-00042.1

13. Oliveira AC, Gama CS. Avaliação da adesão às medidas para a prevenção de infecções do sítio cirúrgico pela equipe cirúrgica [Evaluation of adherence to measures for the prevention of surgical site infections by the surgical team]. *Rev Esc Enferm USP*. 2015;49(5):767-774. doi:10.1590/S0080-623420150000500009

14. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. *Am J Infect Control*. 1999;27(2):97-96.

15. Khan Z, Ahmed N, Zafar S, et al. Audit of antibiotic prophylaxis and

adherence of surgeons to standard guidelines in common abdominal surgical procedures. *East Mediterr Health J*. 2020;26(9):1052-1061. Published 2020 Sep 24. doi:10.26719/emhj.20.025