Original Research Article

Evaluation of Pattern of Antibiotic Usage among Hospitalized Patients in District Hospitals of North East India: A Multicenter Point Prevalence Study

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Abstract

Background: Antimicrobial resistance is a critical global health issue, particularly in lower- and middle-income countries. This study aimed to evaluate antibiotic usage patterns in district hospitals of Northeast India.

Methods: This cross-sectional point prevalence survey was conducted in four district hospitals in Tripura, India over three months in 2025. Data on antibiotic prescriptions were collected for 350 inpatients across Medicine, Surgery, Orthopaedics, ENT, Paediatrics, and Obstetrics & Gynaecology departments.

Results: The overall antibiotic prescription rate was 89.7%, with variation across hospitals (81.2-95.0%). Across the various departments, the highest number of patients was recorded in Medicine. Ceftriaxone was the most commonly prescribed antibiotic (30.9% of prescriptions). The majority of antibiotics were used therapeutically (95.9%) rather than for prophylaxis. Acute febrile illness was the most frequent indication. Intravenous administration was predominant (85.9% of prescriptions).

Conclusion: The high prevalence of antibiotic use, especially broad-spectrum and parenteral agents, highlights the need for targeted antimicrobial stewardship interventions in district hospitals of Northeast India. Strategies to optimize prescribing practices and promote appropriate use are warranted.

Keywords: Antimicrobial prescriptions; Antimicrobial resistance; Hospital-acquired infections; Point prevalence survey.

Introduction

Antimicrobial resistance (AMR) is one of the most critical global health issues of the 21st century, posing a threat to decades of medical advancements by making previously effective antibiotics useless. Although AMR is a worldwide concern, its effects are more pronounced in Lower- and Middle-Income Countries (LMIC). AMR has significant costs for both health systems and national economies overall. [1,2]

The World Health Organization (WHO) supports incorporating Point Prevalence Survey (PPS) into antimicrobial stewardship initiatives, acknowledging their effectiveness in evaluating and tracking antimicrobial usage in various healthcare environments. Instruments like the 2019 AWaRe Classification enhance the practical analysis of antimicrobial consumption trends, assisting stakeholders in pinpointing intervention opportunities and implementing suitable measures. [1,3,4] In resource-constrained settings, acquiring

antimicrobial use data is challenging due to limited electronic records and manpower, hampering antimicrobial stewardship initiatives. [5] Assessment of antimicrobial use patterns can provide insights for policy-making.6 PPS has proven effective in revealing antibiotic consumption patterns, HAI prevalence, and prescribing practices across healthcare facilities. [7,8] A European multicentric PPS showed variations in antibiotic prescribing rates and identified optimization opportunities, while a Chinese study highlighted PPS's role in identifying inappropriate prescribing risk factors to improve stewardship efforts. [9,10]

In countries such as India, point prevalence surveys have been instrumental in informing antimicrobial policies, addressing issues of misuse, and enhancing access to quality antimicrobials. [8,11–13] Previous PPS studies conducted in India have yielded valuable insights into antimicrobial usage;

however, there is a notable absence of such studies from the northeastern region of India, particularly the state of Tripura. Consequently, this study aims to evaluate the pattern of antibiotic usage in various district hospitals of Northeast India and to assess the antibiotic prescribing patterns among patients admitted to various wards of four district hospitals in this region.

Material and Methods

This was an observational, cross-sectional study conducted over a period of three months (April–June 2025) in four district hospitals of Tripura: Gomati District Hospital, Udaipur; South District Hospital, Shantirbazar; North District Hospital, Dharmanagar; and Unakoti District Hospital, Unakoti.

Data collection was carried out through a cross-sectional point prevalence survey, with information obtained from patient files on a single day in each hospital: Gomati on 12 April 2025, Shantirbazar on 12 May 2025, Dharmanagar on 14 May 2025, and Unakoti on 14 June 2025, each between 8:00 AM and 2:00 PM. Consecutive sampling was adopted, and all patients admitted to the male and female wards of Medicine, Surgery, Orthopaedics, ENT, Paediatrics, and Obstetrics & Gynaecology departments were eligible for inclusion. No exclusion criteria were applied. After collecting of data on the defined dates, 100 from Gomati, 85 from Shantirbazar, 85 from Dharmanagar, and 80 from Unakoti, leading to the final sample size of 350.Details regarding antibiotic use—including indication, dosage and route of administration, frequency and number of doses, and duration of therapy or prophylaxis—were extracted.

Data were entered and analyzed using SPSS version 27.0, and graphs were generated with R software. Qualitative data were presented as frequencies and percentages, while continuous data were expressed as means with standard deviations.

Results

The mean age of the study participants was 38.5 years (±16.7), with an overall age range of 1 to 99 years. Substantial variation in age distribution was observed across the four district hospitals. The highest mean age was recorded in Dharmanagar District Hospital (42.3 years ±11.6), followed by Gomati (38.9 ±13.4), Unakoti (38.0 ±16.8), and Santirbazar (34.7 ±23.0). The minimum age was 22 years in both Gomati and North, whereas younger patients were included from Santirbazar (2 years) and Unakoti (1 year). The maximum age was highest in Santirbazar (99 years), followed by Unakoti (79 years), Gomati (75 years), and North (62 years), reflecting considerable heterogeneity in age distribution across study sites. Among the selected patients, with females comprising 51.7% (n = 181) and males 48.3% (n = 169). The distribution of patients by gender across the four hospitals shows in the Figure 1.
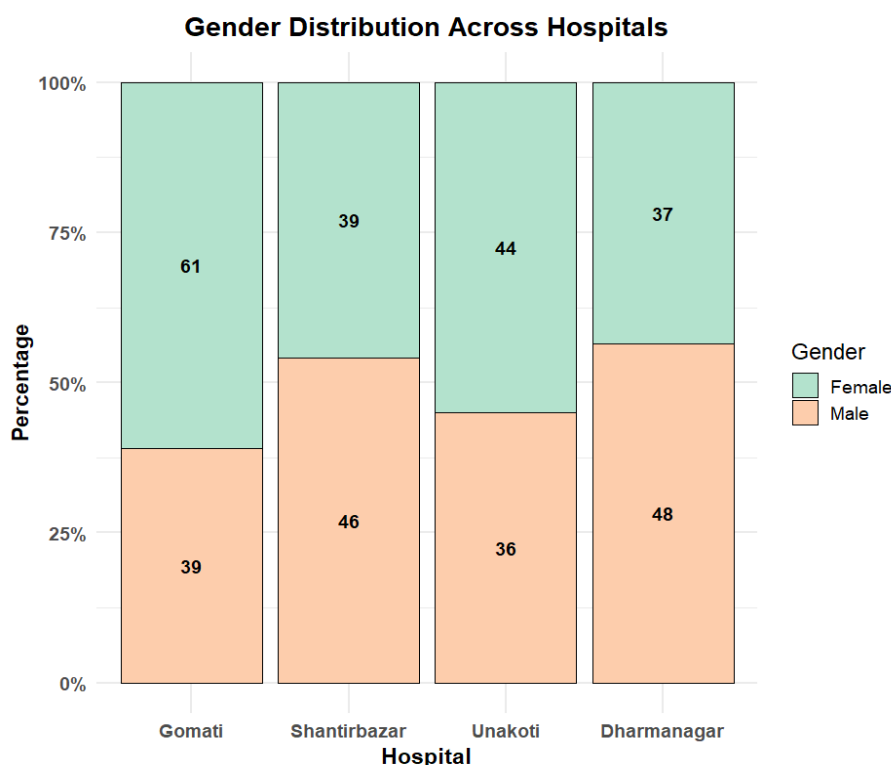

Figure 1: Gender distribution across hospitals

Across the various departments, the highest number of patients was recorded in Medicine (n=98), followed by Obstetrics and Gynaecology (n=54), Pediatrics (n=32), ENT (n=27), and Orthopedics (n=23). Figure 2 presents a detailed distribution of patients by department across the selected hospitals.
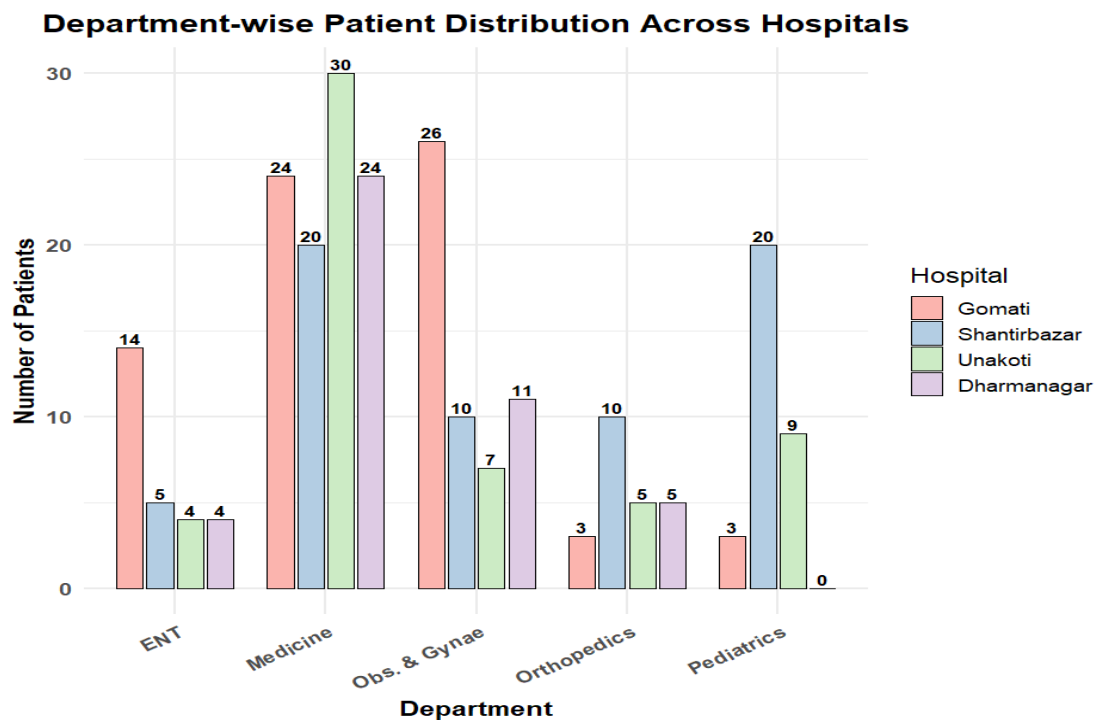

Figure 2: Department wise distribution of patients across hospitals

Across four hospitals, 314 patients (89.7%) received at least one antimicrobial agent, while antibiotics were not prescribed in 36 cases (10.3%). The highest prescription rate was observed in Unakoti (95%, 76/80), followed by Shantirbazar (92.9%, 79/85), Gomati (90%, 90/100), and Dharmanagar (81.2%, 69/85) (figure 3).
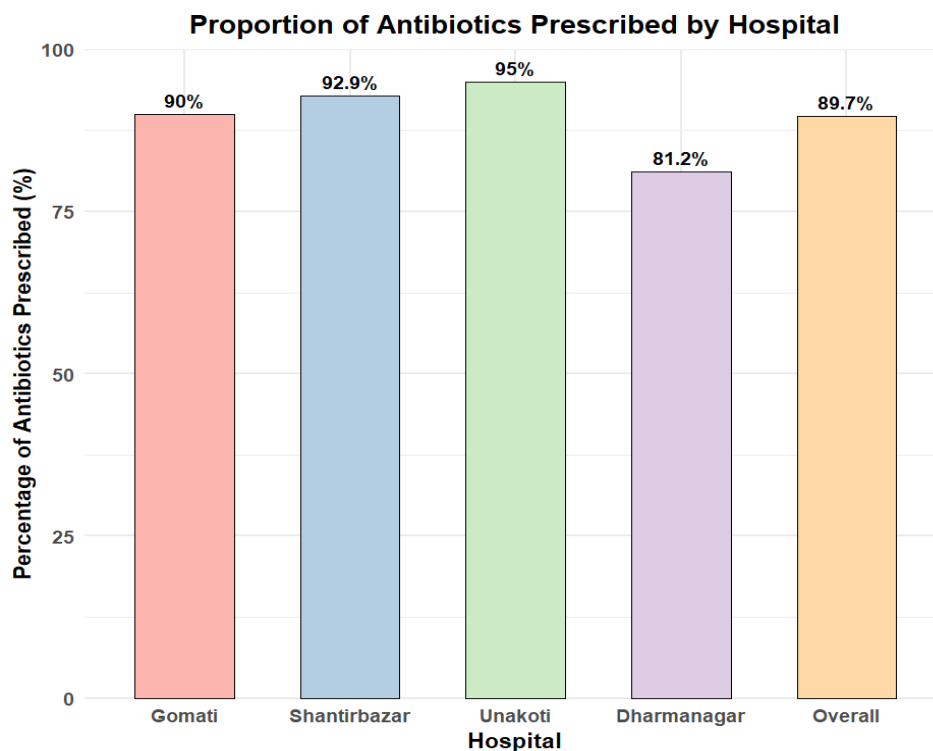

Figure 3: Pattern of antibiotic prescribed among hospitals and overall

Among the total prescriptions reviewed, antibiotics were administered for therapeutic purposes in the majority of cases (n=301, 95.9%) (Table 1). This distribution highlights that the predominant indication for antibiotic use was treatment of established or suspected infections, with relatively limited prophylactic administration.

Table 1: Distribution of indications across hospitals

Hospital	Therapeutic	Prophylactic
Gomati	88 (98%)	2 (2%)
Shantirbazar	77 (97%)	2 (3%)
Unakoti	69 (91%)	7 (9%)
Dharmanagar	67 (97%)	2 (3%)
Overall	301 (96%)	13 (4%)

A broad range of clinical indications was recorded across the four district hospitals. The most frequent were acute febrile illness (AFI, n = 38), cholecystitis (n = 35), lower respiratory tract infections (LRTI, n = 34), post-caesarean section (LSCS) status (n = 25), and urinary tract infections (UTI, n = 10). AFI occurred equally in Gomati and North (13 each), with fewer cases in Santirbazar and Unakoti (6 each). LRTI was concentrated in Santirbazar (n = 16) and Unakoti (n = 10). Cholecystitis was reported in all hospitals, most often in North (n = 11) and Unakoti (n = 10). Post-LSCS status was highest in Gomati (n = 12). Other important indications were pancreatitis (n = 22, mostly North), pelvic inflammatory disease (PID; n = 16, mostly Gomati), and perianal abscess (n = 6). Less frequent conditions included coronary artery disease (CAD; n = 7), cerebrovascular accidents (CVA; n = 4, all Unakoti), and post-hysterectomy status (n = 4, all Gomati). Rare events comprised traumatic injuries, septic abortion, Bartholin's cyst, phenol poisoning, COPD, and hepatitis. Figure 4 illustrates the distribution of common indications across hospitals.
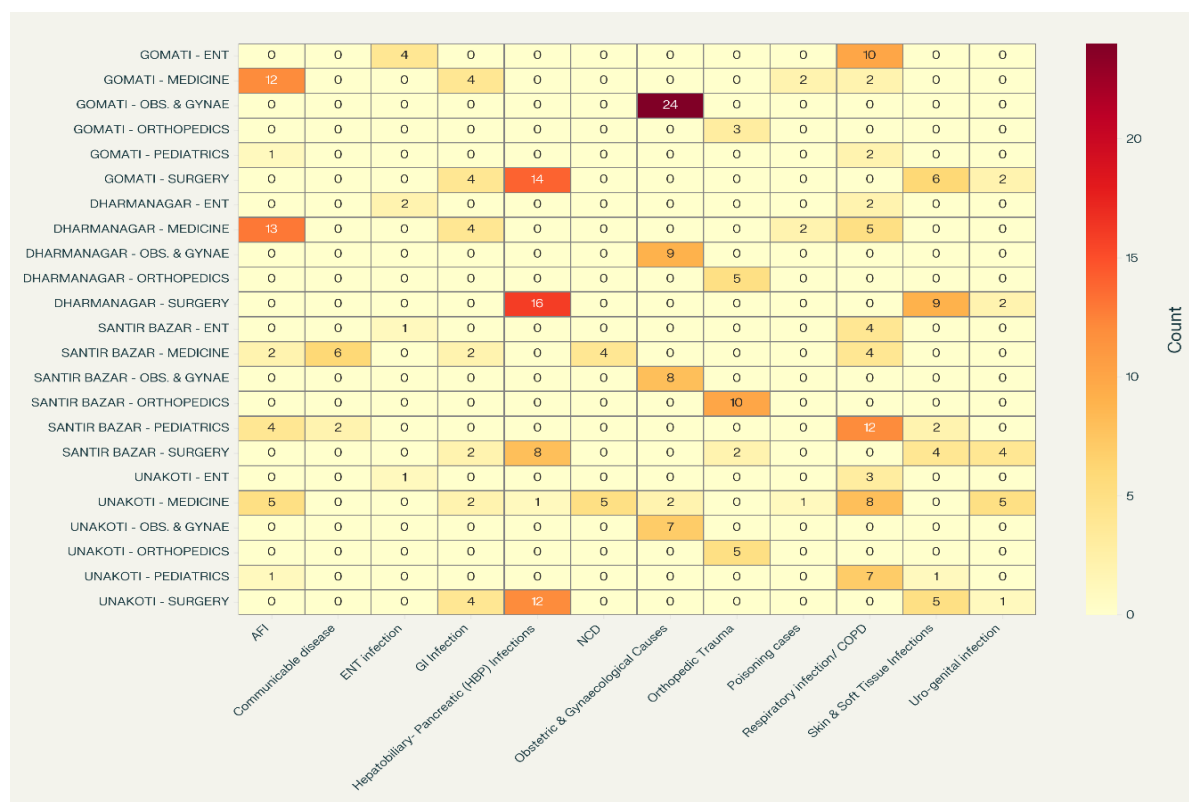

Figure 4: Distribution of common indications across departments and hospitals

A total of 19 different antibiotics were prescribed across the four district hospitals. Ceftriaxone was the most frequently prescribed agent, with 97 prescriptions overall (Gomati: 31, Dharmanagar: 24, Shantirbazar: 18, Unakoti: 24). Amoxicillin–clavulanate was the next most common, with 49 prescriptions (Gomati: 16, Dharmanagar: 9, Shantirbazar: 12, Unakoti: 12). Combination therapies such as ceftriaxone–sulbactam (n=13) and ceftriaxone with metronidazole (n=16) were also notable. In contrast, certain agents were rarely used; for example, cefoperazone, cefuroxime–sulbactam, and imipenem were prescribed only once or twice and only in selected hospitals.

Prescriptions for azithromycin, doxycycline, levofloxacin, and linezolid were less frequent overall but showed variability across sites (figure 5). Overall, prescription patterns were broadly similar across hospitals, although Gomati and Dharmanagar accounted for higher frequencies of ceftriaxone and doxycycline, while Unakoti showed more use of amikacin-based combinations.
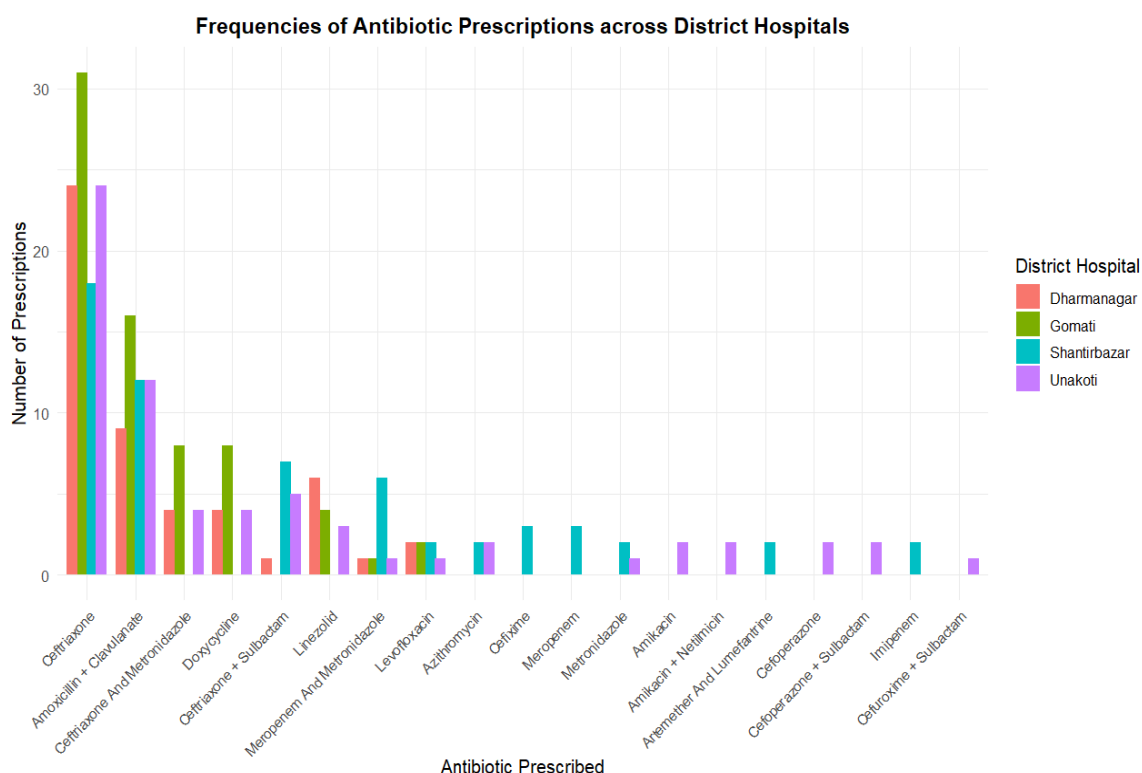

Figure 5: Distribution of antibiotics prescribed across hospitals

Across the four district hospitals, intravenous administration was the predominant route of antibiotic use, accounting for 270 prescriptions overall. Hospital-wise, the highest intravenous use was observed in Gomati (n=81), followed by Shantirbazar and Unakoti (64 each), and Dharmanagar (61). Per-oral formulations were less frequently prescribed, with similar distributions across hospitals. Syrup formulations were prescribed infrequently (n=11), most commonly in Shantirbazar (n=6) and Unakoti (n=4). Overall, these findings highlight a strong reliance on parenteral therapy across all sites, with limited use of oral preparations (Table 2).

Table 2: Distribution of routes of antibiotics use

Hospital	Intravenous	Per Oral	Per Oral (Syrup form)
Gomati	81 (90%)	8 (9%)	1 (1%)
Shantirbazar	64 (81%)	9 (11%)	6 (8%)
Unakoti	64 (84%)	8 (11%)	4 (5%)
Dharmanagar	61 (88%)	8 (12%)	0 (0%)
Overall	270 (86%)	33 (11%)	11 (4%)

Discussion

This cross-sectional point prevalence survey across four district hospitals of Tripura highlights a high overall antibiotic prescription rate of 89.7%. Such a figure is considerably higher than rates reported in earlier Indian studies, raising concerns about the appropriateness of antibiotic use in these settings. For example, Singh et al. documented an antibiotic prescription rate of 57.4% across 16 Indian hospitals in 2019. Similarly Bhattacharjee et al. also reported 59.6%, suggesting that prescribing practices in Tripura may be substantially more liberal. [8,14] Our findings also revealed marked inter-hospital variation, with the highest prevalence recorded in Unakoti (95.0%) and the lowest in Dharmanagar (81.2%).

The rates in Shantirbazar (92.9%) and Gomati (90.0%) were similarly elevated. These inter-facility differences mirror patterns previously reported both in India and internationally, as described by Singh et al. and Plachouras et al., where local policies, clinician preferences, and

resource availability often influence prescribing behaviour. [8,10] The consistently high prevalence observed across all four hospitals, however, points towards a systemic trend of potentially excessive antibiotic use. This finding underscores the urgent need for targeted antimicrobial stewardship interventions and stricter prescription monitoring to optimise antibiotic use and reduce the risk of resistance.

Consistent with previous research, ceftriaxone emerged as the most frequently prescribed antibiotic in the present study. This finding is in line with the observations of Kumar et al. and Bhattacharjee et al., who also reported ceftriaxone as the predominant choice in their respective settings. [7,14]

The widespread use of ceftriaxone may be attributed to its broad-spectrum activity, availability, and clinician familiarity. Interestingly, our study also identified a comparatively higher use of amoxicillin-clavulanate than has been reported in earlier Indian studies. This variation could indicate regional prescribing preferences, differences in clinical practice across hospitals, or underlying variations in local antimicrobial resistance profiles, warranting further exploration.

In the present study, the majority of antibiotics were prescribed for therapeutic rather than prophylactic purposes, a finding consistent with earlier reports by Singh et al. and Bhattacharjee et al. [8,14] This suggests that clinicians in the surveyed hospitals predominantly rely on antibiotics for active treatment rather than preventive use, which may reflect both clinical judgment and resource considerations. With respect to indications, acute febrile illness emerged as the leading reason for antibiotic administration.

This pattern differs from that reported by Panditrao et al., who observed lower respiratory tract infections as the most common indication for antibiotic use in Indian tertiary care centres. [12] Such differences may be attributable to variation in patient populations, seasonal disease burden, or diagnostic capabilities between tertiary and district-level facilities. The predominance of prescriptions for acute febrile illness in our setting may also indicate a tendency towards empirical prescribing in the absence of rapid diagnostic support, which could further highlight the need for strengthening diagnostic stewardship.

The predominance of intravenous antibiotic administration in this study, accounting for 85.9% of all prescriptions, is a striking finding and exceeds rates reported in several other low- and middle-income countries. For instance, a large multicentre study in China documented intravenous use in 76.7% of cases, while Bhattacharjee et al.

reported 78.7% of antibiotic prescriptions being administered parenterally. [9,14] The markedly higher reliance on intravenous therapy in the current setting may reflect physician prescribing habits, perceived efficacy of parenteral formulations, or patient-related factors such as severity of illness. Nonetheless, this pattern highlights an important opportunity to encourage oral step-down therapy when clinically appropriate, which could improve patient comfort, reduce costs, and lower risks of line-related complications.

The study's cross-sectional design, with data collected on a single day at each hospital, may not capture seasonal variations in antibiotic prescribing patterns. This point prevalence approach provides only a snapshot of antibiotic use. Our study was limited to four district hospitals in one state of Northeast India, which may not represent prescribing practices across the region. Future longitudinal studies with larger samples and assessment of prescribing quality are needed to address these limitations.

Conclusion

This study provides important insights into antibiotic prescribing practices in district hospitals of Tripura, an area for which limited data are available. The high overall prevalence of antibiotic use, coupled with the predominance of broad-spectrum and parenteral prescriptions, underscores the need for context-specific antimicrobial stewardship strategies. Interventions should prioritise optimising prescription practices by reducing unnecessary use, promoting pathogen-targeted therapy, and encouraging timely transition to oral agents where feasible. These measures may help to preserve antibiotic effectiveness, minimise adverse outcomes, and mitigate the risk of resistance. Further research is warranted to investigate the underlying drivers of prescribing behaviours in district-level hospitals and to evaluate the impact of tailored stewardship programmes in resource-limited settings.

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