e-ISSN: 0976-822X, p-ISSN:2961-6042

Available online on http://www.ijcpr.com/

International Journal of Current Pharmaceutical Review and Research 2025; 17(11); 1531-1534

Original Research Article

Evaluation of Antibiotic Use in Different Departments of a Tertiary Care Hospital in Silvassa: A Prospective Observational Study

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Received: 01-09-2025 / Revised: 15-10-2025 / Accepted: 21-11-2025
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Conflict of interest: Nil

Abstract

Introduction: Antibiotic resistance increases treatment complexity, cost, and risk of poor outcomes, making rational antibiotic use essential.

Objectives: To monitor and evaluate antibiotic utilization patterns among critically ill and postoperative inpatients across hospital departments.

Material and Methods: A prospective, hospital-based observational study was conducted in the medicine ward of a tertiary care hospital in Silvassa. Medication orders were collected over six months. A total of 150 patients were enrolled according to predefined inclusion and exclusion criteria; 339 antibiotic prescriptions were recorded and analyzed for class distribution and indication.

Results: Cephalosporins were the most frequently prescribed class (124; 82.6%), followed by nitroimidazoles (59; 39.3%), penicillins (41; 27.3%), macrolides (16; 10.6%), polymyxins (14; 9.3%), fluoroquinolones (13; 8.6%), tetracyclines (12; 8%), beta-lactams (11; 7.3%), aminoglycosides (9; 6%), lincomycin (6; 4%), and glycopeptides (3; 2%). Antibiotic use was most frequent for gastrointestinal infections (16.6%), followed by cardiovascular conditions (16.0%) and respiratory tract infections (15.3%).

Conclusion: Cephalosporins predominated in inpatient antibiotic prescribing. Comprehensive appraisal of local prescribing patterns is necessary before instituting treatment policies. Engagement of hospital-based pharmacy professionals and implementation of stewardship measures are recommended to promote rational antibiotic use.

Keywords: Aminoglycoside, Antibiotic resistance, Cephalosporins.

Introduction

Antibiotics exert their therapeutic effect through selective toxicity, targeting microbial structures or processes while sparing host tissues. Because selectivity is often relative rather than absolute, careful attention to agent selection, dosing, route, and duration is required to maximise microbial kill while minimising host toxicity [1]. Although antibiotics are generally effective and well tolerated, their use is not without risk: adverse drug reactions, disruption of normal microbiota, and selection for resistant organisms are important clinical considerations [2].

The discovery of penicillin by Sir Alexander Fleming in 1928 inaugurated the antibiotic era and fundamentally transformed clinical medicine. However, inappropriate or excessive antibiotic use has accelerated the emergence and dissemination of antimicrobial resistance, undermining therapeutic efficacy and public-health gains [3]. Prudent antibiotic stewardship is therefore essential to preserve clinical utility and limit adverse population-level consequences [4].

Antibiotics remain among the most frequently prescribed drug classes in hospital practice worldwide. In resource-limited settings such as India, the economic burden of antimicrobial therapy and the downstream costs associated with resistance amplify the need for rational prescribing. Where combination therapy is indicated, clinicians should be informed by evidence-based indications to limit unnecessary broad-spectrum exposure and resistance selection. Systematic evaluation of prescribing patterns—through monitoring, audit, and feedback—provides an objective basis for

improving prescribing practice and patient outcomes [5]. Understanding local antibiotic utilisation is a prerequisite for developing institutional antibiotic policies and stewardship interventions that safeguard patients and support prescribers in making evidence-based therapeutic decisions [6]. Robust, representative data on antibiotic use therefore underpin efforts to optimise therapy and raise standards of care.

Materials and Methods

Study design and setting- A prospective observational study was conducted in the Department of Medicine at a tertiary care teaching hospital in Silvassa, India. The study period extended for six months from October 2022 to March 2023. Institutional ethics committee approval was obtained prior to study initiation.

Study population and eligibility- Consecutive inpatients aged >12 years who were hospitalized with an infection or who developed an infection during hospitalization and who received at least one antimicrobial agent or prophylactic antibiotic were eligible for inclusion. Exclusion criteria comprised patients aged ≤12 years, pregnant or lactating women, patients admitted to intensive care units, outpatients, unconscious patients, and those who declined to provide informed consent. A total of 150 patients meeting the inclusion criteria were enrolled after written informed consent was obtained from each participant or their legally authorised representative.

Data collection- Clinical and prescription data were prospectively abstracted from medical case sheets, drug charts, and laboratory reports using a predesigned data collection form.

Collected variables included demographic information, primary and secondary clinical diagnoses, relevant medical history, and details of antimicrobial therapy: agent name, pharmacological class, dose, route of administration, frequency, duration, indication, and whether the product was generic, branded, single agent, or fixed-dose combination. Where applicable, antibiotics were classified according to the Central Drugs Standard Control Organization (CDSCO) categories (new/old drug status). Microbiological results and changes to therapy based on culture reports were recorded.

Outcome measures and rationality assessment- Primary outcomes were patterns of antibiotic prescribing and descriptive measures of antimicrobial use. Rationality assessment considered indication appropriateness, concordance with institutional or national guidelines, age- and weight-appropriate dosing, route selection, and duration of therapy.

Statistical analysis and data management- Descriptive statistics were computed using Microsoft Excel. Categorical variables are presented as counts and percentages; continuous variables are reported as mean ± standard deviation or median (interquartile range) as appropriate. Data entry was performed using the standardized form and verified by a second investigator to ensure accuracy and completeness. All analyses were conducted on de-identified data to preserve patient confidentiality.

Results

Study population- During the six-month study period, 204 patients were admitted to the General Medicine ward; 150 (73.5%) of these patients received one or more antibiotic prescriptions and were included in the analysis.

Demographic characteristics- Of the 150 patients, 125 (83.3%) were male and 25 (16.7%) were female (Table 1). Age distribution was skewed toward adults: 0–15 years, 4 (2.7%); 16–30 years, 36 (24.0%); 31–45 years, 47 (31.3%); 46–60 years, 44 (29.3%); 61–75 years, 15 (10.0%); >75 years, 3 (2.0%). The largest age stratum was 31–45 years.

Discussion

Antibiotics remain among the most frequently prescribed therapeutic agents, and their inappropriate use has well-documented consequences including increased healthcare costs, adverse drug reactions, and the emergence and propagation of antimicrobial resistance. Selective pressure exerted by antimicrobial exposure is a principal driver of resistance development, a phenomenon of global concern. Hospitalized patients account for a substantial proportion of antibiotic consumption, and third-generation cephalosporins are commonly employed for hospital-acquired infections because of their broad spectrum and clinical utility. [7]

The present prospective audit identified several patterns that warrant attention. First, antibiotic prescribing in the study cohort was dominated by cephalosporins, nitroimidazoles and penicillins, with 339 antibiotic prescriptions recorded among 150 patients; this predominance of cephalosporins is consistent with prior reports. [13,14]

Second, antibiotic use was most frequently associated with gastrointestinal and cardiovascular indications in our setting, whereas several earlier Indian studies reported respiratory tract infections as the leading indication for inpatient antibiotic therapy, indicating potential local variation in case-mix or prescribing practice. [9,15,16] Third, the cohort exhibited a marked male predominance (83.3%) and the largest age stratum comprised patients aged 31–45 years; the reasons for sex and

age distributions observed here are unclear and may reflect local admission patterns, healthcare-seeking behaviour, or underlying disease epidemiology. [9–12]

Table 1: Gender distribution (n = 150)

Gender	n	%
Male	125	83.3
Female	25	16.7

Table 2: Indications for antibiotic use (n = 150)

Indication	n	%
Gastrointestinal infections	25	16.6
Cardiovascular disease	24	16.0
Respiratory disease	23	15.3
CNS disorders	23	15.3
Alcoholic liver disease	20	13.3
Diabetes mellitus	9	6.0
Fever	8	5.3
Sickle cell disease	6	4.0
Kidney disease	6	4.0
Pancreatitis	4	2.7
Others	2	1.3

Table 3: Antibiotic classes prescribed (n = 150)

Antibiotic class	n	%
Cephalosporins	124	82.6
Nitroimidazoles	59	39.3
Penicillins	41	27.3
Macrolides	16	10.6
Polymyxins	14	9.3
Fluoroquinolones	13	8.6
Tetracyclines	12	8.0
Beta-lactams	11	7.3
Aminoglycosides	9	6.0
Lincomycin	6	4.0
Glycopeptides	3	2.0

Multiple factors may contribute to high antibiotic utilisation, including limited awareness of the long-term consequences of excessive antibiotic use, economic incentives that influence prescribing, and inadequate oversight of antimicrobial prescribing. [8] The current study was observational and descriptive; it did not include qualitative assessments of prescriber rationale nor systematic linkage of prescriptions to microbiological data. Consequently, causal inferences regarding appropriateness cannot be made, and the extent to which prescriptions conformed to evidence-based indications remains incompletely characterised.

Conclusion

This study provides a descriptive overview of inpatient antibiotic prescribing at a tertiary-care centre and identifies a predominance of broad-spectrum agents and substantial antibiotic exposure across diverse clinical indications. To optimise antimicrobial use, we recommend strengthening hospital antimicrobial stewardship through: routine microbiological sampling to guide targeted therapy; implementation of local prescribing guidelines aligned with national standards; regular prescription audits with feedback to prescribers; and integration of clinical pharmacists into ward teams to review and advise on antimicrobial therapy. Future research should incorporate qualitative methods and microbiology-linked appropriateness assessments to identify specific drivers of inappropriate use and to evaluate the impact of stewardship interventions.

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