

Antimicrobial Uses in A Tertiary Care Teaching Hospital and Community Based Pharmacy: A Comparative Study**Baidyanath Mishra¹, Ikhita Misra², Bikash Nayak³, Ishani Rath⁴, Bandana Rath⁵**¹Assistant Professor, Department of Pharmacology, SLN MCH, Koraput, Odisha, India²Assistant Professor, Department of ENT, SJMCH, PURI, Odisha, India³Assistant Professor, Department of Pharmacology, SLN MCH, Koraput, Odisha, India⁴Senior Resident, Department of Biochemistry, VIMSAR Burla, Odisha, India⁵Professor & HOD, Department of Pharmacology, SLN MCH, Koraput, Odisha, India

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Corresponding Author: Dr. Baidyanath Mishra

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Abstract:**Background:** Antimicrobial overuse and inappropriate prescribing are common in healthcare settings, although the prevalence varies between community pharmacies and Government hospitals. Few comparative studies have been conducted in India and hence needs further research.**Objective:** To compare antimicrobial use patterns, dispensing practices, and indicators of appropriate antibiotic use between a multidisciplinary teaching hospital and community pharmacies.**Methods:** This was a cross-sectional observational comparative study conducted over a six-month period. In a Government tertiary care teaching hospital, 846 prescriptions from twelve departments were assessed using WHO indicators for antimicrobial use. A total of 151 private pharmacies in urban and semi-urban areas were also surveyed to assess antimicrobial dispensing patterns and awareness on antimicrobial resistance (AMR).**Results:** In our hospital, 84.6% of hospitalizations required the use of antimicrobials, with an average of 1.6 ± 0.5 antimicrobials per prescription and average treatment duration of 5.1 ± 2.2 days. The most frequently used antimicrobials were ceftriaxone (40.4%), ceftriaxone-sulbactam (20%), and metronidazole (16.8%). Empirical treatment was predominant, with limited use of cultures and antibiotic susceptibility testing. In community pharmacies, 76.8% of antimicrobials were dispensed without a prescription, primarily for viral infections (colds, coughs, fever, and diarrhoea). Among those dispensing over-the-counter (OTC) medications, 84.1% were unaware of antimicrobial resistance (AMR). Azithromycin, amoxicillin-clavulanic acid, and the ofloxacin-ornidazole combination were the most frequently dispensed over-the-counter medications.**Conclusion:** The high use of antimicrobials in both cases is due to empirical prescribing in Government hospitals and over-the-counter dispensing in community pharmacies. The study highlights the need to strengthen antibiotic stewardship strategies through well-structured hospital guidelines, more frequent use of culture testing, strict adherence to guidelines, and time to time training of pharmacists in community pharmacies.**Keywords:** Antimicrobials, Over the counter (OTC) drugs, Antibiotic stewardship Program (ASP), Community Pharmacies.**DOI:** 10.25258/ijcpr.18.8.200

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Introduction

Antimicrobial resistance (AMR), driven by the inappropriate use of antimicrobials, is a global public health challenge in hospital settings [1,2] where antibiotics are often prescribed empirically, very commonly without microbiological confirmation contributing to the emergence of resistance. In community settings, antimicrobials are frequently dispensed without a prescription, particularly for self-limiting viral infections, further aggravating the antimicrobial resistance (AMR). [2-4] Although antimicrobial stewardship programs (ASPs) have been implemented in referral hospitals, appropriate antimicrobial use status remains

underscored in community pharmacies, especially in low- and middle-income countries like India. [5-7] A comprehensive literature review revealed a lack of assessment of appropriate antimicrobial use between tertiary care teaching hospitals and community pharmacies. Addressing this gap, the present study was aimed to compare the antimicrobial use, prescribing, and dispensing practices, as well as indicators of appropriate antibiotic use, between a government tertiary care hospital and private retail pharmacies in southern Odisha, eastern India.

Methods

Study Design & Setting: A cross-sectional observational comparative study was conducted at a tertiary care referral hospital with multidisciplinary services and at randomly selected private pharmacies in urban and semi-urban areas of southern Odisha (Eastern India) over six months duration.

Sampling and Data Collection

Hospital Setting: Systematic random sampling was performed across twelve wards (General medicine and surgical departments). A total of one thousand prescriptions were collected for analysis.

Data Collection: WHO indicators for antimicrobial use were employed, covering the aspects related to the hospital setting, prescribing practices, and patient care. Collected data included the antimicrobial class, indications (empirical, definitive, and prophylactic), treatment duration, and antimicrobial susceptibility testing status. (8,9)

Community Pharmacy Setting

Sample: One hundred and fifty-one private retail pharmacies were surveyed using a structured questionnaire.

Data Collection: Pharmacists were interviewed using open-ended questions regarding their

antimicrobial dispensing practices (with and without a prescription), commonly dispensed antimicrobials, the frequency of over-the-counter dispensing, and their knowledge of antimicrobial resistance and recorded on case record forms. [7, 9]

Ethical Considerations: This study was conducted following approval from institutional ethics committee for both settings. Patient identifiers, identity of pharmacist and retail pharmacy shops were anonymized.

Study Outcomes: The primary objective was to compare antimicrobial dispensing practices between public and private pharmacies. Secondary objectives included assessing over-the-counter antimicrobial dispensing practices and pharmacists' knowledge on antimicrobial resistance.

Statistical Analysis: Data were recorded using a predesigned case report form (CRF). All categorical variables were expressed as counts (n) and frequencies (%). Descriptive statistics was employed using GraphPad Prism software version 7.1.

Results

Out of 1,000 prescriptions, 846 (84.6%) included at least one antimicrobial agent. The average number of antimicrobials per prescription was 1.6 ± 0.5 and the mean treatment duration was 5.1 ± 2.2 days.

Table 1: Major antimicrobials prescribed in the tertiary care hospital (n=846 prescriptions with antimicrobials)

Sl. No.	Antimicrobials	Frequencies (N)	Percentage (%)	ATC Code
1	Ceftriaxone	342	40.4	J01DD04
2	Ceftriaxone-sulbactam	169	20.0	J01DD54
3	Metronidazole	142	16.8	J01XD01
4	Piperacillin-Tazobactam	110	13.0	J01CR05
5	Cefoperazone-sulbactam	68	8.0	J01DD12
6	Cefuroxime	42	5.0	J01DC02
7	Ciprofloxacin	42	5.0	J01MA02
8	Amoxicillin-clavulanic acid	24	2.8	J01CR02
9	Azithromycin	18	2.1	J01FA10
10	Rifaximin	11	1.3	A07AA11

Indication for Use: Empirical therapy in our hospital setup accounted for 58.6% of prescriptions, definitive therapy with 32.4%, and prophylaxis 7.8%. Culture sensitivity testing was performed in only 1.2% of cases.

Private Retail Pharmacy Dispensing Patterns: Among 151 pharmacies surveyed, 76.8% (n=116) reported that they were dispensing antibiotics without a valid prescription. The Common indications for selling antibiotics were sore throat, cough, common cold, Urinary tract infections, fever and diarrhea.

Table 2: Antimicrobial dispensing patterns in private retail pharmacies (n=151)

Parameter	Frequency (n)	Percentage (%)
Pharmacies dispensing antibiotics OTC	116	76.8.
Pharmacies dispensing only with prescription	35	23.2
OTC dispensers unaware of AMR	97	84.1#
OTC dispensers aware of AMR	19	15.9#
Most frequently dispensed antibiotic (Azithromycin)	145	96.02
Second most dispensed (Amoxicilline-clavulinic acid)	140	92.7

Percentages calculated among OTC dispensers (n=116): Common indications: Respiratory tract infections (76% for azithromycin), gastrointestinal

infections (metronidazole, ofloxacin and ornidazole combination 80%).

Table 3: Comparison of antimicrobial use indicators between tertiary care hospital and community pharmacy settings

Indicator	Tertiary Care Hospital	Community Pharmacy
Antimicrobial exposure rate	84.6% of hospitalizations	76.8% dispensed without prescription
Most common agents	Ceftriaxone, ceftriaxone-subactam	Azithromycin, Amoxicillin-clavulanic acid
Empirical use	58.6% of prescriptions	Predominantly empirical OTC
Microbiological testing	1.2% culture sensitivity	Not applicable
Stewardship infrastructure	ASP present (variable)	Minimal
Awareness of AMR among providers	Moderate (physicians)	Low (84.1% unaware)
Regulatory compliance	Moderate	Very Poor

Data synthesized from hospital audit and pharmacy survey.

Discussion

This comparative observational survey was conducted in the southern Odisha, eastern India. This study reveals the distinct patterns of antimicrobial use in a tertiary care teaching hospital and community pharmacies. We observed that the OTC dispensing of antimicrobials was more common among private retail pharmacies. In government hospital setting, high rates of empirical prescribing, broad-spectrum agent use and limited culture testing reflect moderate gaps in stewardship. [4] In community pharmacies, widespread OTC dispensing without prescriptions, coupled with low AMR awareness among pharmacists, indicates implementation of strong regulatory guideline and time to time training of dispensers.

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Hospital setting: The predominant use of cephalosporins (ceftriaxone, cefuroxime) aligns with global trends in empirical therapy for severe infections but raises concerns about antimicrobial resistance. A similar observation was made in this study of Gandhi et al 2021 most common prescribed antibiotic was ceftriaxone and most common

indication was for respiratory infections. [10] In our set up, low culture sensitivity testing trend limits the de-escalation opportunities and promotes unnecessary broad-spectrum antimicrobial use. However, Pandit Rao et al 2021 have reported a much higher culture sensitivity testing rate (22.8%) contradicting to our observation (1.2%). [11] Our overall findings corroborate with similar studies conducted in other states across India. [4, 11-14]

Community Pharmacy Setting: A high rate of OTC dispensing in community pharmacies observed in our study is in consistent with other Indian studies who reported 76–93% antibiotic sale without prescription. [15-17] (Saleem et al, 2020; Kotwani et al 2021; Abdulah et al 2025) Common dispensing for viral illnesses (cold, cough and fever) reflects patient demand and violation of the regulations by pharmacists. Low AMR awareness among OTC dispensers noted in this study demands time to time training and educations for pharmacists. [18]

According to Drugs and Cosmetic rules of India, (Schedule H) antibiotic dispensing or sale must be on a valid prescription from registered medical practitioner. Moreover, use of schedule H1 drugs such as third and fourth generation cephalosporins and newer fluoroquinolones, carbapenems, antitubercular drugs are to be strictly regulated. [1] Dispensing of both schedule H and H1 drugs must be recorded in a register. Even the patient demography with drug details should be recorded and maintained by a registered pharmacist. [19] Hospital antimicrobial stewardship program should emphasize on the adherence to the guidelines for antimicrobial use, de-escalation protocols and culture driven prescribing. In community settings, public awareness campaigns, strict regulatory enforcement and pharmacist training on AMR, knowledge on stewardship program among the medical as well as paramedical staff are keys to appropriate use of antimicrobials. This study directs for the implementation of Collaborative programs linking

hospital ASPs with community pharmacies that could enhance better healthcare service and curb the inappropriate antibiotic exposure.

Conclusion

The result of our study has underpinned the trend of inappropriate Antimicrobial dispensing pattern in private retail pharmacies and gap in ASP adherence in Government hospital. This could be a contributing factor for rising trend in antimicrobial resistance in the community. So consequently, we suggest for implementation of rigorous regulatory measures to manage appropriate antimicrobial dispensing practices.

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