



EVALUATION OF ANTIMICROBIAL PRESCRIBING TRENDS IN A TERTIARY CARE HOSPITAL: A CROSS-SECTIONAL DRUG UTILIZATION STUDY

Dr. Sameer Balasaheb Dharrao¹, Dr Rahul Chavan^{2*}

¹Associate professor, Department of Pharmacology, Dr. Vasantrao Pawar Medical college, Hospital and research centre, Adgaon Nashik

^{2*}Associate Professor, Department of Pharmacology, SMBT Institute of Medical Sciences and Research Centre, Dhamangoan, Nashik

***Corresponding Author:** Dr Rahul Chavan

*Associate Professor, Department of Pharmacology, SMBT Institute of Medical Sciences and Research Centre, Dhamangoan, Nashik, Email: drrahulchavan@hotmail.com

Abstract

Background: Irrational use of antimicrobial agents is a major contributor to the growing problem of antimicrobial resistance (AMR), especially in tertiary care hospitals. Periodic evaluation of prescribing patterns is essential to promote rational antimicrobial use.

Objectives: To evaluate the prescribing patterns of antimicrobial agents in a tertiary care hospital using World Health Organization (WHO) prescribing indicators and to assess their rationality.

Methods: A hospital-based cross-sectional drug utilization study was conducted over a period of six months in a tertiary care teaching hospital. Prescriptions containing at least one antimicrobial agent were included. Data were analyzed for demographic characteristics, number and class of antimicrobials prescribed, route of administration, fixed-dose combinations, use of generic names, and adherence to WHO core prescribing indicators.

Results: A total of 600 prescriptions were analyzed. The mean age of patients was 46.2 ± 17.8 years, with a male predominance (58%). The average number of drugs per prescription was 4.1 ± 1.3 . Antimicrobials were prescribed in 100% of the included prescriptions, with an average of 1.8 antimicrobials per prescription. Beta-lactam antibiotics were the most commonly prescribed class (42%), followed by fluoroquinolones (18%) and aminoglycosides (14%). Parenteral antimicrobials accounted for 54% of prescriptions. Only 38% of antimicrobials were prescribed by generic name, and 62% were from the National List of Essential Medicines (NLEM).

Conclusion: The study revealed a high use of broad-spectrum and injectable antimicrobials with suboptimal generic prescribing. Strengthening antimicrobial stewardship programs, promoting adherence to standard treatment guidelines, and regular prescription audits are essential to ensure rational antimicrobial use.

Keywords: Antimicrobial agents, Drug utilization study, Prescribing pattern, WHO indicators, Antimicrobial resistance

Introduction

Antimicrobial agents are among the most frequently prescribed drugs in hospital settings worldwide because of their indispensable role in the prevention and treatment of infectious diseases. Their

discovery transformed medicine by significantly reducing morbidity and mortality associated with bacterial, viral, fungal, and parasitic infections; however, the irrational and excessive use of these drugs has accelerated the emergence of antimicrobial resistance (AMR). AMR occurs when microorganisms evolve mechanisms to withstand antimicrobial agents, rendering standard treatments ineffective and leading to prolonged illness, increased healthcare costs, and higher mortality rates globally^{1,2}. The World Health Organization (WHO) recognizes AMR as one of the top ten global public health threats and has established the Global Action Plan to improve antimicrobial use and surveillance^{2,3}.

Tertiary care hospitals, which manage complex and critical cases, often exhibit high antimicrobial exposure due to the severity of infections, frequent surgical procedures, and reliance on broad-spectrum agents. These settings thus serve as crucial venues for monitoring antimicrobial utilization and guiding stewardship interventions^{4,5}. Drug utilization studies (DUS), as defined by the WHO, employ standardized prescribing indicators to evaluate patterns of drug use and identify irrational prescribing practices, such as polypharmacy, preference for injectable formulations, and extensive use of broad-spectrum antibiotics^{6,7}. Evidence from tertiary care studies indicates that a substantial proportion of antimicrobial prescriptions are empirical rather than culture-guided, often involving combinations of antibiotics with overlapping spectra, which can further drive resistance and increase adverse effects^{4,8}.

Antimicrobial Stewardship Programs (ASPs) aim to improve prescribing quality by promoting optimal drug choice, dose, route, and duration of therapy, and have been associated with reduced consumption of broad-spectrum agents and better adherence to clinical guidelines^{9,10}. Despite these initiatives, inappropriate prescribing remains a pervasive challenge in many hospitals, underscoring the need for regular prescription audits using WHO indicators and targeted stewardship strategies to enhance rational antimicrobial use and curb AMR's advance^{6,11}.

Materials and Methods

A hospital-based cross-sectional observational drug utilization study was conducted in a tertiary care teaching hospital over a period, from October 2024 to April 2025. The study population comprised prescriptions of inpatients admitted to the medical and surgical wards that contained at least one antimicrobial agent. Adult inpatients aged 18 years and above who received one or more antimicrobial drugs were included in the study. Prescriptions of pediatric patients, outpatient prescriptions, and those that were incomplete or illegible were excluded from analysis. A total of 600 prescriptions were included using convenience sampling. Data were collected retrospectively from patient case records and prescription charts using a structured data collection form. The variables recorded included demographic details, total number of drugs per prescription, type and class of antimicrobial agents prescribed, route of administration, use of fixed-dose combinations, prescribing by generic or brand names, and inclusion of drugs from the National List of Essential Medicines (NLEM). Antimicrobial utilization and prescribing practices were assessed using World Health Organization (WHO) core prescribing indicators. The collected data were entered into Microsoft Excel and analyzed using descriptive statistical methods. Results were expressed as frequencies, percentages, means, and standard deviations. Ethical approval for the study was obtained from the Institutional Ethics Committee, and patient confidentiality was strictly maintained throughout the study.

Results

A total of 600 inpatient prescriptions containing at least one antimicrobial agent were evaluated during the study period.

Demographic Profile

Of the 600 prescriptions analyzed, 348 (58%) belonged to male patients and 252 (42%) to female patients, indicating a male predominance. The majority of patients were in the age group of 41–60 years (264; 44%), followed by those aged 61–80 years (156; 26%). Patients aged 18–40 years constituted 180 (30%) of the study population (Table 1).

Prescription Analysis

The mean number of drugs prescribed per prescription was 4.1 ± 1.3 , reflecting a moderate degree of polypharmacy. The average number of antimicrobial agents prescribed per prescription was 1.8 ± 0.6 (Table 2).

Pattern of Antimicrobial Use

Analysis of antimicrobial classes revealed that beta-lactam antibiotics were the most commonly prescribed class, accounting for 42% of total antimicrobial prescriptions. This was followed by fluoroquinolones (18%), aminoglycosides (14%), and macrolides (11%). Other antimicrobial agents, including antifungals and miscellaneous drugs, constituted 15% of prescriptions (Table 3, Figure 1). With respect to the route of administration, parenteral antimicrobials were prescribed in 54% of cases, whereas oral formulations accounted for 46% of prescriptions, indicating a higher utilization of injectable antimicrobial therapy among inpatients (Table 4, Figure 2).

WHO Prescribing Indicators

Evaluation of antimicrobial prescribing practices using WHO core prescribing indicators showed that only 38% of antimicrobial agents were prescribed by their generic names. Drugs listed in the National List of Essential Medicines (NLEM) accounted for 62% of antimicrobial prescriptions. Fixed-dose combinations constituted 27% of total antimicrobial prescriptions (Table 5, Figure 3).

Tables

Table 1. Demographic characteristics of patients (n = 600)

Parameter	Number	Percentage (%)
Gender		
Male	348	58
Female	252	42
Age group (years)		
18–40	180	30
41–60	264	44
61–80	156	26

Table 2. Prescription indicators

Parameter	Mean $\pm$ SD
Average number of drugs per prescription	4.1 ± 1.3
Average number of antimicrobials per prescription	1.8 ± 0.6

Table 3. Distribution of antimicrobial classes prescribed

Antimicrobial class	Percentage (%)
Beta-lactams	42
Fluoroquinolones	18
Aminoglycosides	14
Macrolides	11
Others	15

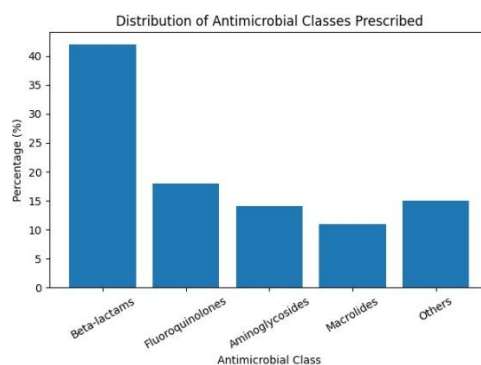
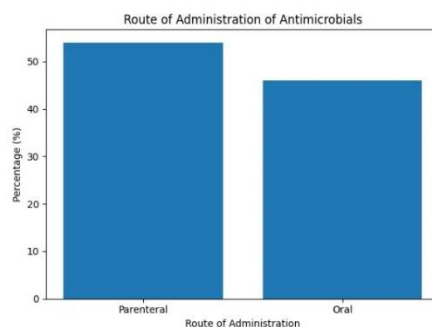
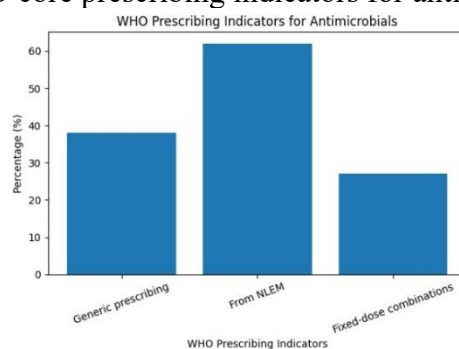
Table 4. Route of administration of antimicrobials

Route	Percentage (%)
Parenteral	54

Route	Percentage (%)
Oral	46

Table 5. WHO prescribing indicators for antimicrobials

Indicator	Percentage (%)
Prescribed by generic name	38
From NLEM	62
Fixed-dose combinations	27

Figure 1: Distribution of antimicrobial classes prescribed.**Figure 2: Route of administration of antimicrobial agents****Figure 3: WHO core prescribing indicators for antimicrobial agents.**

Discussion

The present study highlights important trends in antimicrobial prescribing practices in a tertiary care hospital and identifies areas requiring intervention to promote rational drug use. The average number of drugs per prescription (4.1 ± 1.3) observed in this study indicates a moderate degree of polypharmacy. Similar findings have been reported by Karande et al. and Rajopadhye et al., who

documented an average of 3.8–4.5 drugs per prescription in tertiary care hospitals in India, reflecting the complexity of inpatient management and the presence of multiple comorbidities^{1,2}.

Beta-lactam antibiotics were the most frequently prescribed antimicrobial class (42%) in the present study. This observation is consistent with studies by Sharma et al., Gopalakrishnan et al., and Chaudhary et al., who reported predominant use of beta-lactams due to their broad-spectrum activity, favorable safety profile, and widespread availability^{3–5}. The high proportion of parenteral antimicrobial use (54%) observed in this study is comparable to findings by Patel et al. and Kotwani et al., indicating a preference for injectable formulations in hospitalized patients^{6,7}. However, excessive use of parenteral antimicrobials may increase treatment costs, prolong hospital stay, and raise the risk of catheter-related complications if not clinically justified.

Generic prescribing was relatively low (38%) in the present study, a finding similar to reports by Holloway and van Dijk and Shelat et al., emphasizing the need for prescriber sensitization and policy-level interventions to encourage generic prescribing^{8,9}. Although 62% of antimicrobials were prescribed from the National List of Essential Medicines (NLEM), further improvement is warranted to ensure cost-effective and rational antimicrobial therapy. Overall, these findings underscore the importance of regular prescription audits and strengthening antimicrobial stewardship programs to reduce irrational prescribing and combat antimicrobial resistance^{10–12}.

Conclusion

This single-center study did not assess microbiological culture–sensitivity data or clinical outcomes, limiting generalizability. Nevertheless, it revealed high use of broad-spectrum and injectable antimicrobials with suboptimal generic prescribing, emphasizing the need for continuous prescription audits, prescriber education, and strengthened antimicrobial stewardship programs.

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