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PRESCRIBING PATTERN OF ANTIMICROBIAL DRUGS IN POST-OPERATIVE PATIENTS IN A TERTIARY CARE HOSPITAL OF ASSAM

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ABSTRACT

Background: Surgical site infections remain a major cause of post-operative morbidity, prolonging hospitalization and increasing treatment cost. Rational and judicious use of antimicrobial agents is essential for their prevention and treatment, and prescribing patterns require periodic evaluation to identify irrational use and curb the emergence of antimicrobial resistance.

Objective: To study the type and dosage schedule of antimicrobial drugs used in post-operative patients and to evaluate the antimicrobial treatment pattern in these patients.

Methods: A cross-sectional observational study was conducted using case records of post-operative patients admitted to the surgical wards of Assam Medical College & Hospital, Dibrugarh, between June and September 2014, after obtaining Institutional Ethics Committee (Human) approval. Patients above 15 years of age of either sex undergoing major surgery were included; patients below 15 years and those with diabetes mellitus or tuberculosis were excluded. Demographic data, diagnosis, type of surgery, and antimicrobial dosage schedules were recorded on a predesigned performa.

Results: Of 250 patients studied, 133 (53.2%) were female and 117 (46.8%) were male, with the 15–29-year age group most represented (28.0%). Cholecystectomy was the commonest surgery (27.6%), followed by other abdominal surgeries (23.6%), appendicectomy (14.4%) and genital surgeries (14.4%). Piperacillin–tazobactam (4.5 g) was the most frequently prescribed antimicrobial (29.5%), followed by metronidazole (16.25%), ceftriaxone–sulbactam (13.5%), amikacin (13.5%), ceftriaxone (8.25%), imepenem (3.5%) and meropenem (1.25%).

Conclusion: Piperacillin–tazobactam followed by metronidazole were the most commonly used agents for post-operative antimicrobial prophylaxis in this tertiary care hospital of Assam. Judicious selection of antimicrobials with the narrowest effective spectrum, guided by local microbiological sensitivity patterns, is recommended to minimise the future emergence of antimicrobial resistance.

KEYWORDS: Antimicrobial prescribing pattern; post-operative; surgical prophylaxis; piperacillin–tazobactam; antimicrobial resistance; tertiary care hospital.

INTRODUCTION

Ever since Sir Alexander Fleming's Nobel-winning discovery of penicillin, antimicrobial agents have fundamentally transformed the management of infectious disease, a contribution Fleming himself underscored while accepting the 1945 Nobel Prize.[1] Yet nearly eight decades on, surgical units continue to grapple with surgical site infection as one of the principal drivers of post-operative illness — extending hospital stay and adding substantially to the economic burden of surgical care.

Surveys of antimicrobial use in Indian hospitals have documented considerable variability in prescribing intensity, with reported utilization figures spanning roughly a quarter to two-thirds of admitted patients depending on the setting studied.[2,3] This wide variation reflects differences in institutional protocols, case-mix, and the extent to which prescribing is guided by evidence rather than habit or convenience — underscoring why antimicrobials, used appropriately, remain indispensable to both the prevention of surgical site infection and the broader management of infectious disease.

At the same time, empirical and often unnecessarily broad-spectrum antimicrobial use in the peri-operative setting — particularly reliance on third- and fourth-generation cephalosporins — has been implicated in accelerating antimicrobial resistance. Periodic institutional audits of prescribing behaviour are therefore necessary, both to detect patterns of irrational use and to inform local antibiotic stewardship policy. With this background, the present study was designed to characterise the antimicrobial prescribing pattern, including drug selection and dosage schedules, among post-operative patients admitted to the surgical wards of a tertiary care hospital in Assam.

Aims and Objectives
To study the type and dosage schedule of antimicrobial drugs used in post-operative patients and to evaluate the antimicrobial treatment pattern in these patients.

MATERIALS AND METHODS

Study design, setting and duration
This was a cross-sectional, observational, record-based study conducted in the surgical wards of Assam Medical College & Hospital (AMCH), Dibrugarh, Assam, over a period of four months from June to September 2014. The case records of post-operative patients admitted during this period were reviewed.

Ethical approval
Permission for the study was obtained from the Institutional Ethics Committee (Human), Assam Medical College & Hospital, Dibrugarh, prior to commencement of data collection.

Inclusion criteria
Eligibility was restricted to patients aged above 15 years, irrespective of sex, who underwent a major surgical procedure in the surgical wards during the study window.

Exclusion criteria
Patients less than 15 years of age and those with co-morbid diabetes mellitus or tuberculosis were excluded from the study, as these conditions independently influence antimicrobial choice and outcome.

Data collection
A predesigned Performa was used to capture, for every enrolled patient, basic demographic details, the surgical diagnosis, the procedure performed, and the specific antimicrobial agent(s) prescribed along with their dosage schedule. Once collected, this information was compiled into a master data sheet and summarized as frequencies and corresponding percentages for each variable.

Statistical analysis
Descriptive statistics were used to summarize the data. Results are presented as numbers (n) and percentages (%), and depicted using tables and charts.

RESULTS

A total of 250 post-operative patients admitted to the surgical wards during the study period were included in the analysis.

Table 1. Sex distribution of study patients (n = 250)

Sex	Number (n)	Percentage (%)
Male	117	46.80
Female	133	53.20
Total	250	100.00

Of the 250 patients, 133 (53.2%) were female and 117 (46.8%) were male, giving a female-to-male ratio of approximately 1.14:1 (Table 1).

Table 2. Age distribution of study patients (n = 250)

Age group (years)	Number (n)	Percentage (%)
15–29	70	28.00
30–39	53	21.20
40–49	50	20.00
50–59	37	14.80
60–69	27	10.80
70–79	7	2.80
80–89	6	2.40

Age group (years)	Number (n)	Percentage (%)
Total	250	100.00

The largest proportion of patients belonged to the 15–29-year age group (28.0%), followed by the 30–39-year group (21.2%) and the 40–49-year group (20.0%). Patients above 70 years of age constituted only 5.2% of the study population (Table 2).

Table 3. Distribution of surgeries performed (n = 250)

Type of surgery	Number (n)	Percentage (%)
Cholecystectomy	69	27.60
Appendicectomy	36	14.40
Genital surgeries	36	14.40
Other abdominal surgeries	59	23.60

Cholecystectomy was the most commonly performed surgery (27.6%), followed by other abdominal surgeries (23.6%), while appendicectomy and genital surgeries accounted for 14.4% each (Table 3). (The remaining 20.0% of patients underwent other surgical procedures not separately classified above.)

Table 4. Distribution of antimicrobial agents prescribed

Name of antibiotic	Percentage (%)
Piperacillin–tazobactam 4.5 g	29.50
Metronidazole 100 ml	16.25
Ceftriaxone–sulbactam 1.5 g	13.50
Amikacin 500 mg	13.50
Ceftriaxone 1 g	8.25
Imepenem 500 mg	3.50
Meropenem 1 g	1.25

Piperacillin–tazobactam (4.5 g) was the most frequently prescribed antimicrobial agent (29.5%), followed by metronidazole (16.25%). Ceftriaxone–sulbactam and amikacin were each prescribed in 13.5% of cases, while ceftriaxone, imepenem and meropenem were used less frequently (8.25%, 3.5% and 1.25% respectively) (Table 4).

DISCUSSION

In the present study, cholecystectomy was found to be the commonest surgical procedure (27.6%) performed among the study population, reflecting the high burden of biliary tract disease in this region.

Piperacillin–tazobactam (29.5%) was the most commonly used antimicrobial agent in the surgical wards of AMCH, Dibrugarh, followed by metronidazole. This finding contrasts with several other tertiary care hospital-based studies from India, which have reported maximal use of third-generation cephalosporins, fluoroquinolones and metronidazole for post-operative antimicrobial prophylaxis.[2]

These findings are broadly comparable with those of other Indian tertiary-care based prescribing audits, although the specific agent favoured has varied by centre. Ramalingam and Pandian, in a prospective study of 513 post-operative general surgery patients in Pondicherry, found cephalosporins (52.32%) to be the leading class of antimicrobial prescribed, followed by metronidazole (34.38%), with third-generation cephalosporins accounting for the largest single share — a pattern that diverges from the piperacillin–tazobactam-predominant prescribing seen in the present study.[4] By contrast, Gaikwad et al, in an analysis of 385 post-operative prescriptions from a teaching hospital in Pune, reported metronidazole as the most frequently used agent (92.98%), followed by ceftriaxone (49.35%), amikacin (46.75%) and piperacillin–tazobactam (36.10%); piperacillin–tazobactam was thus a prominent but not the leading choice, more consistent with the pattern observed here.[5] In a further one-year drug utilisation study from a Gujarat tertiary hospital involving 604 surgical patients, Patel et al found amikacin (5.81%), metronidazole (5.30%) and ciprofloxacin (5.19%) to be the antimicrobials most commonly prescribed among a much broader overall drug basket, reflecting a comparatively more aminoglycoside- and fluoroquinolone-oriented prescribing culture at that centre.[6] Taken together, these comparisons suggest that while metronidazole use for anaerobic cover is fairly consistent across Indian surgical wards, the preferred broad-spectrum partner agent — be it a cephalosporin, a

beta-lactam/beta-lactamase inhibitor combination, or an aminoglycoside/fluoroquinolone — varies considerably by institution, likely reflecting differences in local antibiotic policy, drug availability, and prevailing resistance patterns.

The pharmacological rationale for this preference is well established. As a broad-spectrum penicillin, piperacillin alone is active against numerous gram-positive and gram-negative pathogens, but many clinically relevant organisms produce beta-lactamase enzymes capable of degrading it before it can act. Tazobactam, structurally related to sulbactam, works around this problem by irreversibly binding and neutralising these bacterial enzymes. The net effect of co-administration is not simply additive: tazobactam effectively restores piperacillin's activity against organisms that would otherwise inactivate it, which is why the fixed-dose combination performs well as empirical cover in mixed or polymicrobial surgical infections.[3]

A separate concern raised by these findings relates to the cephalosporin class. Repeated or indiscriminate post-operative use of third- and fourth-generation cephalosporins has been associated with accelerated resistance development against these very agents, eroding their usefulness over time.[2,3] Two principles should guide antimicrobial selection for surgical prophylaxis: the agent chosen should cover the organisms most likely to contaminate that specific surgical field, while otherwise being kept as narrow in spectrum as clinically defensible, so that broader-spectrum reserve options are not exhausted prematurely. Applying this reasoning, agents such as ceftriaxone and cefotaxime are best held back from routine prophylactic use and reserved instead for situations where the patient goes on to develop overt post-operative sepsis. The centre-to-centre variation noted above further reinforces the case for locally derived, microbiology-guided antibiotic policies rather than uniform empirical protocols extrapolated across institutions.

It is also worth noting that the predominance of piperacillin–tazobactam observed in the present study is consistent with current national treatment recommendations. The National Treatment Guidelines for Antimicrobial Use in Infectious Disease Syndromes (Version 2.0, 2025), jointly issued by the National Centre for Disease Control and the Indian Council of Medical Research, list piperacillin–tazobactam as first-line empirical therapy for cholecystitis and cholangitis complicated by sepsis, as well as for several other intra-abdominal and systemic sepsis syndromes encountered in surgical practice, including complicated appendicitis, peritonitis and acute pyelonephritis. [7] Since cholecystectomy was the leading procedure in the present cohort and a proportion of these patients are likely to have presented with acute or complicated cholecystitis rather than elective, uncomplicated disease, the high observed use of piperacillin–tazobactam may reflect appropriate alignment with these national recommendations for the septic or complicated subset of biliary tract disease, rather than its use as a blanket prophylactic agent for all cholecystectomies. For uncomplicated, non-septic cholecystitis, the same national guidelines instead recommend narrower-spectrum agents such as amoxicillin–clavulanate or ceftriaxone, underscoring that antimicrobial choice in this setting should be stratified by clinical severity rather than applied uniformly across all post-operative patients.

CONCLUSION

All patients in this study received antimicrobial prophylaxis in the post-operative period. Piperacillin–tazobactam, followed by metronidazole, were the antimicrobial agents most commonly used to prevent surgical site infection in the surgical wards of Assam Medical College & Hospital. However, further prospective studies correlating antimicrobial choice with blood/wound culture and sensitivity reports, as well as cost-effectiveness analyses of the various antimicrobial groups used, will be required to promote more rational and evidence-based antimicrobial prescribing in this setting.

Declarations

Ethics approval and consent to participate

The study was approved by the Institutional Ethics Committee (Human), Assam Medical College & Hospital, Dibrugarh, prior to initiation. As this was a retrospective record-based study, the requirement for individual patient consent was waived by the Committee; patient confidentiality was maintained throughout data collection and analysis.

Consent for publication

Not applicable.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflicts of interest

The authors declare that they have no conflicts of interest relevant to this article.

Author contributions

Concept and design: SD, KS, KG. Data collection: KS. Data analysis and interpretation: KS, PKP. Drafting of the manuscript: PKP. Critical revision for important intellectual content: SD, KG. Supervision: SD. All authors read and approved the final manuscript, in accordance with ICMJE authorship criteria.

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