

ANALYSIS OF THE PATTERN OF ANTIBIOTIC PRESCRIPTION IN A PRIVATE SECONDARY CARE HOSPITAL

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ABSTRACT

Background: Antibiotic misuse and overuse are major contributors to antimicrobial resistance (AMR), treatment failure, adverse drug reactions, increased healthcare costs, and prolonged hospital stay. Monitoring antibiotic prescribing patterns is essential to promote rational antibiotic use and support antimicrobial stewardship. **Aim:** To evaluate antibiotic prescribing patterns and assess the rationality of antibiotic use in a tertiary care hospital. **Methods:** A prospective study was conducted from June 2026 to September 2026 using prescription-based data collected through a structured proforma. A total of 200 outpatient prescriptions were evaluated. Patient demographics, diagnosis, prescribed antibiotics, and other prescribing information were recorded and analysed using Microsoft Excel 365. **Results:** Among 200 prescriptions, 102 (51%) were from females and 98 (49%) were from males. A total of 266 antibiotics were prescribed. Amoxicillin + clavulanic acid was the most frequently prescribed antibiotic (35.71%), followed by cefixime (25.56%) and azithromycin (18.05%). Single-antibiotic prescriptions accounted for 70.5%, while two-antibiotic prescriptions accounted for 26.5%. Respiratory infections were the most common clinical context for antibiotic prescribing. The mean number of drugs per encounter was 4.28. Generic prescribing was 96.62%, while 79.2% of drugs were prescribed from the essential drug list. **Conclusion:** The study demonstrated substantial antibiotic use and polypharmacy in outpatient prescriptions. Strengthening antimicrobial stewardship, adherence to standard treatment guidelines, and rational antibiotic selection may help improve prescribing practices and reduce inappropriate antibiotic use.

KEYWORDS: Antibiotics, Prescribing pattern, Antimicrobial resistance, Rational drug use, Antimicrobial stewardship, WHO prescribing indicators.

INTRODUCTION

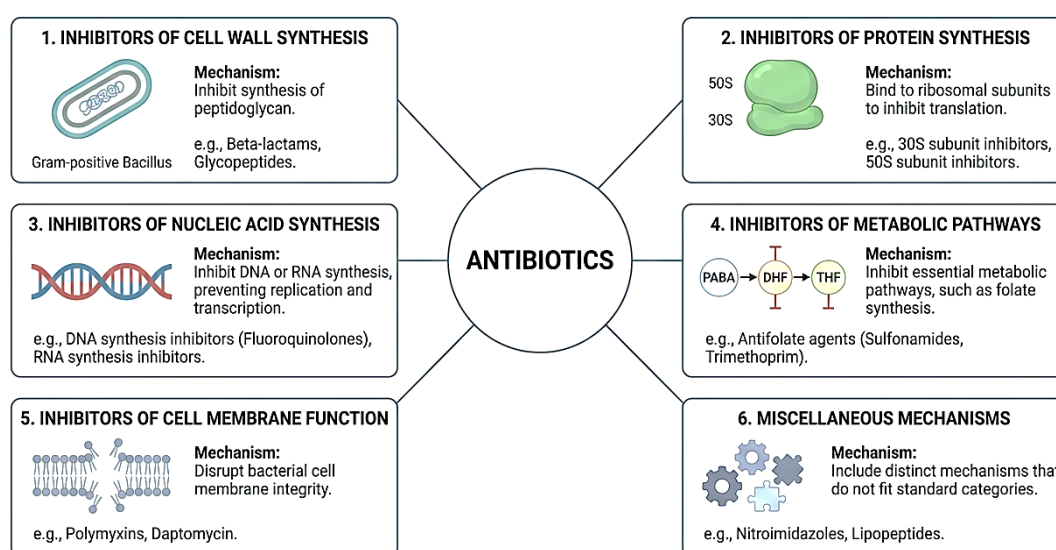
Antibiotics, discovered beginning with penicillin in 1928, revolutionized medicine but their long-term

effectiveness is threatened by antimicrobial resistance (AMR).^[1,2-5] Overuse and misuse of antibiotics—by prescribers, dispensers, patients, and communities—

drive resistance, treatment failures, adverse drug reactions (ADRs), longer hospital stays, higher costs, and increased mortality.^[6,7] Notable AMR concerns include spread of genes such as bla_{NDM-1}; resistant healthcare-associated Gram-negative infections are associated with significantly higher costs and longer admissions. Common antibiotics (β -lactams, fluoroquinolones, glycopeptides, anti-TB drugs, imidazoles) account for a large share of ADRs. Rational antibiotic use matters especially in cost-sensitive settings (e.g., India). Irrational practices include brand-driven prescribing, unnecessary combinations, poor adherence to essential medicines lists, and excessive injectable use.

Prescribing-pattern studies and audits (using WHO indicators: average medicines per prescription, generic prescribing, antibiotic percentage, essential medicines list adherence, injection encounters) help monitor and improve rational use.^[8,9] Antimicrobial stewardship programs (ASPs) are key to optimizing therapy, reducing unnecessary prescriptions, preventing harms (including C. difficile and ADRs), and guiding policy at hospital level. The present study aims to evaluate antibiotic use patterns, associated ADRs, and the clinical and financial burdens of overuse in a tertiary care hospital, providing representative data to inform policies and stewardship.

CLASSIFICATION OF ANTIBIOTICS



The WHO defines rational medicine use as giving the right drug to the right patient in the right dose and duration at the lowest possible cost.^[10-13] Irrational use includes polypharmacy, unnecessary antibiotic use, overuse of injections, poor prescription adherence, and self-medication, all of which contribute to antimicrobial resistance and higher healthcare costs. The text emphasizes that antibiotic resistance is a major global threat, especially in low- and middle-income countries where access, regulation, and guideline-based prescribing are often weaker. To improve prescribing quality, WHO and INRUD provide indicators for prescription, facility, and patient care, and WHO also promotes the AWaRe classification to support antimicrobial stewardship.^[14]

Using the AWaRe system, 74% of antibiotics belonged to the Access group, 24% to the Watch group, and none to the Reserve group. This suggests relatively prudent prescribing and better stewardship than in some other settings, although the very high overall antibiotic exposure still signals a need for ongoing audit, staff training, and stronger antimicrobial stewardship.^[14]

Defined Daily Dose (DDD) is the assumed average maintenance dose per day of a drug for its main use in adults.

- It is a **standardized unit** used mainly for drug utilization studies and comparison of medicine use across populations.
- DDD does **not always match the actual prescribed dose** or the recommended clinical dose.
- Real-world doses vary because of **age, body weight, ethnicity, disease severity, pharmacokinetics, and other patient factors**.
- Each drug usually has **one DDD for each ATC code and route of administration**.
- **Prescribed Daily Dose (PDD)** is different from DDD because PDD is based on **actual prescriptions** and patient conditions.
- Understanding the **PDD–DDD relationship** helps in proper analysis of drug use.
- Drug consumption can also be measured by **quantity, cost, prescription frequency, and repeats**, but DDD standardizes these for better comparison.

- The **WHO Collaborating Centre** assigns DDDs under the ATC/DDD system with support from the international drug statistics working group.^[15]

Antimicrobial Resistance (AMR)

- Reduced or complete lack of response of a microorganism to an antimicrobial agent.
- Similar to tolerance, where higher doses are needed for the same effect.^[9]

Preventing antimicrobial resistance requires careful antibiotic use and strong hospital policies.

- Avoid unnecessary, inadequate, or prolonged antimicrobial treatment.
- Use narrow-spectrum antibiotics whenever possible.
- Use combination therapy when long treatment is needed, such as in tuberculosis or HIV.
- Treat known resistant infections, such as those caused by *Staphylococcus aureus*, *E. coli*, and *Mycobacterium tuberculosis*, promptly and appropriately.^[16]

Antimicrobial stewardship programs

Antimicrobial stewardship programs are ongoing institutional efforts to improve antibiotic prescribing in hospitals. Their goals are to improve patient outcomes, reduce costs, and minimize harm such as resistance and other adverse effects.

These programs may include:

- Antibiotic formularies.
- Restriction policies requiring specialist or pharmacist approval.
- Switching from broad- to narrow-spectrum agents.
- Converting intravenous therapy to oral therapy when appropriate.
- Pharmacokinetic support.^[17,18,19]

METHODOLOGY

Study Duration: The cases examined were gathered from the hospital between June 2026 and September 2026.

Source of Data: We used a specially designed data entry form (proforma) to get all the necessary information about the patient from the prescription.

Design of Data Collection form: The data collection form was made to get the necessary information about the patient's demographics, medical and medication histories and current treatment plan, such as the name, dose, route of administration and frequency of the drugs prescribed from the patient's prescription.

Inclusion Criteria

- In-patients who are 18 years old or older and of either gender.
- Patients who have other diseases or conditions that go along with their main illness.
- Cases from the outpatient department.
- People who are taking more than one drug regimen.

Exclusion Criteria

- People who more less than 100 years old.
- Patients who don't want to take part in the study.
- Patients in the emergency room and the intensive care unit.

Selection of Patients

The outpatient department of the hospital will be where the data is collected.

The following are some of the sources that will be used to collect the data:

- A prescription.
- Medicines for outpatients.

METHODOLOGY

Statistical Analysis: We used Microsoft Excel 365 to look at the data.

Study Procedure:

- A Prospective study is performed utilizing patient information acquired from prescriptions.
- The designed proforma kept track of the patient's age, sex, diagnosis and the names, doses, and times of the drugs they were prescribed.
- Entering the data you got into the Microsoft Excel 365 work sheet.

RESULT AND DISSCUSION

A total of 200 prescriptions contain patient information with diagnosis information which was compared to the standard value. Antibiotics accounted for the highest proportion of prescriptions, and their use should be evaluated according to standard treatment guidelines. The aim of this prospective study was to assess prescription patterns in Antibiotics. According to the literature review, diagnosis and follow-up based on standard treatment guidelines or protocols are complicated by comorbidities and by limitations in applying therapies beyond conventional treatment.^[14]

Among the 200 patients included in the study, 102 (51%) were female and 98 (49%) were male. Females constituted a slightly higher proportion of the study population than males as shown as figure:1 and Table :1.

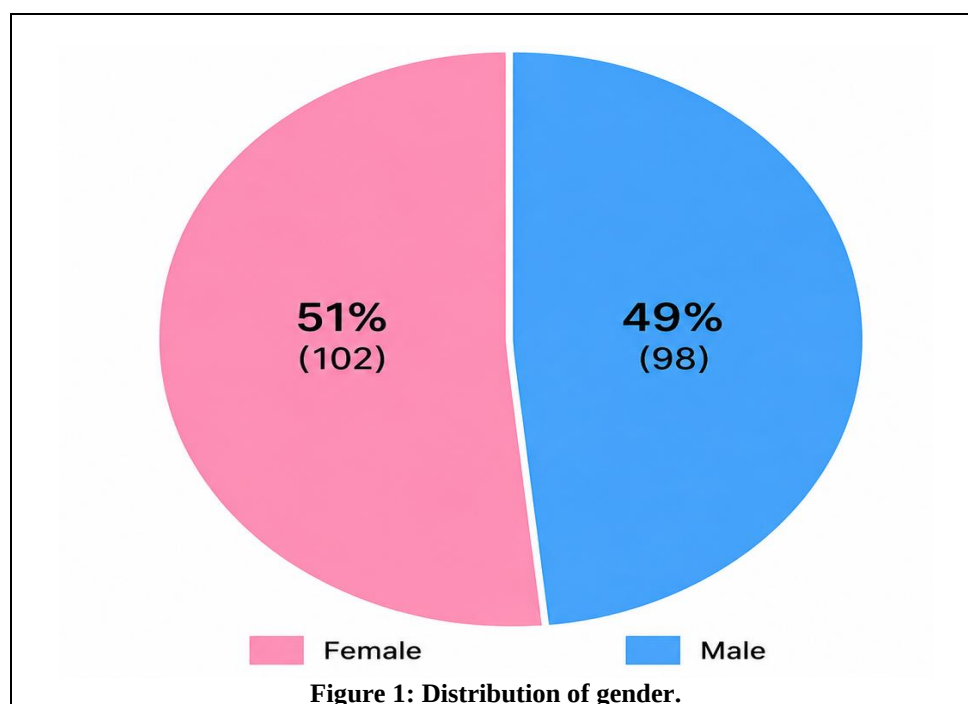


Figure 1: Distribution of gender.

Table 1: Distribution of gender.

SNO	GENDER	NO.OF.PRESCRIPTION	PERCENTAGE
1	MALE	98	49.00%
2	FEMALE	102	51.00%
	TOTAL	200	100%

Table 2: Characteristics of Sampled Patients.

Age, Years	FREQUENCY	PERCENTAGE
<5	15	7.50%
5 to 14	31	15.50%
15 to 30	57	28.50%
31 to 44	34	18%
45 to 64	41	20.50%
>65	19	10.00%

As in the present study, the most prescribed class of antibiotics was penicillin (38.71%), followed by cephalosporins (25.56%) and macrolides (18.05%). This finding is consistent with another study conducted in Addis Ababa and Dessie where penicillin (51.9%) was the most prescribed class of antibiotics followed by fluoroquinolones (18.3%)^[20,21] it was clearly shown by Table:3 and figure :2

This is comparable to a Kenyan study where the antibiotic classes most frequently prescribed were penicillin (46.9%) and cephalosporins (45.8%).^[22] A research study in Bangladesh found that cephalosporins were the most prescribed class of antibiotics and macrolides were the second most prescribed class.^[35] Levofloxacin (2.63%) was the most prescribed antibiotic in the present study followed by Ciprofloxacin (1.88%) and Nitroimidazoles (9.77%).^[14]

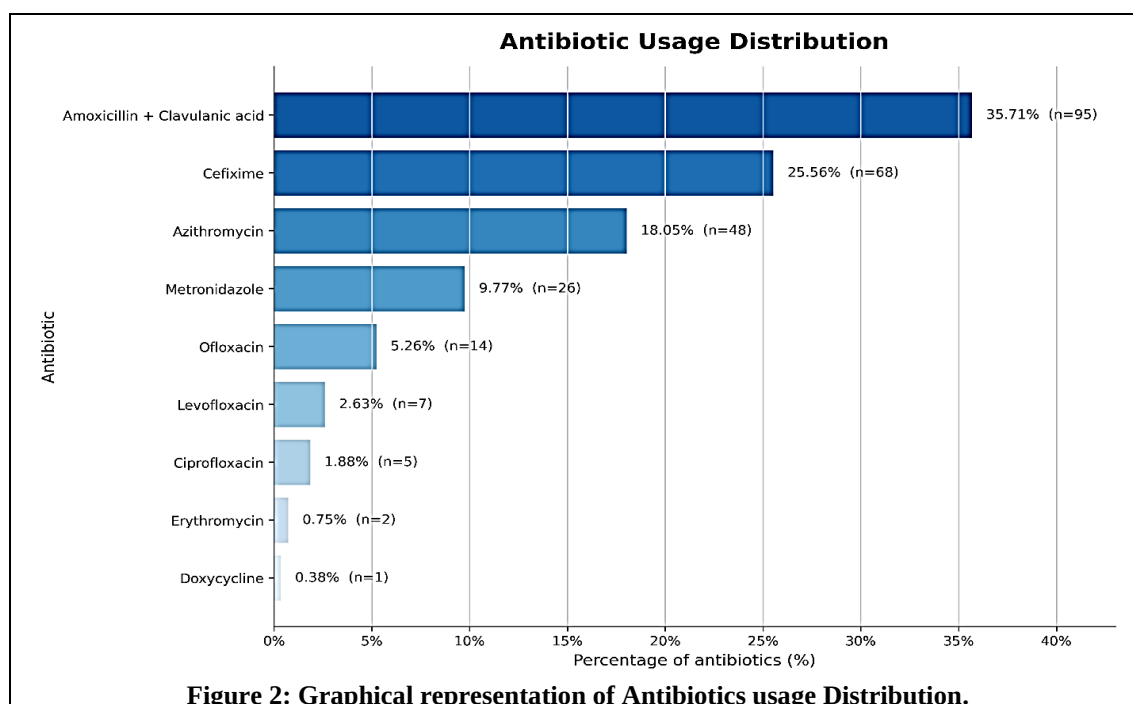


Table 3: Antibiotics usage Distribution.

S.NO	ANTIBIOTICS	CLASSIFICATION	FREQUENCY	PERCENTAGE
1	Amoxicillin + Clavulanic acid	Penicillins – β -lactam + β -lactamase inhibitor	95	35.71%
2	Cefixime	Cephalosporins	68	25.56%
3	Azithromycin	Macrolides	48	18.05%
4	Metronidazole	Nitroimidazoles	26	9.77%
5	Ofloxacin	Fluoroquinolones	14	5.26%
6	Levofloxacin	Fluoroquinolones	7	2.63%
7	Ciprofloxacin	Fluoroquinolones	5	1.88%
8	Erythromycin	Macrolides	2	0.75%
9	Doxycycline	Tetracyclines	1	0.38%
	Total NO.OF.Antibiotics		266	100%

Of the 266 antibiotics given out of 200 prescriptions, the Amoxicillin + Clavulanic acid was the most prescribed antibiotic, representing 35.71% (n=95), followed by Cefixime representing 25.56% (n=68) and Azithromycin representing 18.05% (n=48). Metronidazole represented 9.77% (n=26), while Ofloxacin, Levofloxacin, Ciprofloxacin, Erythromycin, and Doxycycline represented 5.26%.

Out of 200 prescription analyses done, there were 141 prescriptions (70.5%) that had one antibiotic, 53 prescriptions (26.5%) that had two antibiotics, 5 prescriptions (2.5%) that had three antibiotics, and only 1 prescription (0.5%) that had more than three antibiotics. Results showed that single-antibiotic prescriptions were more common than prescriptions with three or more antibiotics it will explained in table 4 and figure 3.

SNO	PRESCRIPTION INDICATOR	FREQUENCY	PERCENTAGE
1	No. of prescriptions with 1 antibiotic	141	71%
2	No. of prescriptions with 2 antibiotics	53	27%
3	No. of prescriptions with 3 antibiotics	5	2.50%
4	No. of prescriptions with more than 3 antibiotics	1	0.50%
	Total prescriptions	200	100%

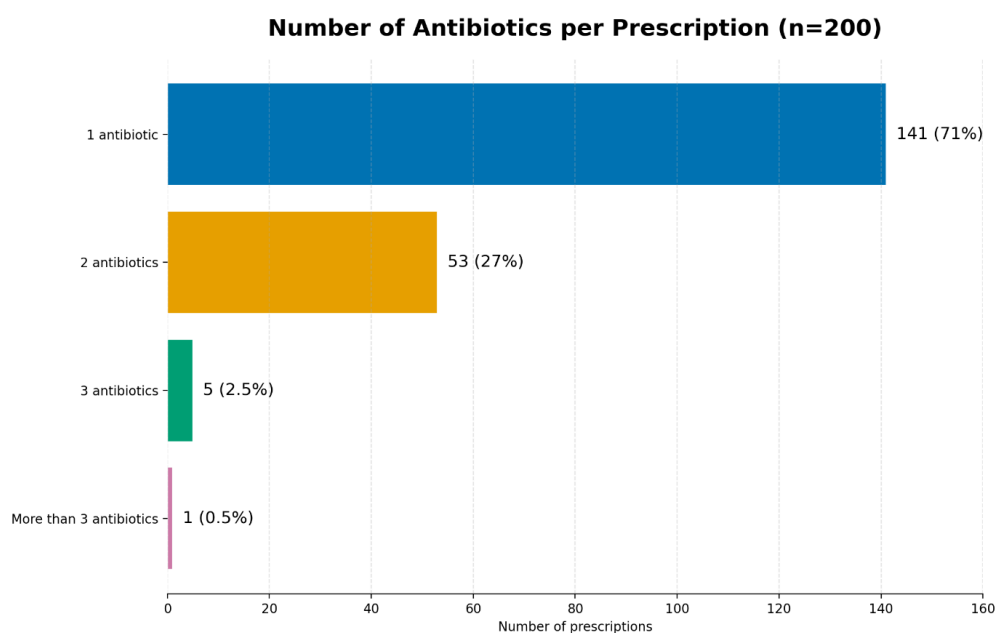


Table 4: and figure 3: Represent the Prescription Indicator.

Table 5: Class of antibiotics as per diagnosis.

S.NO	Diagnosis / Condition	Antibiotic(s) prescribed
1	Acute febrile illness / Fever	Amoxicillin, Amoxicillin + Clavulanic acid, Cefixime, Azithromycin
2	Fever with cough / cold	Amoxicillin + Clavulanic acid, Cefixime, Azithromycin
3	Sore throat / Pharyngitis	Amoxicillin + Clavulanic acid, Cefixime, Azithromycin
4	Tonsillitis / Acute tonsillopharyngitis	Amoxicillin + Clavulanic acid, Amoxicillin
5	Upper respiratory tract infection (URTI)	Amoxicillin + Clavulanic acid
6	Cough and cold / Respiratory tract infection	Cefixime, Amoxicillin + Clavulanic acid, Azithromycin
7	Sepsis	Linezolid, Itraconazole*
8	Lower-limb cellulitis	Linezolid
9	Abdominal pain / Gastrointestinal symptoms	Cefixime, Metronidazole
10	Vomiting with fever	Cefixime, Metronidazole
11	Eye infection	Ciprofloxacin ophthalmic preparation, Metronidazole
12	Sebaceous cyst – scrotum	Cefpodoxime
13	Inguinal hernia	Cefpodoxime, Metronidazole
14	Diarrhoeal/GI-related symptoms	Ofloxacin, Metronidazole
15	Fever, cough and sore throat	Amoxicillin + Clavulanic acid
16	Fever with myalgia	Amoxicillin + Clavulanic acid / Cefixime
17	Nasal block / sore throat	Amoxicillin + Clavulanic acid

The Mean number of drugs prescribed per encounter in the present study was 4.28 which is in accordance with the WHO recommendations (1.6-1.8). This finding was higher than similar studies done in Addis Ababa, Hawassa, Ghana and earlier in Gondar with a mean number of medicines per encounter of 2.0, 1.9, 3.5 and 1.77 respectively.^[20,23,24,25] The number of drugs prescribed at each consultation can be seen as an indicator of better prescribing practices. It increases the number of drugs taken, thus increases the complications from drug-drug interaction and adverse drug reactions. Upper Respiratory Infection (105,39.47%), Lower Respiratory Tract Infection (62,23.31%), Skin/soft Tissue Infection (28,10.53%), Acute Tonsillitis (18,6.77%), Sore throat (10,3.76%), Urinary Tract Infection(6,2.26%) were recorded.^[20] (Table:5).

The average percentage of drugs prescribed by their generic names in this study was 96% (Table:6) which was slightly lower than the WHO recommended value (100%). This was like the study conducted in Hawassa, Addis Ababa and Wolyta Sodo, where generic prescribing was 98.14%, 98.7% and 94% respectively.^[20,24,28] Yet a similar study conducted in Kenya revealed that only 62.5% of drugs were prescribed by generic names.

This may be related to the difference in the medication procurement policies of the two countries. The Ethiopian policy is to procure drugs by their generic names. It may also be due to economic differences of the populations where Kenyans may be able to afford branded medications, unlike many Ethiopians. This may

influence physicians' preference for brand and generic products.

Table 6: Summary Report of Prescribing Indicators comparison of standard WHO prescribing Indicators.

Prescribing Indicators	Total Number of Drugs	Average (%)	WHO Standard Value(%)
Average number of drugs per encounter	856	4.28	1.6-1.8
Percentage of encounters with antibiotics	266	31.01	20-26.8
Percentage of drugs prescribed by generic name	827	96.62	100
Percentage of drugs from essential drug list	678	79.2	100

In this study the percentage of drugs prescribed from the drugs list was 79.2 % (Table:6). This value was close to the 100% recommended by the World Health Organization. The result matched findings from studies in Hawassa, where the percentage was 96.6% and in southern Ethiopia, where it was 94.1%.^[23,24] However, it was much higher than a study conducted in Lesotho, which reported 79%.^[25] The current finding suggests prescribing practices. This could be because of oversight by hospital management. It might also be due to the countries pharmaceutical procurement policy. That policy is based on the national Essential Drugs List. This means only drugs on the list are available, in health care facilities. As a result, prescribers are limited to choosing from the list.^[14]

The study was conducted only at outpatient pharmacy hence does not include antibiotics utilizing at inpatient department and thus may not correctly indicate the entire antibiotics utilizing pattern in the hospital. The data were also collected only by reviewing the prescription papers and registry books that do not include interviews with prescribers and/or patients to assess factors contributing to the current practice. The study also does not include review of the medical chart of patients to further evaluate if the prescriptions were rational and appropriate to the current diagnosis.

Implications for Antimicrobial Stewardship

Polypharmacy, with a mean of 4.28 drugs per encounter, more than twice the WHO benchmark of 1.6–1.8, complicates stewardship, as multi-drug regimens are more difficult to audit for rational antibiotic use. All 200 prescriptions reviewed in this study had at least one antibiotic, and respiratory presentations were the most common in the diagnosis list. This pattern reflects the widespread empirical, presumptive use of antibiotics for mostly self-limiting upper respiratory infections observed in outpatient stewardship studies worldwide. Broad-spectrum antibiotics in the “Watch” category accounted for a substantial portion of prescribing, including cephalosporins (25.56%) and fluoroquinolones (~9.8% combined). This distribution is consistent with the WHO’s AWARe framework, which categorizes antibiotics into Access, Watch, and Reserve groups for the purpose of promoting rational selection, and suggests Access-group agents as first-line treatments for common infections.^{42,43} A similar Indian outpatient study using the AWARe framework also noted that cefixime (Watch

group) was the most prescribed antibiotic, ahead of amoxicillin-clavulanic acid (Access group), highlighting a common regional pattern of overuse of Watch-antibiotics for uncomplicated infections was also observed in the Indian outpatient study that cefixime from the Watch group was most frequently prescribed, ahead of amoxicillin/clavulanic acid from the Access group. By contrast, a comparable prescribing indicator study in an Ethiopian general hospital revealed a majority Access-group share (54.4%) where the WHO AWARe classification showed that 54.4% of antibiotics prescribed were Access-group and Watch-group antibiotics accounted for 45.6%. Thus, the present cohort’s reliance on Watch-category cephalosporins and fluoroquinolones leaves room for improvement toward the WHO target of shifting consumption toward Access-group agents.^[27] Respiratory diagnosis were the main driver for antibiotic prescribing and delayed prescribing is a stewardship option well evidenced. A Cochrane review of 12 randomized trials concluded that advising patients to delay filling an antibiotic prescription for respiratory infections resulted in a significant reduction in antibiotic use without any impact on symptom control or complication rates compared with immediate prescribing.

An update to this Cochrane review in 2022, based on 12 trials involving 3,968 participants, assessed prescribing strategies across a range of respiratory tract infections, and an earlier meta-analysis of similar trials reported a very large relative reduction in antibiotic use with delayed versus immediate prescribing. An earlier Cochrane synthesis of respiratory-infection trials reported a substantially lower rate of antibiotic use with delayed versus immediate prescribing, with no difference in symptom control.^[28] A 2025 systematic review and meta-analysis of 56 randomized trials found that audit and feedback interventions in primary care reduced overall antibiotic prescribing volume, unnecessary initiation, prolonged-duration prescribing, and broad-spectrum selection. Audit and feedback interventions were associated with an 11% relative reduction in antibiotic prescribing volume and a 23% relative reduction in unnecessary antibiotic initiation, with the largest effects seen in interventions specifically targeting respiratory infection prescribing. Interventions targeting prescribing for respiratory tract infections showed strong evidence of reduced antibiotic prescribing, with most studies reporting reductions greater than 14%, and some

reaching 30%.^[29,30] In particular, hospital- and outpatient-based restriction/preauthorization programs have been shown to reduce fluoroquinolone and cephalosporin use in a measurable way, without adverse effects on clinical outcomes: A U.S. health-system antimicrobial stewardship program that included provider education, electronic prescribing alerts, and modifications to susceptibility reporting resulted in a measurable reduction in inappropriate outpatient fluoroquinolone prescribing for bronchitis and sinusitis.

CONCLUSION

The discussion shows substantial use of antibiotics and polypharmacy. The experiment shows that antibiotic prescribing in the 200 outpatient prescriptions was common and often more intensive than recommended. The most common antibiotics were amoxicillin-clavulanic acid, cefixime, and azithromycin, and the main clinical context for prescription was respiratory infections. The large use of cefixime and fluoroquinolones further suggests that wider spectrum “Watch” antibiotics could be overused for common outpatient infections. The study concludes that stronger antimicrobial-stewardship measures for antibiotic prescribing are needed. Priority actions should include ensuring clinical justification for antibiotics, particularly for probable viral respiratory infections. This pattern reflects the widespread empirical, presumptive use of antibiotics.

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