ORIGINAL ARTICLE

A Point Prevalence Survey of Antibiotic Use among Inpatients at a Tertiary Care Health Facility in Kolkata

Chiranjib Bagchi[1*], Shreyashi Dasgupta[2], Trisha Sarkar[3], Vibhor Dudhraj[4], Arti Bahl[5], Suneet Kaur[6]

Received: 10 November 2025; *Accepted:* 07 April 2026

Abstract

Background: Inappropriate use of antibiotics can have a significant impact on health care costs, increasing the likelihood of adverse drug reactions (ADR) and acting as a primary contributor to the development of antimicrobial resistance (AMR).

Objective: To get baseline data on the pattern and characteristics of antibiotic use among the inpatients at a particular tertiary care health facility in Kolkata.

Materials and methods: This point prevalence survey (PPS) was conducted in the study hospital as a part of the first multicentric survey at NACNET (National Antimicrobial Consumption Network) sites, India. Data from all indoor admitted patients (medical wards) were collected, using a pretested Google Form, at 9:00 AM on a single day in the month of December 2021. The total number of beds covered was 148. Antibiotic use was classified as empiric, definitive, or prophylactic.

Results: Cumulatively, 118 antibiotic prescribing encounters were documented among 84 surveyed patients. A total of 72.61% ($n = 61$) of admitted patients were on antibiotics. Out of these, 19.04% ($n = 16$) patients received one antibiotic, 46.42% ($n = 39$) patients received two antibiotics, and 7.14% ($n = 6$) patients received three or more antibiotics. The rest 27.38% ($n = 23$) of patients did not receive any antibiotics. The top two antibiotics prescribed were doxycycline and gentamicin, both from the "Access" category. When taking into account the total prescribing encounters of antibiotics, about 50.84% ($n = 60$), 42.37% ($n = 50$), and 6.77% ($n = 8$) were from the Access, Watch, and Reserve groups, respectively. The average number of antibiotics prescribed was 1.40 per eligible patient.

Conclusion: The relatively high use of antibiotics observed can be attributed to the study site being a tertiary care hospital specializing in the treatment of infectious diseases. This study showed the feasibility of conducting a point prevalence survey in a tertiary care public facility hospital with a paper-based medical record system. The study results emphasized the need to implement activities such as prescription audit, hospital antibiotic policy, and antibiotic stewardship program in the future.

Journal of The Association of Physicians of India (2026): 10.59556/japi.74.1517

Introduction

Antibiotics, among the most widely prescribed medications globally, are also frequently misused and overused.[1–7] Such inappropriate usage significantly impacts healthcare costs and contributes to the emergence of antimicrobial resistance (AMR) and adverse drug reactions (ADR).[8]

Although the misuse of antibiotics is widespread, there are limited studies from India available analyzing the antibiotic consumption pattern and use.[9–17]

Given the country's population density and diverse healthcare practices, it is essential to generate baseline data to formulate effective policies and interventions promoting rational antibiotic use.

Continuous nationwide data collection on antibiotic prescribing is often challenging in resource-constrained settings such as India due to heavy workloads and limited infrastructure.

Hence, the point prevalence survey (PPS) methodology provides a viable and practical approach to gather representative data within a defined time frame. PPS is a globally recognized tool for assessing antimicrobial use and resistance trends in healthcare institutions.[18–20]

Objective

- To obtain baseline data on antibiotic use among hospital-admitted patients.
- To determine the pattern and characteristics of antibiotic usage in the healthcare facility.

Materials and Methods

Design and Setting

This was a single-center, cross-sectional, point prevalence survey (PPS) conducted at a tertiary care teaching hospital in Kolkata, as a part of the first multicentric survey at NACNET sites, selected for antibiotic use and consumption surveillance in India coordinated by NCDC (National Center for Disease Control, Government of India).[21]

As the title suggests, the study is a survey. This PPS was planned to estimate the types, quantity, and characteristics of antibiotics used in the particular health care facility. The study was designed centrally by NCDC following WHO guidelines to estimate the type, quantity, and pattern of antibiotic use in health care facilities. The study institute was one of the many participating centers across India.[21,22]

Ethics Approval

This study received ethical clearance from the Central Ethics Committee (NCDC) under an exempt clause and was additionally approved by the Clinical Research Ethics Committee of the study institute, Kolkata. Necessary administrative permissions were obtained before commencement of the study activities.

Inclusion Criteria

All inpatients present in the hospital wards, admitted till 9:00 AM on the day of data collection, were included.

Exclusion Criteria

Outpatients, emergency patients, those admitted after 9:00 AM, and those scheduled for discharge on the day of data collection were excluded.

[1]Clinical Pharmacologist and Professor, Department of Pharmacology, Tamralipto Government Medical College and Hospital, Purba Medinipur; [2]Junior Consultant, Department of Clinical Pharmacology, Tata Medical Center; [3]Project Pharmacist, Department of Clinical and Experimental Pharmacology, School of Tropical Medicine, Kolkata, West Bengal; [4]Research Scholar, Department of Epidemiology; [5]Additional Director, Division of Epidemiology, National Center for Disease Control (NCDC); [6]Joint Director, Division of Epidemiology, National Center for Disease Control (NCDC), New Delhi, India; *Corresponding Author

How to cite this article: Bagchi C, Dasgupta S, Sarkar T, *et al.* A Point Prevalence Survey of Antibiotic Use among Inpatients at a Tertiary Care Health Facility in Kolkata. J Assoc Physicians India 2026;74(6):e30–e34.

Study Procedure

This PPS was conducted on a single day in December 2021 across nine medicine wards, excluding two COVID-19 wards at our hospital. A total of 148 beds were surveyed. Prior to data collection, a workshop was organized on the previous day to train the data collectors, including residents and a number of faculty members of our institute. A predesigned electronic form supplied by the NCDC was used for data capturing. No direct patient interaction took place—all study data were captured from patient medical records, treatment charts, and laboratory reports. Information collected included antibiotic name, dose, duration, indication, infection site, and culture-sensitivity report, in addition to other parameters, as per the predesigned form. During this process, requisite inputs were sought from the on-duty consultants or medical officers when required. All data were anonymized to maintain confidentiality. As there was no direct patient interaction, written informed consent was not sought in this study.

Definitions

For the purpose of our study, the following definitions were used. Empiric antibiotic prescription referred to initial antibiotic therapy started prior to receiving the supporting culture sensitivity report, whereas definitive therapy meant antibiotic prescriptions that followed culture sensitivity results.[12] Medical prophylaxis denotes antibiotic use to prevent an infection in a nonsurgical (medical) context, whereas use before any surgical intervention was considered as surgical prophylaxis.[13,14] Community-acquired infections (CAIs) were defined as infections developing outside the hospital or within 48 hours of admission to the hospital, without prior healthcare exposure.[15] Hospital-acquired infections (HAIs) refer to those manifesting after 48 hours of hospital admission.[16]

Parameters Measured

Key parameters included:

- Frequency (number and percentage) of patients receiving antibiotics.
- Classification of antibiotic prescriptions as empiric, prophylactic, or definitive.
- Route of administration of antibiotics (oral or parenteral).
- Indication-wise categorization for CAIs, HAIs, or prophylaxis.
- Frequency (number and percentage) of dual coverage for anaerobes or gram-negative organisms.
- Class-wise consumption as per WHO-ATC and AWaRe classification.
- Data were collected via predesigned Google Forms, compiled in Microsoft Excel 2016, and analyzed using descriptive statistics.

Results

A total of 84 patients admitted to the medical wards were surveyed, of whom 61 (72.61%) patients had received antibiotics (Table 1). The hospital's critical care unit (CCU) was temporarily closed for fumigation during the study, and the hospital has no dedicated surgical units; hence, antibiotic usage in CCU and surgical prophylaxis data were not included.

The average number of antibiotics per patient was 1.93 (Table 2). Empirical prescriptions accounted for 94.05% of cases, while only 5.95% were definitive. Among the indications for antibiotic therapy, 78.68% were for CAIs, 18.03% for medical prophylaxis, and 3.27% for HAIs. Most antibiotics (51.69%) were administered orally, while 48.30% were given parenterally. Only 2.38% of patients had double anaerobic coverage, whereas 33.33% of patients received double gram-negative coverage, gentamicin and doxycycline being the most common antibiotic combination prescribed. Looking at individual antibiotic prescriptions, doxycycline was the most frequently used antibiotic, followed by gentamicin and piperacillin-tazobactam (Fig. 1). Beta-lactam/beta-lactamase inhibitor combinations and third-generation cephalosporins were the next most commonly prescribed antibiotics (Table 3).

Among all the antibiotics prescribed, 50% belonged to the "Access" category, 43.22% to the "Watch" category, and 6.77% to the Reserve category of antibiotics as described by the WHO in their AWaRe classification (Fig. 2).[23]

Use of designated antibiotics such as meropenem, vancomycin, and polymyxin B was minimal, namely, in 4, 1, and 1 patient, respectively, whereas piperacillin-tazobactam and linezolid use was moderate, in 13 and 7 patients, respectively. At the time of the survey, the institutional antibiotic policy was under development and thus unavailable for analysis.

Discussion

Antimicrobial surveillance helps assess prescribing behavior, identifies target areas for intervention, and guides rational antibiotic use. The current PPS highlighted several important findings in the context of a hospital setup of small caliber.

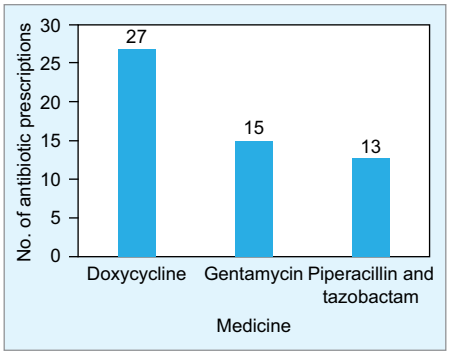

Fig. 1: Top three antibiotics as per usage

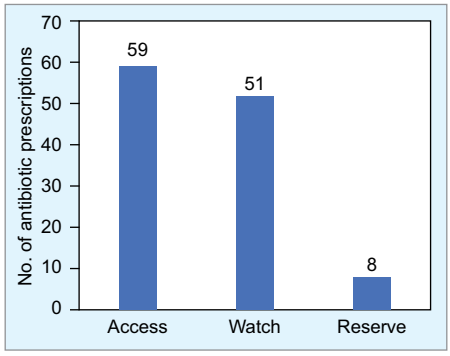

Fig. 2: Break-up of antibiotics prescribed as per AWaRe classification by WHO

Table 1: Description of basic hospital and patient indices

Variables	*Number*
Annual hospital admission (previous year, 2020)	1,351
Number of patients surveyed	84
Total number of beds in the hospital	162
Number of acute beds in the hospital	101
Number of CCU beds in the hospital	9
Total beds occupied in different wards (all in the medical ward)	84
Number of hospital-eligible patients undergoing survey	84
Characteristics of the patients	Male = 49, female = 34, transgender = 01, adult = 80, pediatric = 4
Number (%) of patients on antibiotics	61 (72.61%)

Table 2: Results are depicted below as per the variables concerned

Variables	*Number (%)*
Number (%) of patients on antibiotics	61 (72.61%)
Total number of antibiotic prescriptions	118
Number (%) of patients on	
1 antibiotic	16 (19.04%)
2 antibiotics	39 (46.42%)
On ≥ 3 antibiotics	6 (7.14%)
No antibiotics	23 (27.38%)
Range of antibiotics per patient	1–5
Average antibiotics per eligible patient	1.40
Average number of antibiotics per patient	1.93
Number of prescriptions with parenteral antibiotics	57 (48.30%)
Number of prescriptions with oral antibiotics	61 (51.69%)
Patients with definitive therapy	5 (5.95%)
Number (%) of patients on antibiotics by indication	
Community-acquired infection (CAI)	48 (78.68%)
Hospital-associated infection (HAI)	2 (3.27%)
Surgical prophylaxis (SP)	Nil
Medical prophylaxis (MP)	11 (18.03%)
Number (%) of patients receiving double anaerobic cover	2 (2.38%)
Number (%) of patients receiving double cover for gram-negative organisms	28 (33.33%)
Number (%) of prescriptions with a documented reason for antibiotic prescription	90 (76.27%)
Number (%) of prescriptions with choice of antibiotic according to local prescribing guidelines	Not available
Number of patients (%) undergoing antibiotic sensitivity before treatment	12 (14.28%)
Number of patients discharged with antibiotics	Not applicable
Most commonly used antibiotic/antimicrobial in the institution/hospital	Doxycycline
The most common indication of antibiotic use in an institution/hospital	Community-acquired infection
Prescriptions with a stop or review date documented	36 (30.50%)

Table 3: Details of antibiotic prescriptions

Antibiotic	*ATC code*	*Number of prescriptions (total = 118)*	*Included in WHO-EML 2021*	*AWaRe classification*
Doxycycline	J01AA02	27	Yes	Access
Gentamicin	J01GB03	15	Yes	Access
Piperacillin and tazobactam	J01CR05	13	Yes	Watch
Ceftriaxone	J01DD04	8	Yes	Watch
Cotrimoxazole	J01EE01	8	Yes	Access
Linezolid	J01XX08	7	Yes	Reserve
Rifaximin	A07AA11	7	No	Watch
Ciprofloxacin	J01MA02	6	Yes	Watch
Azithromycin	J01FA10	5	Yes	Watch
Cefotaxime	J01DD01	5	Yes	Watch
Meropenem	J01DH02	4	Yes	Watch
Metronidazole	J01XD01	4	Yes	Access
Amoxicillin and clavulanic acid	J01CR02	2	Yes	Access
Clindamycin	J01FF01	3	Yes	Access
Polymyxin B	A07AA05	1	Yes	Reserve
Chloramphenicol	S02AA01	1	Yes	Access
Vancomycin	J01XA01	1	Yes	Watch
Levofloxacin	J01MA12	1	No	Watch
Clarithromycin	J01FA09	1	Yes	Watch

The annual inpatient admission in the study hospital was relatively less in 2020, because of the COVID-19 pandemic, which subsequently increased from 2021 onwards (Table 1).

The study hospital caters only to patients requiring medical care, and there are no surgical care specialties or emergency departments in the hospital. Patients are admitted from the outpatient departments only, and the data collected therefore does not reflect antibiotic usage in surgical or emergency settings. A total of 11 (eleven) inpatient wards, all designated medicine wards, were included for the purpose of the

survey. There were two dedicated COVID-19 wards at the hospital during that period, which were excluded from the purview of the survey. The overall antibiotic usage rate (72.61%) was higher than what was reported in previous Indian studies[12,13] but lower than that reported from neighboring countries.[14,15] About 19.04% of surveyed patients were on one antibiotic, 46.42% received two, and 7.14% received three or more antibiotics, showing a similar trend to an earlier Indian study where the distribution was 43%, 40%, and 18%, respectively.[12] Since the study hospital acts as a referral center for infectious and tropical diseases, a high proportion of patients require antimicrobial therapy, which explains the high antibiotic usage pattern observed. Additionally, due to the temporary closure of the hospital CCU during that period, some seriously ill patients requiring critical care were accommodated in the general medical wards, further inflating the total burden of antibiotics.

Empirical therapy dominated the prescribing practices, 94.05% in this study, which was reported as 72.14% in an earlier study from India,[12] revealing a reliance on broad-spectrum antibiotics without regular microbiological confirmation. This aligns with challenges in tertiary care hospitals where severely ill patients require immediate empirical therapy, with most of the referred patients already on antibiotics at the time of presentation. However, low culture testing (14.28%) underscores the need for revisiting the institutional culture-testing protocols and timely laboratory turnaround to facilitate de-escalation. The majority of the prescriptions were for community-acquired infections, consistent with the hospital's patient profile.

Notably, doxycycline and gentamicin, both in the "Access" group of antibiotics, were among the top two prescribed antibiotics (Fig. 2). However, 6 of the top 10 antimicrobials belonged to the "Watch" category, and one, linezolid, to the "Reserve" category (Table 2). The oral (51.69%) to parenteral (48.30%) antibiotic proportion indicated appropriate use in most cases, reflecting clinical judgment based on disease severity, in comparison to earlier studies showing high parenteral use.[12,13] Excessive double gram-negative coverage (33.33%) and minimal anaerobic overlap (2.38%) were observed. The increase in gentamicin-doxycycline combinations corresponded with a concurrent brucellosis outbreak in West Bengal, as the study hospital serves as a referral center for infectious diseases within the state. Rifaximin use was also frequent, along with meropenem, piperacillin-tazobactam, and ceftriaxone, and was prescribed mainly for prophylaxis of hepatic encephalopathy in chronic liver disease patients.

Although the reason for antibiotic use was documented in 76.27% of prescriptions, documentation of review or stop dates remained poor (only in 30.50%), indicating the possibility of discontinuation upon verbal instructions alone. The lack of an active antibiotic policy (under development during the period) prevented assessment of compliance, further emphasizing the need for early implementation of an institutional policy for antibiotic use. Over-prescription and prolonged antibiotic duration were also identified. Designated antibiotics such as vancomycin, polymyxin B, and carbapenems were used judiciously, but the use of piperacillin-tazobactam and linezolid requires restriction.

These findings align with other multicentric PPS studies from India showing high antibiotic use,[13] dominance of the "Watch" category, and limited microbial culture-based therapy. Targeted interventions should focus on promoting culture testing before empirical therapy, encouraging de-escalation, reducing unnecessary dual coverage, and ensuring antibiotic review documentation. Implementation of an antimicrobial stewardship program (AMSP) with regular audits, clinician education, and updated local guidelines can substantially improve prescribing practices.

Limitations

Considering that the study hospital caters exclusively to infectious and tropical disease patients, antibiotic consumption might appear overestimated in comparison to other multispecialty hospitals. The standardized data capture form limited detailed evaluation of dosage, duration, and drug–drug interactions, but highlighted the scope to modify the subsequent versions accordingly. Variation in the data collector's expertise might have introduced interobserver bias.

Conclusion

This point prevalence survey proved to be a practical, efficient, and reproducible tool for generating baseline data on hospital inpatient antibiotic prescribing practices. Findings revealed high empirical antibiotic use, limited culture-based prescribing, and predominant reliance on "Watch" antibiotics. Target areas identified include rationalizing antibiotic use, including restricting the "Watch" group of antibiotics, ensuring culture sensitivity testing, timely de-escalation, and improving documentation practices, such as writing review or stop dates. Strengthening hospital-level stewardship programs is crucial for curbing resistance, promoting rational pharmacotherapy, and safeguarding antibiotic efficacy in the long term.

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