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Original Research Article

A prospective study on the utilization pattern of antimicrobial agents among inpatients in the medicine ward of K. R. Hospital, Mysore Medical College and Research Institute

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ABSTRACT

Background: Drug utilization studies are crucial to assess prescribing patterns and promote rational use of antimicrobial agents, thereby reducing resistance and treatment costs.
Methods: A prospective observational study was conducted on 100 inpatients receiving antimicrobial therapy. Data were collected from patient records and analyzed using descriptive statistics to determine demographic details, prescription patterns and WHO core prescribing indicators.
Results: Of the 100 patients, 56% were female and 44% were male. Respiratory tract infections were the most common diagnosis (32%), followed by gastrointestinal infections (23%), urinary tract infections (15%) and viral fever (11%). Cephalosporins were the most frequently prescribed antimicrobials with ceftriaxone in 38% of prescriptions, followed by penicillin (28%), fluroquinolones were-(15%), aminoglycosides-(8%) and macrolides-(6%), carbapenems-5%. Generic prescriptions accounted for only 62% of total drugs. Furthermore, 78% of drugs were prescribed from the essential drug list. The average number of drugs per prescription was 4.2.
Conclusions: Antimicrobial utilization showed predominant use of cephalosporins and piperacillin combinations. Although most drugs were prescribed from the essential list, adherence to rational prescribing practices can be improved through antibiotic policies and regular prescription audits to minimize resistance and optimize cost-effectiveness.

Keywords: Antimicrobial utilization, Drug utilization study, WHO prescribing indicators, Rational use of medicines, Cephalosporins, Respiratory tract infection

INTRODUCTION

Antimicrobials are among the most frequently prescribed drugs in hospital settings and play a crucial role in the management of infectious diseases. However, irrational and inappropriate use of these drugs has contributed significantly to the global burden of antimicrobial resistance (AMR).[1] The emergence of multi-drug resistant organisms is now a major public health concern, particularly in developing countries like India, where over-prescription, polypharmacy, self-medication and lack of prescription audits are common.[2,3] Drug Utilization Studies (DUS) offer a scientific approach to evaluating prescribing trends, identifying irrational practices, and promoting rational use of drugs.[4] These studies provide valuable data that can help formulate hospital-specific

guidelines, support antimicrobial stewardship programs (ASPs) and optimize patient outcomes.[5] The World Health Organization (WHO) recommends regular surveillance of antimicrobial usage patterns using standard indicators such as Defined daily dose (DDD) and Anatomical therapeutic chemical (ATC) classification to monitor trends and guide corrective actions.[6] In medicine wards, empirical use of broad-spectrum antimicrobials without microbiological confirmation is common, which increases the risk of resistance, adverse drug reactions and unnecessary economic burden.[7]

Moreover, periodic analysis of antimicrobial prescribing patterns helps ensure adherence to national and institutional guidelines, improve quality of care and reduce the length of hospital stay and healthcare costs.[8] Given this background, a prospective study assessing the utilization pattern of antimicrobial drugs in the medicine ward is essential to identify existing gaps in prescribing practices and to promote rational, evidence-based use of antimicrobials in a tertiary care hospital setting.

METHODS

Study design and setting

This prospective, observational study was conducted in the Department of General Medicine at Mysore Medical College and Research Institute, Mysuru, Karnataka, India, a tertiary care teaching hospital, over a period of three months (from September 2025 to November 2025).

Sample size

The sample size was estimated to be 100 using an estimation technique based on the expected prevalence of antimicrobial use among inpatients.

Ethical considerations

The study was conducted after obtaining approval from the Institutional Ethics Committee of Mysore Medical College and Research Institute (Approval No.: *MMC EC 72.25-IS*). Written informed consent was obtained from all participants prior to inclusion in the study. Confidentiality of patient information was strictly maintained.

Selection of participants

Inclusion criteria

Inpatients admitted to the general medicine ward during the study period. Patients receiving at least one antimicrobial agent age ≥18 years.

Exclusion criteria

Outpatients. Patients admitted to other departments or referred from ICU/surgery. Patients not receiving antimicrobial therapy.

Data collection

Relevant data including patient demographics, diagnosis, antimicrobial agents prescribed (generic name, dose, route of administration and duration of therapy) were collected from patient case records.

Statistical analysis

All collected data were entered into Microsoft Excel and analysed using appropriate descriptive statistics. Categorical variables were expressed as frequencies and percentages. Results were presented in figures as appropriate.

Prescribing indicators (WHO/INRUD)

The WHO/INRUD prescribing indicators evaluated included the total number of antimicrobials prescribed, the average number of antimicrobials per prescription, the percentage of antimicrobials prescribed by their generic names, the percentage of antimicrobials prescribed from the Essential Medicines List, and the duration of antimicrobial therapy in days.

RESULTS

A total of 100 inpatients receiving antimicrobial therapy were included in the study (Figure 1). Of the 100 patients, 46 were males and 54 were females, indicating a slight female predominance (Figure 1).

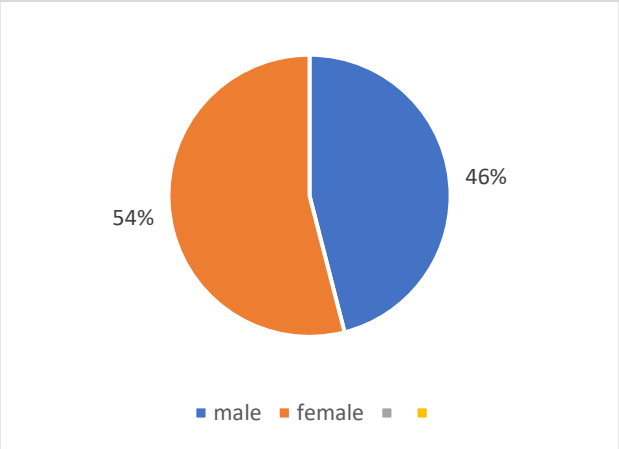

Figure 1: Gender distribution of the study population.

The figure 2 the distribution of infections shows that respiratory tract infections constitute the largest proportion, accounting for 32% of the total cases. This is followed by urinary tract infections, which represent 23%. Gastrointestinal infections contribute 15%, indicating a moderate prevalence compared to other categories. Viral fever accounts for 11% of cases, while skin infections comprise 9%. The remaining 10% fall under miscellaneous conditions, representing a heterogeneous group of less frequently encountered infections. Overall,

the data indicate that respiratory and urinary tract infections together form more than half of the total burden, highlighting their significant clinical prevalence in the study population.

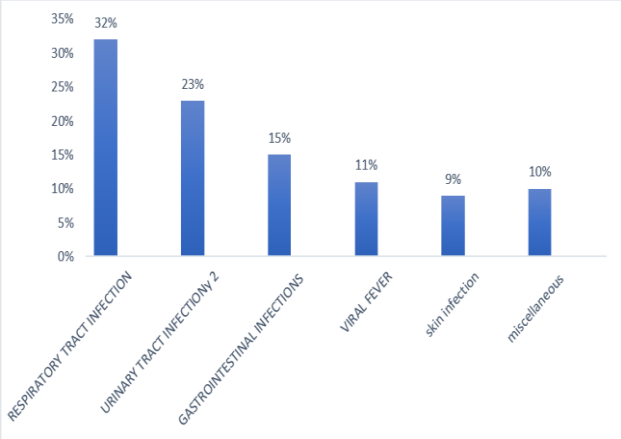

Figure 2: Indications for antimicrobial use.

Cephalosporins were the most frequently prescribed class of antibiotics, accounting for 38% of total prescriptions. This was followed by penicillins at 28%, indicating substantial utilization of β-lactam antibiotics. Fluoroquinolones constituted 15% of prescriptions, while aminoglycosides accounted for 8%. Macrolides and carbapenems were less commonly used, contributing 6% and 5%, respectively.

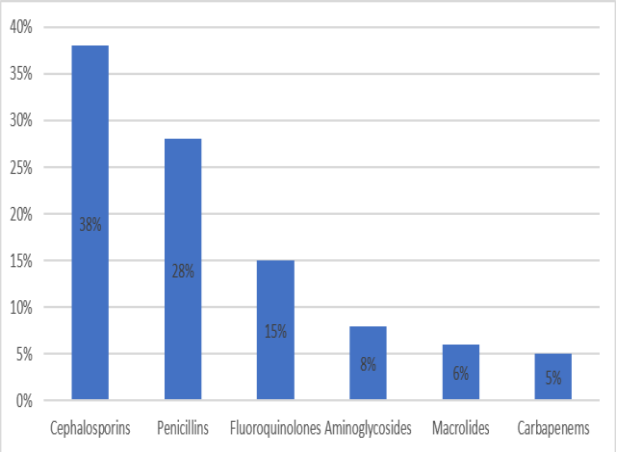

Figure 3: Percentage of antimicrobial prescribed.

Overall, the prescribing pattern demonstrates a predominance of cephalosporins and penicillins, reflecting their central role in the management of infectious conditions in the study setting.

The WHO/INRUD prescribing indicators showed that a total of 142 antimicrobials were prescribed among 100 prescriptions studied. The average number of antimicrobials per prescription was 1.42, which is within the WHO recommended limit of ≤2. The percentage of antimicrobials prescribed by generic name was 62%. Additionally, 72% of antimicrobials were prescribed from the National list of essential medicines (NLEM 2022/WHO EML), indicating fair adherence with scope for improvement. The duration of antimicrobial therapy ranged from 3 to 14 days depending on the type and severity of infection.

DISCUSSION

Our study demonstrated that respiratory tract infections (32%) and urinary tract infections (23%) were the most common indications for antimicrobial therapy. Similar findings were reported by Ramesh et al in a tertiary care hospital in Karnataka, where respiratory infections accounted for 35% of cases, followed by urinary tract infections (21%).[9] This trend reflects the high burden of community and hospital acquired respiratory and urinary infections in Indian clinical practice.

Cephalosporins (38%) were the most commonly prescribed antimicrobial class in our study, followed by penicillins with β-lactamase inhibitors (28%). This is consistent with the results of Sharma et al, who found cephalosporins to be the leading class (42%) in antimicrobial prescriptions among inpatients.[10] The preference for broad-spectrum cephalosporins may be attributed to their wide coverage and frequent use in empirical therapy. However, such widespread use raises concerns regarding antimicrobial resistance.

The average number of antimicrobials per prescription (1.42) in our study was within the WHO/INRUD standard (≤2). Similar averages were reported in studies conducted in Mysore and Bangalore, ranging from 1.3 to 1.6.[11,12] Although this suggests relatively rational prescribing, instances of polypharmacy (≥2 antimicrobials) were noted in severe infections, a pattern also observed in Basu et al (2021).[13] Generic prescribing in our study (62%) was lower than the WHO ideal of 100%. A study by Patel et al reported only 58% of antimicrobials prescribed by generic name, highlighting that brand-name prescribing remains a widespread issue in India.[14] Encouraging physicians to prescribe by generic names could improve cost-effectiveness and patient access to medicines. Adherence to the National list of essential medicines (NLEM 2022) in our study was 78%, which is comparable to reports from other tertiary care centres in India, ranging between 70-85%. While encouraging, further improvement is needed to ensure full compliance.

Limitations

The study was limited by its single-center design and a relatively small sample size of only 100 patients, which may not adequately represent the overall antimicrobial utilization pattern in a larger population. In addition, the exclusion of patients from the ICU, surgical wards, pediatric department and outpatient departments may have led to an underestimation of the overall antimicrobial utilization pattern in the hospital.

CONCLUSION

Our study demonstrates that respiratory and urinary tract infections were the predominant indications for antimicrobial use in hospitalized patients. Cephalosporins and penicillin derivatives were the most frequently prescribed agents. The predominance of broad-spectrum agents, particularly cephalosporins and penicillin derivatives, highlights their widespread use in empirical therapy for hospitalized patients. While such use may provide effective initial coverage, it also raises concerns about promoting antimicrobial resistance if not carefully monitored. The average number of antimicrobials per prescription remained within WHO standards, though polypharmacy was observed in severe cases. Prescribing by generic name was suboptimal and adherence to the essential medicine list was good but not complete. The duration of therapy was generally rational, with treatment courses tailored to the type and severity of infection.

Taken together, these findings highlight both strengths and gaps in prescribing practices. Strengthening antimicrobial stewardship through increased generic prescribing, strict adherence to essential medicine guidelines and cautious use of broad-spectrum antibiotics is essential to optimize therapy, reduce costs and combat the growing challenge of antimicrobial resistance in tertiary care hospitals.

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