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Original Research Article

A descriptive study on drug prescription pattern among preoperative and postoperative inpatients in Department of General Surgery at SMS hospital, Jaipur

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ABSTRACT

Background: Perioperative pharmacotherapy plays an important role in preventing complications, relieving pain, controlling infection, and supporting recovery after surgery. Evaluation of prescribing patterns using World Health Organization (WHO) core prescribing indicators can identify areas for improving rational and cost-effective medicine use. Aim was to evaluate the drug prescription pattern among preoperative and postoperative inpatients in the Department of General Surgery at SMS Hospital, Jaipur.

Methods: A hospital-based observational study was conducted among 322 adult surgical inpatients at SMS Hospital, Jaipur, over one year from September 2024 to August 2025. Prescription data were assessed during the preoperative period and on the second postoperative day. Drug utilization was evaluated using WHO core prescribing indicators and the National List of Essential Medicines (NLEM) 2022. Data were entered into Microsoft excel and summarized using means, standard deviations, frequencies, percentages, tables, and graphs; a $p < 0.05$ was considered statistically significant where applicable.

Results: Among 322 patients, the mean number of drugs per encounter increased from 6.33 ± 1.17 preoperatively to 7.61 ± 1.47 postoperatively. The proportion of drugs prescribed by generic name decreased from 77.84-68.80%. Proportion of encounters with antimicrobials increased from 98.45% to 100%, while injections were prescribed in 100% of encounters during both periods. Prescribing from NLEM 2022 98.82% preoperatively and 93.84% postoperatively.

Conclusions: Drug utilization increased after surgery, with frequent use of analgesics, antimicrobials, gastrointestinal protective agents, and intravenous fluids. Prescribing from the NLEM 2022 remained high; however, the lower proportion of generic prescribing postoperatively and extensive antimicrobial and injection use indicate areas where prescribing practices and antimicrobial stewardship could be further strengthened.

Keywords: Preoperative, Postoperative, Drug utilization, Prescribing pattern, WHO prescribing indicators, Antimicrobial stewardship, NLEM 2022

INTRODUCTION

The perioperative period includes the preoperative, intraoperative, and postoperative phases of care surrounding a surgical procedure. The preoperative phase

begins with the decision to undertake surgery and continues until transfer to the operating room, whereas the postoperative phase extends from completion of surgery until recovery. Appropriate pharmacological management

throughout these phases is important for patient safety, prevention of complications, and recovery.¹

Preoperative medications may reduce anxiety and help prevent perioperative complications. Intraoperative pharmacotherapy may include anaesthetic agents, opioids, and neuromuscular blockers, while postoperative treatment commonly addresses pain, infection, fluid and electrolyte balance, thromboprophylaxis, and nausea and vomiting.²

Postoperative pain is an important clinical problem following surgery. Acute postoperative pain has been reported in a substantial proportion of surgical patients, and inadequate pain control may contribute to delayed recovery, prolonged hospitalization, impaired wound healing, and reduced quality of life.^{3,4} Rational prescribing of analgesics and other perioperative medicines is therefore an important component of quality surgical care.

Drug utilization research evaluates the prescribing, dispensing, and use of medicines with the aim of promoting rational drug therapy. The WHO describes rational use of medicines as the provision of medicines appropriate to patients' clinical needs, in doses that meet individual requirements, for an adequate period, and at the lowest cost to patients and the community.⁵

WHO core prescribing indicators provide a standardized approach to evaluating selected aspects of prescribing quality.⁶

Antimicrobial prescribing is particularly important in surgical practice because inappropriate antimicrobial exposure may contribute to antimicrobial resistance. The WHO AWaRe classification categorizes antibiotics into Access, Watch, and Reserve groups and supports antimicrobial stewardship and appropriate antibiotic selection.⁷

The present study was undertaken to evaluate the drug prescription pattern among preoperative and postoperative inpatients in the Department of General Surgery at SMS Hospital, Jaipur.

METHODS

Study design and setting

This was a hospital-based observational study conducted in the Department of Pharmacology in collaboration with the Department of General Surgery, SMS Hospital, Jaipur, a tertiary care teaching hospital.

Study duration

The study was conducted over one year, from September 2024 to August 2025, after approval from the Research Review Board (RRB), or until the required sample size was achieved.

Study population

The study included adult patients admitted to the General Surgery inpatient department who underwent surgical procedures during the study period.

Inclusion criteria

Patients aged 18 years or above, of either sex, admitted for surgery and willing to participate after providing written informed consent were included in the study.

Exclusion criteria

Pregnant and lactating women and patients who left the hospital against medical advice were excluded from the study.

Sample size

The calculated sample size was 322 participants, based on a 95% confidence level, 4% allowable error, and an expected preoperative tramadol use of 16%, as reported by Shah et al.⁸

Data collection and outcome measures

Eligible patients were enrolled after the informed consent. Clinical and prescription data were recorded during the pre-operative period and on the second post-operative day.

The primary outcome measures were the average number of drugs per encounter, percentage of drugs prescribed by generic name, percentage of encounters with antimicrobial prescribing, percentage of encounters with injection prescribing, and percentage of drugs prescribed from the NLEM 2022.

Statistical analysis

Data entered into Microsoft excel and analyzed using appropriate statistical methods. Quantitative variables were expressed as mean±standard deviation, while qualitative variables were summarized as frequencies and percentages and presented in tables and graphs.

A p value<0.05 was considered statistically significant.

RESULTS

A total of 322 patients were evaluated. The mean age was 45.6±16.57 years. The 36-50-year age group represented the largest proportion of patients (31.99%), and males constituted 60.56% of the study population.

The hypertension (16.77%) and diabetes mellitus (8.39%) were the most frequently reported comorbidities. Drug doses were generally standardized, as well as most the anti-microbials were prescribed two to three times daily.

The average number of drugs per encounter increased from 6.33 ± 1.17 preoperatively to 7.61 ± 1.47 postoperatively. Generic prescribing decreased from 77.84% to 68.80%. Antimicrobial prescribing increased from 98.45% to 100%, while injection prescribing was 100% during both periods. The proportion of drugs prescribed from the NLEM 2022 remained high in both periods.

Males constituted 60.56% of study population compared with 39.44% females, 36-50-year age group was largest group, followed by 21-35-year group. Male predominance was observed in most age groups, whereas females predominated among participants older than 80 years.

Pantoprazole and ondansetron were prescribed to all patients (100%). Normal saline was the most frequently used intravenous fluid (78.26%). Paracetamol was the most frequently prescribed analgesic (51.24%), while ceftriaxone was the most frequently prescribed

antimicrobial (57.76%). Lactulose (16.46%) and calcium gluconate (6.83%) were among the commonly prescribed supportive medicines.

Pantoprazole (100%) and ondansetron (93.5%) were frequently prescribed postoperatively. Normal saline was the predominant intravenous fluid (83.8%). Diclofenac was the most frequently prescribed analgesic (62.7%). Metronidazole (44.7%) and ceftriaxone (43.8%) were the leading antimicrobials. Other supportive medicines included metoclopramide, calcium gluconate, and tranexamic acid.

Among preoperative antimicrobial prescriptions, ceftriaxone (57.76%) was the most frequently used Watch-group agent, while metronidazole (37.89%) was the most frequently used Access-group agent. Linezolid was the only reserve-group agent reported and was prescribed in 0.62% of patients.

Table 1: Comparison of WHO core prescribing indicators between preoperative and postoperative periods.

Indicators	Preoperative	Postoperative
Total number of cases	322	322
Total number of drugs prescribed	2040	2504
Average number of drugs per encounter	6.33 ± 1.17	7.61 ± 1.47
Drugs prescribed by generic name (%)	77.84	68.80
Encounters with antimicrobials prescribed (%)	98.45	100
Encounters with injections prescribed (%)	100	100
Drugs prescribed from NLEM 2022 (%)	98.82	93.84

Table 2: Age-wise and gender distribution of study participants.

Age group (in years)	Female, N (%)	Male, N (%)	Total
≤20	5 (35.71)	9 (64.29)	14
21-35	28 (32.56)	58 (67.44)	86
36-50	41 (39.81)	62 (60.19)	103
51-65	33 (45.83)	39 (54.17)	72
66-80	18 (40.91)	26 (59.09)	44
>80	2 (66.67)	1 (33.33)	3
Total	127 (39.44)	195 (60.56)	322

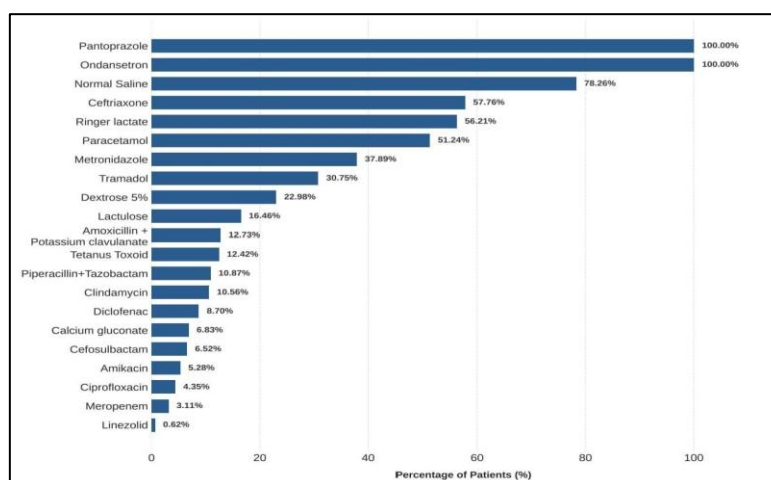


Figure 1: Distribution of preoperative drugs prescribed among study patients.

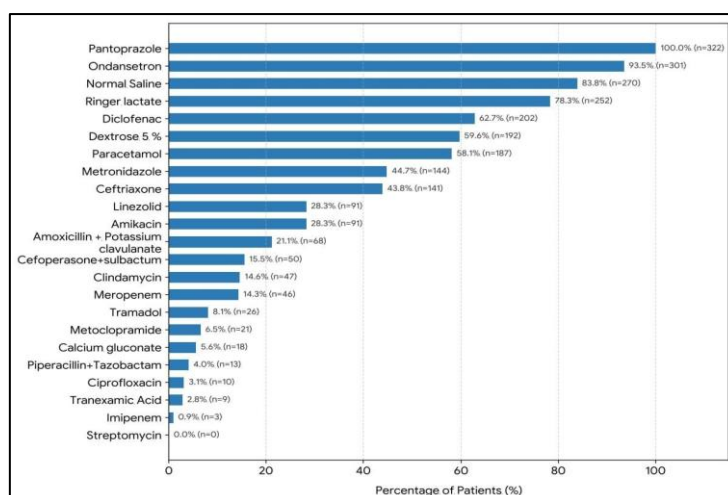


Figure 2: Distribution of postoperative drugs prescribed among study patients.

Table 3: Preoperative antimicrobial drugs according to WHO AWaRe classification.

AWaRe groups	Antimicrobial	N	Percentage (%)
Access	Amoxicillin + potassium clavulanate	41	12.73
Access	Metronidazole	122	37.89
Access	Amikacin	17	5.28
Access	Cefosulbactam	21	6.52
Access	Clindamycin	34	10.56
Watch	Ceftriaxone	186	57.76
Watch	Ciprofloxacin	14	4.35
Watch	Piperacillin + tazobactam	35	10.87
Watch	Meropenem	10	3.11
Reserve	Linezolid	2	0.62

Table 4: Postoperative antimicrobial drugs according to WHO AWaRe classification.

AWaRe groups	Antimicrobial	N	Percentage (%)
Access	Metronidazole	144	44.72
Access	Amikacin	91	28.26
Access	Clindamycin	47	14.60
Access	Amoxicillin + potassium clavulanate	68	21.12
Watch	Ceftriaxone	141	43.79
Watch	Meropenem	46	14.29
Watch	Ciprofloxacin	10	3.11
Watch	Cefoperazone + sulbactam	50	15.53
Watch	Streptomycin	0	0.00
Watch	Imipenem	3	0.93
Watch	Piperacillin + tazobactam	13	4.04
Reserve	Linezolid	91	28.26

Postoperatively, both access-and watch-group antimicrobials were frequently prescribed.

Metronidazole (44.72%) was the most frequently prescribed access-group agent, while ceftriaxone (43.79%) was the most frequently prescribed watch-group agent.

Linezolid was the only Reserve-group antimicrobial reported and was prescribed in 28.26% of patients.

DISCUSSION

The present study evaluated drug utilization before surgery and on the second postoperative day among 322 general surgical inpatients. The average number of drugs per encounter increased from 6.33 ± 1.17 preoperatively to 7.61 ± 1.47 postoperatively. This increase is expected in the postoperative setting because treatment may include analgesics, antimicrobials, intravenous fluids, antiemetics,

gastrointestinal protective agents, and other supportive medicines.

Shah et al reported 8.25 drugs per prescription, 98.95% generic prescribing, 100% antibiotic use, 99.5% injection use, and 69.74% essential drug use. Patel et al reported 8.94 drugs per prescription, 87.27% generic prescribing, 92.05% antibiotic use, 100% injection use, and 84.22% prescribing from the Essential Medicines List. Compared with these reports, the present study showed fewer average drugs per encounter but a lower proportion of generic prescribing than reported by Shah et al and Patel et al.^{8,9}

The mean age of the study population was 45.6±16.57 years, with the largest proportion belonging to the 36-50-year age group. Shah et al reported a mean age of 46±18.46 years, showing a similar age profile.⁸ Ahmed reported that most patients in a general surgery outpatient population were aged 30-39 years, followed by 20-29 and 40-49 years.¹⁰

Pantoprazole and ondansetron were prescribed to all patients preoperatively, while ceftriaxone and paracetamol were the most frequently used antimicrobial and analgesic, respectively. Postoperatively, pantoprazole and ondansetron remained frequently prescribed, while diclofenac was the most commonly used analgesic and metronidazole and ceftriaxone were the leading antimicrobials. Karande et al reported an average of 5.98 drugs per prescription in the preoperative period and 7.0 postoperatively, with essential medicine use of 59.09% and 77.27%, respectively.¹¹ Shah et al also reported substantial use of analgesics in perioperative care.⁸

The AWaRe analysis showed substantial use of Watch-group antimicrobials preoperatively, particularly ceftriaxone. Postoperatively, access-and watch-group agents predominated, while linezolid was the reported Reserve-group agent. Karande et al reported cephalosporins as commonly prescribed antimicrobials, while Choudhary et al reported frequent use of cefixime and ciprofloxacin.^{11,12} Patel et al reported amikacin, metronidazole, ciprofloxacin, and ceftriaxone among the commonly prescribed antimicrobials.⁹

The high frequency of antimicrobial prescribing and the substantial use of Watch and Reserve agents warrant attention to indication-based prescribing, culture-guided therapy where appropriate, and antimicrobial stewardship. The reduction in generic prescribing after surgery also indicates an opportunity to promote prescribing by generic name. At the same time, the high proportion of NLEM-listed medicines suggests substantial alignment with the essential medicines framework.

Limitations

The present study was conducted in a single tertiary-care teaching hospital and included patients from the department of general surgery; therefore, the findings may

not be directly generalizable to other hospitals or surgical specialties. The study evaluated prescribing patterns at defined perioperative time points and did not assess long-term clinical outcomes, treatment appropriateness for individual diagnoses, or patient-level antimicrobial resistance patterns.

CONCLUSION

The study demonstrated a higher drug burden on the second postoperative day than during the preoperative period. Analgesics, antimicrobials, gastrointestinal protective agents, antiemetics, and intravenous fluids constituted important components of perioperative pharmacotherapy. Prescribing from the NLEM 2022 remained high in both periods. However, the lower proportion of generic prescribing postoperatively and extensive antimicrobial and injection use highlight areas for further optimization. Strengthening generic prescribing and antimicrobial stewardship may improve the rationality, safety, and cost-effectiveness of perioperative pharmacotherapy.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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