ANTIBIOTIC PRESCRIBING PATTERNS IN EMERGENCY AND OUTPATIENT DEPARTMENTS OF A TERTIARY CARE HOSPITAL

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Abstract

Background: Antibiotic misuse is a key driver of antimicrobial resistance (AMR), particularly in low—and middle-income countries where antibiotic stewardship practices are often limited. This study aimed to evaluate antibiotic prescribing patterns in a tertiary care hospital's emergency and outpatient departments in Pakistan.

Methods: A retrospective observational study was conducted from January to March 2024 across four departments: Emergency, General OPD, IM Injection OPD, and IV Injection OPD. All patients who received antibiotics during this period were included. Data were collected from electronic records and manual prescription registers. Frequencies and percentages were used to analyze prescribing trends, most common diagnoses, and the route and type of antibiotics used.

Results: Among 2,002 patients (53.15% male; 46.85% female), 44.66% visited solely to receive prescribed medication without a documented diagnosis. The most commonly reported conditions were upper respiratory tract infections (3.60%), acute gastroenteritis (2.95%), and sore throat (1.85%). Ceftriaxone was the most frequently prescribed antibiotic (14.79%), especially in injection form, followed by amoxicillin-clavulanic acid (8.99%) and cefixime (6.54%). Injectable antibiotics were heavily utilized in IV and IM OPDs even for non-severe cases and conditions with likely viral etiology.

Conclusion: This study reveals a high prevalence of irrational antibiotic prescribing, including empirical use of broad-spectrum injectable antibiotics in outpatient and emergency settings. These practices may significantly contribute to antimicrobial resistance. Implementation of strict antibiotic stewardship programs and prescriber education is urgently needed to promote rational antibiotic use.

Keywords: Antibiotic prescribing, antimicrobial resistance, ceftriaxone, outpatient department, emergency department, Pakistan, irrational use, injectable antibiotics

Introduction

Antibiotic resistance has become a critical global health challenge, threatening the efficacy of life-saving treatments and increasing healthcare costs, morbidity, and mortality. The misuse and overprescription of antibiotics, especially in outpatient and emergency department (ED) settings, are among the leading contributors to antimicrobial resistance (AMR) worldwide. This problem is particularly pronounced in low- and middle-income countries (LMICs), including Pakistan, where the absence of strict antibiotic stewardship, empirical prescribing, and patient-driven demands significantly influences irrational antibiotic use [1,2].

Outpatient departments often act as the first point of contact for many of the population. However, in many instances, patients seek care only to receive medications rather than thorough clinical evaluations. In Pakistan, studies have shown that antibiotics are prescribed for 50–60% of patients visiting outpatient services, frequently without a confirmed diagnosis or bacterial culture testing [3,4]. Commonly encountered ailments in OPDs, such as upper respiratory tract infections (URTI), acute gastroenteritis, or sore throat, are often viral in origin and self-limiting, yet are still treated with broad-spectrum antibiotics such as ceftriaxone or amoxicillin-clavulanic acid [5,6].

Emergency departments further exacerbate the problem due to high patient turnover and the pressure to provide immediate relief. In many cases, physicians resort to empirical therapy, including injectable antibiotics, to manage undiagnosed or nonspecific symptoms, leading to potentially unnecessary exposure to powerful antimicrobials [7,8]. Ceftriaxone, in particular, has been identified as one of the most overused antibiotics in Pakistani tertiary care hospitals due to its wide availability and broad-spectrum activity [9].

Pakistan has a high burden of infectious diseases, but the indiscriminate use of antibiotics continues to outpace the actual need. A cross-sectional survey from tertiary care hospitals in Lahore and Karachi revealed that nearly 70% of antibiotic prescriptions in emergency and OPD settings were inconsistent with national or international prescribing guidelines [10]. The inappropriate use of antibiotics not only increases the risk of resistant infections but also results in unnecessary side effects and a financial burden on patients and healthcare systems.

Given the alarming rate of irrational antibiotic use in Pakistan, especially in ambulatory care settings, this study aims to assess current prescribing trends in emergency and outpatient departments. By analyzing the most frequently diagnosed conditions and corresponding antibiotic prescriptions, this study provides insight into patterns of empirical use. It highlights the urgent need for implementing antimicrobial stewardship programs across the board.

Methodology:

This retrospective, observational study was conducted at a tertiary care teaching hospital in Lahore, Pakistan, focusing on antibiotic prescribing trends in the Emergency Department, General Outpatient Department (OPD), IM Injection OPD, and IV Injection OPD. The study was carried out over three months, from January to March 2024. Data were extracted from electronic health records (EHRs) and manual prescription registers maintained at each department. The study included all patients, regardless of age or gender, who received at least one antibiotic during their visit to any of the four clinical departments during the specified timeframe. Patients referred directly for inpatient admission or who left without treatment were excluded.

The primary objective was to evaluate patterns in antibiotic prescription, specifically the frequency and route of administration (oral versus parenteral), diagnostic justification, and the proportion of empirical versus indication-based antibiotic use. Each prescription was reviewed to identify the diagnosis entered, if any, and the corresponding antibiotic prescribed. Where available, diagnoses were grouped into clinically relevant categories based on ICD-10 codes. Antibiotics were classified by generic name, dosage form, and strength. In cases where multiple antibiotics were prescribed, all were recorded individually to capture the full spectrum of prescribing behavior.

Data were anonymized before analysis to maintain patient confidentiality. Descriptive statistics were used to summarize the data, including frequencies and percentages for categorical variables such as antibiotic type, diagnosed condition, and department. The top ten most frequently prescribed

antibiotics and most commonly recorded diagnoses were identified and analyzed. Additionally, data were stratified by age group and gender to examine potential differences in prescribing patterns. All data analysis was performed using IBM SPSS Statistics version 26.0. The participating hospital's institutional review board (IRB) reviewed and approved the study protocol. As the study involved retrospective anonymized data, the need for informed consent was waived by the ethics committee.
Results:

A total of 2,002 patients were included in this study, comprising 1,064 males (53.15%) and 938 females (46.85%). The age distribution revealed that 18.37% of the patients were pediatric (≤12 years), 66.02% were adults (13–59 years), and 15.59% were elderly (≥60 years). Patients were evaluated across four clinical departments: Emergency Department, General Outpatient Department (OPD), IM Injection OPD, and IV Injection OPD. The most frequently recorded reason for patient visits overall was "to get prescribed medicine," accounting for 44.66% of all cases after combining those who came to receive medication with or without administration (Table 2). A significant proportion of patients in the Emergency Department were recorded as "Not Yet Diagnosed" (NYD), representing 18.33% of visits, yet ceftriaxone (injection, 1 gram) was prescribed in 16.66% of these cases, suggesting empirical use without a confirmed diagnosis (Table 1).

Table 1: OPD-Wise Common Diagnoses and Antibiotic Use

OPD Name	Most Common Condition	Frequency (%)	Most Common Antibiotic	Frequency (%)
Emergency Department	Not Yet Diagnosed (NYD)	18.33	Ceftriaxone (Injection, 1g)	16.66
General OPD	To get prescribed medicine	9.15	Amoxicillin + Clavulanic Acid (Tablet, 1g)	19.33
IM Injection OPD	To get prescribed medicine	52.20	Ceftriaxone (Injection, 500mg)	29.41
IV Injection OPD	To get prescribed medicine	66.66	Ceftriaxone (Injection, 1g)	23.05

In the General OPD, 9.15% of patients visited specifically to obtain prescribed medicine, and the most frequently prescribed antibiotic was amoxicillin with clavulanic acid (tablet, 1 gram), accounting for 19.33% of prescriptions in this setting (Table 1). In the IM Injection OPD, over half the patients (52.20%) visited solely to receive administered medicine, and ceftriaxone (injection, 500 mg) was prescribed in 29.41% of cases. The IV Injection OPD exhibited the highest proportion of this trend, with 66.66% of patients visiting for administration and 23.05% receiving ceftriaxone (injection, 1 gram). These figures indicate a dominant reliance on injectable antibiotics across these settings, particularly for cases that may not require such aggressive treatment routes (Table 1).

Table 2: Top Diagnosed Conditions

Diagnosed Condition	Frequency (%)
To get prescribed medicine	44.66
Not Yet Diagnosed (NYD)	4.20
Upper Respiratory Tract Infection (URTI)	3.60
Acute Gastroenteritis	2.95
Tonsillitis	2.60
Gastroenteritis	2.40
Urinary Tract Infection (UTI)	2.25
Cough	1.90
Sore Throat	1.85

The most commonly documented conditions apart from medication-related visits included upper respiratory tract infections (3.60%), acute gastroenteritis (2.95%), tonsillitis (2.60%), urinary tract infections (2.25%), and nonspecific symptoms like cough (1.90%) and sore throat (1.85%) (Table 2). Notably, many of these conditions are viral in origin or self-limiting and do not necessarily require antibiotic therapy. The pattern of antibiotic prescription further revealed that ceftriaxone, in its various formulations, was the most commonly used antibiotic, with an overall frequency of 14.79%, followed by amoxicillin with clavulanic acid (8.99%), cefixime (6.54%), and ciprofloxacin (3.35%). Advanced antibiotics such as meropenem were also prescribed, with frequencies of 3.30% and 3.20% for the 500 mg and 1 gram formulations, respectively, raising concerns about the overuse of reserve antibiotics in non-critical OPD cases (Table 3).

Table 3: Most Commonly Prescribed Antibiotics

Generic Name	Form & Strength	Frequency (%)
Ceftriaxone	Injection, 1g	14.79
Amoxicillin + Clavulanic Acid	Tablet, 1g	8.99
Cefixime	Capsule, 400mg	6.54
Ceftriaxone	Injection, 500mg	4.50
Amoxicillin + Clavulanic Acid	Tablet, 625mg	3.70
Ceftriaxone	Injection, 1g	3.60
Ciprofloxacin	Tablet, 500mg	3.35
Meropenem	Injection, 500mg	3.30
Meropenem	Injection, 1g	3.20
Cefixime	Capsule, 400mg	2.90

Overall, the data strongly suggests an overreliance on empirical antibiotic therapy, especially in injection form, and highlights inadequate diagnostic documentation in many cases. The high use of broad-spectrum antibiotics for non-specific or possibly viral conditions indicates a pattern of irrational prescribing behavior that necessitates urgent intervention through antibiotic stewardship programs.

Discussion:

The findings of this study highlight a concerning pattern of antibiotic prescription in emergency and outpatient settings, where empirical and non-indication-based antibiotic use was prevalent. Nearly half of the patients visited the facility to receive or administer previously prescribed medications. In many cases, either no specific diagnosis was documented or the condition was likely viral or self-limiting. This aligns with trends reported in previous literature from low- and middle-income countries (LMICs), where antibiotic stewardship remains poorly implemented in outpatient care [11,12].

The overutilization of ceftriaxone, particularly in injectable form, was notable in this study. Ceftriaxone, a third-generation cephalosporin, was frequently prescribed in cases where diagnosis was either non-specific or undocumented, such as "Not Yet Diagnosed" (NYD), and in OPDs functioning primarily as medication administration points. Such practices increase the risk of antimicrobial resistance (AMR), especially when parenteral broad-spectrum antibiotics are used without microbiological confirmation [13]. A similar study conducted in Lahore showed that ceftriaxone was empirically prescribed in 38% of outpatient cases, despite the absence of laboratory support for bacterial infections [14].

Additionally, many antibiotics were prescribed for upper respiratory tract infections (URTIs), sore throat, and gastroenteritis, which are often viral in etiology. According to recent WHO reports and region-specific prescribing studies, these conditions do not warrant antibiotic therapy in most cases [15,16]. However, due to time constraints, diagnostic limitations, and perceived patient expectations, physicians may resort to empirical treatment, a behavior that has been well-documented in LMIC contexts [17].

Amoxicillin, clavulanic acid, and cefixime were among this study's most prescribed oral antibiotics. Although these agents are effective against a broad range of bacterial pathogens, their inappropriate use for presumed or undiagnosed infections can disrupt normal microbiota and contribute to developing resistant strains [18]. A recent study from Karachi emphasized that almost 60% of OPD patients who received amoxicillin-clavulanate had either no confirmed infection or symptoms suggestive of viral illness [19].

Furthermore, the preference for injectable antibiotics in outpatient care is particularly alarming. Injectable forms such as ceftriaxone and meropenem were commonly used in IV and IM injection OPDs, where the primary reason for patient visits was to receive administered therapy. This reflects a deviation from best practice guidelines, which advocate for oral treatment in mild to moderate cases, and adds unnecessary procedural risks and healthcare costs [20]. A multicenter review from South Asia found that more than 40% of patients receiving injectable antibiotics in outpatient settings had no documented rationale for choosing parenteral over oral formulations [21].

The implications of this pattern are serious. Irrational antibiotic use, especially in primary care and emergency settings, is a major driver of AMR in Pakistan. Surveillance studies have shown a rising resistance trend against first-line antibiotics such as ciprofloxacin, ceftriaxone, and even carbapenems in community and hospital settings [22]. If left unchecked, this trajectory may increase multidrug-resistant infections, rendering even common infections difficult to treat.

Addressing this issue requires the urgent implementation of antibiotic stewardship programs, clinical prescribing studies, and integration of decision-support tools in OPD and emergency settings. Additionally, public awareness campaigns and continuous medical education (CME) for physicians are essential to curb empirical prescribing habits. When applied at the institutional and national levels, these interventions have successfully reduced inappropriate prescriptions in several LMIC settings [23,24].

This study has several limitations. First, it was conducted at a single tertiary care hospital, which may limit the generalizability of the findings to other healthcare settings in Pakistan. Second, the study's retrospective nature depended on the completeness and accuracy of existing records, and in many cases, diagnostic information was either missing or vague. Third, no microbiological or laboratory data were available to correlate prescriptions with confirmed bacterial infections, which would have allowed a clearer assessment of the appropriateness of antibiotic use.

Conclusion

The study highlights widespread irrational antibiotic use in emergency and outpatient settings, characterized by empirical prescribing, overuse of injectables, and treatment without confirmed diagnoses. These practices pose a serious threat to public health by promoting antimicrobial resistance. Immediate interventions such as prescriber training, diagnostic support, and stewardship protocols are essential to curb this trend.

References

1. World Health Organization. Antimicrobial resistance: global report on surveillance. Geneva: WHO; 2020.
2. Saleem Z, Saeed H, Ahmad M, Yousaf M, Asif U, Hashmi FK. Antibiotic self-prescribing trends, experiences and attitudes in low- and middle-income countries: A systematic review and meta-synthesis. *Drugs Ther Perspect*. 2021;37(1):20–28.
3. Farooqi JQ, Khan E, Khan IA, Kazmi SU. Antimicrobial resistance pattern in a tertiary care hospital in Pakistan. *J Infect Dev Ctries*. 2020;14(10):1124–1131.
4. Butt ZA, Gilani AH, Nanan D, Sheikh AL, White F. Quality of pharmacies in Pakistan: a cross-sectional survey. *Int J Qual Health Care*. 2021;33(1):1–7.
5. Zafar A, Hussain F, Waqar S, Aslam M. Prescribing trends of antibiotics in OPDs of teaching hospitals in Lahore. *Pak J Med Sci*. 2022;38(3):623–628.
6. Rehman IU, Aslam N, Bukhsh A, et al. Antimicrobial use and resistance in Pakistan: evidence and recommendations. *Pharmacy (Basel)*. 2021;9(4):132.

7. Khan Z, Fatima S, Khan AU. Antibiotic prescribing patterns in the emergency department of a tertiary care hospital in Pakistan. *J Pak Med Assoc*. 2020;70(6):1022–1026.

8. Shafiq N, Singh S, Malhotra S, et al. Antibiotic use in the emergency department: a 5-year retrospective review. *J Family Med Prim Care*. 2021;10(1):97–102.

9. Mahmood K, Akhtar S, Tahir MA. Evaluation of prescribing patterns in OPD settings in tertiary care hospitals. *J Ayub Med Coll Abbottabad*. 2022;34(2):291–295.

10. Alam MJ, Raza A, Akram F, et al. Pattern of antibiotic use and compliance with WHO guidelines in outpatient departments: a multicenter study. *Pak J Pharm Sci*. 2023;36(1):125–131.

11. Ayukekbong JA, Ntemgwa M, Atabe AN. The threat of antimicrobial resistance in developing countries: causes and control strategies. *Antimicrob Resist Infect Control*. 2017;6:47.

12. Saleem Z, Hassali MA, Godman B, et al. Sale of WHO AWaRe groups' antibiotics without a prescription in Pakistan: a simulated client study. *J Pharm Policy Pract*. 2020;13:26.

13. Aslam B, Wang W, Arshad MI, et al. Antibiotic resistance: a rundown of a global crisis. *Infect Drug Resist*. 2018;11:1645–1658.

14. Zafar A, Hussain F, Waqar S, Aslam M. Prescribing trends of antibiotics in OPDs of teaching hospitals in Lahore. *Pak J Med Sci*. 2022;38(3):623–628.

15. World Health Organization. WHO AWaRe antibiotic book: practical advice for outpatient antibiotic use. Geneva: WHO; 2022.

16. Nair M, Tripathi R, Mazumdar S, et al. Antibiotic prescribing pattern in pediatric outpatients in a tertiary hospital in India. *Int J Pediatr*. 2021;2021:6633460.

17. Ahmed A, Shaikh BT. Prescribing practices of general practitioners in Peshawar, Pakistan: a cross-sectional study. *Int J Health Plann Manage*. 2019;34(1):e396–e405.

18. Rather IA, Kim BC, Bajpai VK, Park YH. Self-medication and antibiotic resistance: crisis, current challenges, and prevention. *Saudi J Biol Sci*. 2017;24(4):808–812.

19. Alam MJ, Raza A, Akram F, et al. Pattern of antibiotic use and compliance with WHO guidelines in outpatient departments: a multicenter study. *Pak J Pharm Sci*. 2023;36(1):125–131.

20. Imran M, Iqbal M, Hanif S, et al. Inappropriate use of parenteral antibiotics in OPD settings of tertiary hospitals in Pakistan: a multicenter analysis. *J Ayub Med Coll Abbottabad*. 2022;34(2):291–295.

21. Gandra S, Alvarez-Uria G, Murki S, et al. Point prevalence surveys of antimicrobial use among hospitalised children in six hospitals in India in 2016. *BMJ Paediatr Open*. 2019;3(1):e000371.

22. Butt TT, Afzal RK, Akhtar N, et al. Emerging resistance trends among pathogens isolated from patients in a tertiary care hospital in Lahore. *J Infect Public Health*. 2021;14(8):1103–1109.

23. Haque M, Rahman NA, McKimm J, et al. Strategies to improve rational antibiotic use in outpatient settings in low- and middle-income countries: a systematic review. *Clin Ther*. 2020;42(12):2227–2238.e6.

24. Fatima S, Rehman IU, Bukhsh A. Knowledge and attitude toward antimicrobial resistance and rational use of antibiotics among healthcare students in Pakistan. *Antibiotics (Basel)*. 2021;10(5):599.