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Research Article

A STUDY ON THE PRESCRIPTION PATTERN OF THE ANTIBIOTICS IN A TERTIARY CARE HOSPITAL

Dr. Vanishree P Babladi[1], Dr. Pooja V Salimath[1], Dr. Syed Afzal Uddin Biyabani[1]* Channabasappa[2], Deepti Revoore[2]

[1]Assistant Professor, *[1]Research Scholar,Dept. of Pharmacy Practice, Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi, Karnataka, India.
[1]Associate Professor and Research Scholar, Dept. of Pharmacy Practice, Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi, Karnataka, India.
[2]Pharm. D, Dept. of Pharmacy Practice, Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi, Karnataka, India.

Corresponding Author*: Dr. Syed Afzal Uddin Biyabani, Research Scholar,Dept. of Pharmacy Practice, Matoshree Taradevi Rampure Institute of Pharmaceutical Sciences, Kalaburagi, Karnataka, India.

Email ID: biyabani786786@gmail.com

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ABSTRACT

Background: Antibiotic prescribing patterns in hospitalized patients are of increasing global concern due to rising antimicrobial resistance, irrational use, and associated adverse outcomes. Evidence suggests that 20–50% of antimicrobial prescriptions worldwide are inappropriate, contributing significantly to resistance and prolonged hospital stay. Evaluating antibiotic utilization patterns in tertiary care hospitals is essential to promote rational prescribing and strengthen antimicrobial stewardship programs.

Methods: A prospective observational study was conducted over a period of six months in a tertiary care hospital. A total of 150 inpatients receiving antibiotic therapy were randomly enrolled based on predefined inclusion and exclusion criteria. Data on demographic characteristics, principal diagnosis, duration of hospital stay, and antibiotic utilization patterns were collected and analysed. Descriptive statistics were used to summarize data. The chi-square test was applied to assess associations between categorical variables, and a p-value <0.05 was considered statistically significant.

Results: Among the 150 patients, males constituted 52.7% and females 47.3%. A total of 175 antibiotics were prescribed, with third-generation cephalosporins being the most frequently utilized class (59.42%). Infectious diseases were the leading indication for antibiotic therapy (30.67%). A statistically significant association was observed between principal diagnosis and duration of hospital stay (p <0.05). Intravenous administration was the predominant route (95.43%). Monotherapy was significantly more common than combination therapy (p <0.001).

Conclusion: The study highlights a predominant use of broad-spectrum antibiotics, particularly third-generation cephalosporins, in hospitalized patients. These findings underscore the urgent need for robust antimicrobial stewardship interventions aimed at optimizing antibiotic selection, minimizing unnecessary broad-spectrum use, and reducing the risk of antimicrobial resistance.

KEYWORDS: Antibiotics, Antimicrobials, Prescribing Pattern, Antimicrobial Resistance, Antimicrobial Stewardship.

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Introduction

Antibiotics are essential therapeutic agents used for the treatment and prevention of bacterial infections and represent one of the most significant advances in modern medicine[1]. Since the discovery of penicillin, antibiotics have dramatically reduced infection-related morbidity and mortality and have made possible complex medical procedures such as major surgeries, organ transplantation, intensive care management, and cancer chemotherapy[2]. Despite these benefits, antibiotics are increasingly threatened by widespread and often inappropriate use, which has contributed to the global emergence of antimicrobial resistance (AMR)[3].

Antibiotics are among the most commonly prescribed drugs in both community and hospital settings, particularly in tertiary care hospitals where critically ill patients, invasive procedures, and multidrug-resistant organisms are frequently encountered[4]. Prescribing decisions are often influenced by clinical judgment, diagnostic uncertainty, patient expectations, and limited access to timely microbiological data[5]. As a result, antibiotics are frequently prescribed empirically, sometimes without clear clinical indications or microbiological confirmation, leading to irrational use[6].

Inappropriate antibiotic prescribing including unnecessary use for viral infections, inappropriate drug selection, incorrect dosing, and prolonged duration has been associated with adverse drug reactions, increased healthcare costs, prolonged hospital stays, and poor clinical outcomes[7,8]. Globally, antibiotic consumption has increased substantially over recent decades, with low- and middle-income countries, including India, contributing significantly to this rise[9]. Hospital-based studies indicate that up to 50% of inpatients receive antibiotics, and approximately 30% of prescriptions may be inappropriate or unnecessary[10].

The World Health Organization recognizes AMR as one of the top global public health threats, with resistant bacterial infections responsible for millions of deaths annually[11]. In response, antimicrobial stewardship programs promote rational antibiotic use through evidence-based guidelines, prescription audits, education, and multidisciplinary collaboration, including the active involvement of clinical pharmacists[12,13]. Regular evaluation of antibiotic prescribing patterns is a key component of stewardship efforts, enabling the identification of irrational practices and areas requiring intervention[14].

In this context, the present study aims to analyse the prescription patterns of antibiotics in a tertiary care hospital through a prospective review of inpatient prescriptions, focusing on drug selection, dosage, and duration. The findings are expected to provide valuable insights into current prescribing practices, support rational antibiotic use, and contribute to institutional strategies for combating antimicrobial resistance[15].

Objectives of the Study

General Objective

To analyse the prescription patterns of antibiotics among inpatients in a tertiary care hospital.

Specific Objectives

- To identify the most commonly prescribed antibiotics.
- To evaluate the demographic characteristics of patients receiving antibiotic therapy.
- To assess antibiotic prescriptions with respect to:

1. Class of drug
2. Dose
3. Strength
4. Dosage form
5. Route of administration

- To evaluate the duration of hospital, stay among patients receiving antibiotics.

Methodology

Study Design: A prospective observational study.

Study Site: The study was conducted at HKES's Basaveshwar Teaching and General Hospital, Kalaburagi, a tertiary care teaching hospital.

Study Duration: The study was carried out over a period of six months.

Source of Data: Data were collected from patient medical records, prescription charts, and relevant laboratory reports of inpatients admitted to the General Medicine Department of the tertiary care hospital.

Study Population and Selection Criteria

Inclusion Criteria

- Patients of either gender
- Patients aged ≥18 years
- Patients prescribed at least one antibiotic
- Patients with or without comorbidities
- Patients admitted to the General Medicine Department
- Patients willing to participate and provide informed consent

Exclusion Criteria

- Patients aged <18 years
- Patients who were discharged against medical advice
- Patients who expired during hospitalization

Study Procedure

The present study was conducted in accordance with ethical

principles outlined in the Declaration of Helsinki. The study was initiated only after obtaining ethical clearance from the Institutional Review Board (IRB) of the study site. Prior to enrolment, all eligible patients or their legally authorized representatives were informed in detail about the objectives, methodology, potential benefits, and confidentiality aspects of the study. Written informed consent was obtained from each participant before inclusion.

The study population comprised hospitalized patients admitted to the General Medicine Department who met the predefined inclusion and exclusion criteria. Patient recruitment was carried out on a prospective basis during the study period. All enrolled patients were followed from the time of admission until discharge.

The collected data included demographic details such as age and gender, clinical information including primary diagnosis and associated comorbid conditions, and comprehensive antibiotic-related details. Antibiotic data comprised the name of the drug, pharmacological class, dosage form, strength, prescribed dose, route of administration, frequency, and duration of therapy. The use of fixed-dose combinations, switching of antibiotics during therapy, and the use of single or multiple antibiotics were also recorded. Additionally, the length of hospital stay for each patient was documented to assess its association with antibiotic utilization patterns.

All collected data were anonymized to maintain patient confidentiality. The data were subsequently entered into a database and subjected to appropriate statistical analysis to evaluate prescribing patterns, frequency of antibiotic use, and adherence to rational antibiotic prescribing principles.

Statistical Analysis

Data collected during the study were entered into Microsoft Excel and analysed using Statistical Package for the Social Sciences (SPSS) version 31.0. Categorical variables including demographic characteristics, principal diagnosis, duration of hospital stay, antibiotic class, route of administration, and number of antibiotics prescribed per patient were summarized using frequencies and percentages. Associations between categorical variables were assessed using the Chi-square (χ^2) test. A p-value < 0.05 was considered statistically significant. All statistical analyses were performed using two-tailed tests.

Results

Demographic Characteristics of the Study Population

A total of 150 inpatients receiving antibiotic therapy were included in the study. The demographic distribution of patients with respect to gender and age is summarized in Table 1. Out of 150 patients, 79 (52.7%) were male and 71 (47.3%) were female, indicating a slightly higher proportion of male patients in the study population. Age-wise analysis showed that the majority of patients belonged to the 18–27 years age group (44 patients, 29.3%), followed by the 38–47 years age group (25 patients, 16.7%). Patients aged 58–67 years constituted 22 (14.7%), while those aged 28–37 years and 48–57 years each accounted for 20 patients (13.3%). Elderly patients aged 68–77 years represented 13 (8.7%), whereas patients aged 78–87 years and 88–97 years accounted for 3 (2%) each. Overall, the study population demonstrated a broad age distribution with a predominance of young and middle-aged adults (Table 1).

Table 1: Demographic Distribution of Patients (n = 150)

S. No.	Variable	Category / Age Group (Years)	Number of Patients	Percentage (%)
1.	Gender	Male	79	52.7
2.	Gender	Female	71	47.3
3.	Age	18 – 27	44	29.3
4.	Age	28 – 37	20	13.3
5.	Age	38 – 47	25	16.7
6.	Age	48 – 57	20	13.3
7.	Age	58 – 67	22	14.7
8.	Age	68 – 77	13	8.7
9.	Age	78 – 87	3	2
10.	Age	88 – 97	3	2

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Principal Diagnosis and Duration of Hospital Stay

The distribution of patients based on principal diagnosis and duration of hospital stay is presented in Table 2. Infectious diseases constituted the most common primary diagnosis, accounting for 46 patients (30.67%), followed by gastrointestinal disorders and respiratory tract infections, each observed in 31 patients (20.67%). Hepatic disorders were noted in 15 patients (10.00%), while urinary tract infections accounted for 13 patients (8.67%). Other diagnoses such as anaemia, renal disorders, central nervous system disorders, hypothyroidism, and benign paroxysmal positional vertigo were less frequently reported.

Analysis of hospital stay duration showed that the majority of patients had a hospital stay of 3 days (63 patients, 42.00%), followed by 4 days (37 patients, 24.67%) and 5 days (28 patients, 18.67%). Short hospital stays of 2 days were observed in 3 patients (2.00%), while prolonged hospitalizations of 7 days or more were less common (Table 2).

Antibiotic Utilization Pattern

A total of 175 antibiotics were prescribed to 150 inpatients during the study period. The overall antibiotic utilization pattern—including class of antibiotics, route of administration, number of antibiotics per patient, and use of fixed-dose combinations—is summarized in Table 3.

Third-generation cephalosporins were the most frequently prescribed antibiotic class, accounting for 104 (59.42%) of all antibiotics, followed by beta-lactam antibiotics (44, 25.14%). Other classes such as nitroimidazoles (12, 6.85%), penicillins (9, 5.14%), macrolides (3, 1.71%), tetracyclines (2, 1.14%), and sulphonamides (1, 0.60%) were used less frequently.

With respect to the route of administration, intravenous antibiotics predominated (167, 95.43%), while oral formulations accounted for only 8 (4.57%) prescriptions. Analysis of the number of antibiotics per patient revealed that monotherapy was most common (126 patients, 84%), followed by dual therapy (23 patients, 15.33%) and triple therapy (1 patient, 0.67%). Additionally, 37 antibiotics (21.14%) were prescribed as fixed-dose combinations, while 138 (78.86%) were prescribed as single-drug formulations (Table 3).

Table 2: Distribution of Patients by Principal Diagnosis and Duration of Hospital Stay (n = 150)

S. No.	Category	Sub-category	Number of Patients	Percentage (%)
1.	Diagnosis	Anaemia	8	5.33
2.	Diagnosis	Benign paroxysmal positional vertigo	1	0.67
3.	Diagnosis	Central nervous system disorders	2	1.33
4.	Diagnosis	Gastrointestinal disorder	31	20.67
5.	Diagnosis	Hepatic disorder	15	10
6.	Diagnosis	Hypothyroidism	1	0.67
7.	Diagnosis	Infectious disease	46	30.67
8.	Diagnosis	Renal disorder	2	1.33
9.	Diagnosis	Respiratory tract infection	31	20.67
10.	Diagnosis	Urinary tract infection	13	8.67
11.	Hospital stays	2 days	3	2
12.	Hospital stays	3 days	63	42
13.	Hospital stays	4 days	37	24.67
14.	Hospital stays	5 days	28	18.67
15.	Hospital stays	6 days	9	6
16.	Hospital stays	7 days	5	3.33
17.	Hospital stays	8 days	1	0.67
18.	Hospital stays	11 days	1	0.67
19.	Hospital stays	12 days	2	1.33
20.	Hospital stays	18 days	1	0.67

Table 3: Antibiotic Prescribing Pattern among Study Population (N = 150 Patients; 175 Antibiotics)

S. No.	Category	Sub-category	Total No.	Percentage (%)
1.	Antibiotic class	Beta-lactam antibiotics	44	25.14
2.	Antibiotic class	Macrolides	3	1.71
3.	Antibiotic class	Nitroimidazole	12	6.85
4.	Antibiotic class	Penicillin	9	5.14
5.	Antibiotic class	Sulphonamides	1	0.6
6.	Antibiotic class	Tetracyclines	2	1.14
7.	Antibiotic class	Third-generation cephalosporins	104	59.42
8.	Route of administration	Oral	8	4.57
9.	Route of administration	Intravenous	167	95.43
10.	Number of antibiotics	One antibiotic	126	84
11.	Number of antibiotics	Two antibiotics	23	15.33
12.	Number of antibiotics	Three antibiotics	1	0.67
13.	Formulation type	Fixed-dose combinations	37	21.14
14.	Formulation type	Other formulations	138	78.86

Table 4: Summary of Statistical Analysis and P-values

S. No.	Variables Analyzed	Comparison/ Grouping	Statistical Test Used	P-value	Significance
1.	Gender distribution	Male vs Female	Chi-square test	0.51	Not significant
2.	Principal diagnosis vs hospital stays	≤4 days vs ≥5 days	Chi-square test	0.032	Significant
3.	Antibiotic class utilization	Third-generation cephalosporins vs other classes	Chi-square test	<0.001	Highly significant
4.	Route of antibiotic administration	Intravenous vs Oral	Chi-square test	<0.001	Highly significant
5.	Number of antibiotics per patient	Monotherapy vs Combination therapy	Chi-square test	<0.001	Highly significant

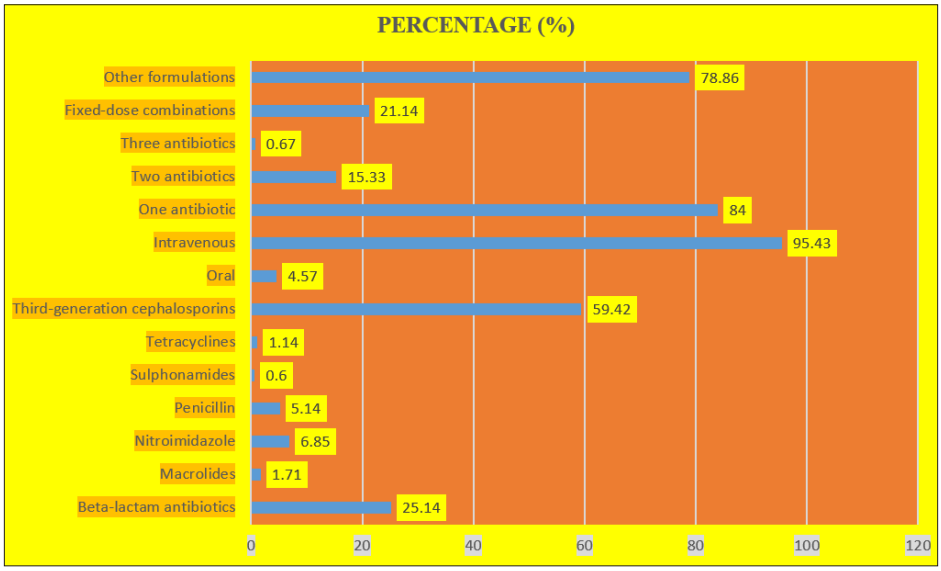

Figure 1: Antibiotic Prescribing Pattern among Study Population (N = 150 Patients; 175 Antibiotics)

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Discussion

The present study provides a comprehensive evaluation of antibiotic prescribing patterns in a tertiary care hospital and highlights prevailing trends, potential deviations from rational prescribing principles, and opportunities for antimicrobial stewardship interventions. A key finding of this study was the predominant use of broad-spectrum antibiotics, particularly third-generation cephalosporins, reflecting common empirical prescribing practices in tertiary care settings.

Antibiotics remain indispensable in modern medicine, having dramatically reduced morbidity and mortality associated with bacterial infections since their introduction. Their availability has enabled complex medical interventions, including invasive surgeries, intensive care management, and immunosuppressive therapies. However, the widespread and often inappropriate use of antibiotics has contributed significantly to the global burden of antimicrobial resistance (AMR), which threatens the effectiveness of existing therapies and poses a major challenge to public health, particularly in developing countries. This situation underscores the need for continuous evaluation of antibiotic utilization patterns, especially in tertiary care hospitals where critically ill and vulnerable patients frequently require antimicrobial therapy.

In the present study, 150 inpatient prescriptions were analysed, comprising 79 male (52.7%) and 71 female (47.3%) patients. A total of 175 antibiotics were prescribed, indicating frequent use of antimicrobial therapy among hospitalized patients. The highest antibiotic utilization was observed in the 18–27-year age group, a finding that may be attributed to increased hospital admissions for infectious and febrile illnesses in young adults, consistent with observations reported in other Indian studies[16-18].

The most frequently prescribed antibiotic was ceftriaxone, accounting for 104 prescriptions (59.42%), followed by beta-lactam antibiotics, nitroimidazoles, penicillins, and carbapenems. Similar prescribing trends have been reported by Kaur et al.[16] and Joshi et al.[22], where ceftriaxone constituted the largest proportion of antibiotics prescribed in tertiary care hospitals. Other studies conducted across different regions of India have also documented a high reliance on third-generation cephalosporins, reflecting their broad spectrum of activity, favorable pharmacokinetic profile, and convenience for empirical therapy[17,20,23,25].

Antibiotics were most commonly prescribed for infectious diseases presenting with fever, followed by gastrointestinal and respiratory tract infections, a pattern consistent with earlier reports from tertiary care institutions[19,21]. The preference for ceftriaxone may be explained by its long half-life, excellent tissue penetration, and efficacy against both Gram-positive and Gram-negative organisms, making it a preferred choice for initial empirical treatment in undifferentiated infections, sepsis, and community-acquired infections.

The study also revealed a high reliance on intravenous antibiotic therapy, with 95.43% of antibiotics administered via the parenteral route. While intravenous therapy is clinically justified in acutely ill or unstable patients, prolonged or unnecessary use of injectable antibiotics raises concerns related to cost-effectiveness, patient discomfort, catheter-related complications, and increased risk of hospital-acquired infections. Similar findings have been reported in studies by Ravi et al[17]. and Vyshnavi et al[20]., emphasizing the need for timely intravenous-to-oral switch strategies where clinically appropriate.

From a pharmacoeconomic and stewardship perspective, the predominance of broad-spectrum injectable antibiotics, particularly ceftriaxone, may contribute to increased healthcare expenditure and selection pressure for resistant organisms. The observed prescribing pattern reflects a clinical culture driven by urgency, diagnostic uncertainty, and preference for empirical broad-spectrum coverage factors commonly reported in tertiary care settings[18,21,24].

Rational antibiotic prescribing requires adherence to evidence-based guidelines, utilization of culture and sensitivity testing, and periodic review of ongoing therapy through antimicrobial stewardship programs. Several studies have demonstrated that compliance with standard treatment guidelines and stewardship interventions significantly improves prescribing quality and reduces unnecessary antibiotic use[16,19,23]. The findings of the present study reinforce the need for structured antimicrobial stewardship programs, regular prescription audits, clinician education, and active involvement of clinical pharmacists to promote rational antibiotic use.

Overall, this study highlights the ongoing challenge of balancing effective empirical therapy with antimicrobial stewardship principles in tertiary care hospitals. Addressing these issues is essential to curb the progression of antimicrobial resistance and ensure sustainable use of antibiotics in clinical practice.

Conclusion

The present study demonstrates a high prevalence of antibiotic use among hospitalized patients, with a marked preference for broad-spectrum antibiotics, particularly third-generation cephalosporins, and predominantly intravenous administration. While such prescribing practices may be clinically appropriate in acute and severe infections, excessive reliance on broad-spectrum and injectable antibiotics can contribute to increased healthcare costs and the development of antimicrobial resistance. These findings highlight the importance of implementing robust antimicrobial stewardship programs, encouraging guideline-based prescribing, timely intravenous-to-oral switch therapy, and regular prescription audits. Strengthening

these measures can promote rational antibiotic use and help mitigate the growing challenge of antimicrobial resistance in tertiary care settings.

Ethical Clearance

The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Prior to initiation, the study protocol was reviewed and approved by the Institutional Ethics Committee / Institutional Review Board (IRB) of HKES's Basaveshwar Teaching and General Hospital, Kalaburagi. Written informed consent was obtained from all participants before enrolment. Confidentiality of patient information was strictly maintained, and data were used solely for research purposes.

Informed Consent

Written informed consent was obtained from all eligible participants after explaining the purpose, procedures, and potential benefits of the study in a language understandable to them. Participation was entirely voluntary, and patients were informed of their right to withdraw from the study at any time without affecting their medical care.

Conflict of Interest

The authors declare no conflict of interest related to this study.

Source of Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Limitations of the Study

Despite providing valuable insights into antibiotic prescribing practices, the present study has certain limitations. The study was conducted in a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings. The sample size was relatively small, and the study duration was limited to six months. Microbiological culture and sensitivity data were not consistently available, which restricted evaluation of appropriateness of antibiotic selection. Clinical outcomes and resistance patterns were not assessed, limiting correlation between prescribing practices and therapeutic effectiveness. Future multicentre studies with larger sample sizes and incorporation of microbiological data are recommended to overcome these limitations.

Strengths of the Study

- Prospective observational design
- Real-world evaluation of inpatient antibiotic use
- Inclusion of multiple prescribing parameters such as drug class, route, formulation, and duration
- Provides baseline data to support antimicrobial stewardship initiatives

Clinical Significance

The findings of this study emphasize the need for rational antibiotic prescribing and highlight areas where antimicrobial stewardship interventions can be strengthened. The results may assist clinicians, hospital administrators, and clinical pharmacists in optimizing antibiotic use, reducing unnecessary exposure to broad-spectrum agents, and combating antimicrobial resistance in tertiary care hospitals.

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Author Contributions

All authors contributed significantly to the conception, design, execution, and interpretation of the study. Data collection, analysis, and manuscript preparation were performed collaboratively. All authors reviewed and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to institutional and ethical regulations.

Patient Confidentiality Statement

All patient identifiers were removed during data collection and analysis. Confidentiality of patient information was strictly maintained, and data were anonymized to prevent identification of individual participants.

Role of Clinical Pharmacist

Clinical pharmacists played a supportive role in data collection, prescription review, and evaluation of antibiotic utilization patterns. Their involvement highlights the importance of pharmacist-led interventions in promoting rational antibiotic use and strengthening antimicrobial stewardship programs in hospital settings.

Implications for Practice

The findings of this study underscore the need for regular prescription audits, guideline-based antibiotic selection, and early intravenous-to-oral switch strategies. Implementation of antimicrobial stewardship programs with active participation of clinical pharmacists can improve prescribing practices, reduce healthcare costs, and minimize the development of antimicrobial resistance.

Recommendations

Based on the study findings, the following recommendations are proposed:

- Development and enforcement of hospital antibiotic

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prescribing guidelines
- Routine antimicrobial prescription audits and feedback to prescribers
- Promotion of culture and sensitivity testing prior to initiating therapy
- Strengthening antimicrobial stewardship programs
- Training and continuous medical education for healthcare professionals on rational antibiotic use

Future Scope

Future research should focus on multicentre studies with larger sample sizes and longer follow-up periods. Incorporation of microbiological culture data, resistance patterns, and clinical outcomes will provide a more comprehensive assessment of antibiotic appropriateness and effectiveness. Interventional studies assessing the impact of pharmacist-led stewardship programs are also warranted.

Compliance with Guidelines

The study was conducted in accordance with Good Clinical Practice (GCP) guidelines and applicable ethical standards. Reporting of the study follows standard observational study reporting principles.

Key Messages

- Broad-spectrum antibiotics dominate inpatient prescribing patterns
- Intravenous administration remains the preferred route in hospitalized patients
- Ceftriaxone is the most commonly prescribed antibiotic Antimicrobial stewardship is essential to curb irrational antibiotic use

Abbreviations

AM – Antimicrobials

AMR – Antimicrobial Resistance

ASPs – Antimicrobial Stewardship Programs

GCP – Good Clinical Practice

IRB – Institutional Review Board

WHO – World Health Organization

Conflicts of interest

There are no conflicts of interest.

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