Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jd15c683

ANTIBIOTIC GUIDELINE ADHERENCE AND PRESCRIBING PATTERNS AMONG PHYSICIANS IN BANGLADESHI TERTIARY HOSPITALS

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Abstract

Background: Antimicrobial resistance (AMR) poses a critical global health threat, with irrational antibiotic prescribing practices being a key driver—especially in low- and middle-income countries (LMICs) like Bangladesh. Despite the existence of national and international prescribing guidelines, adherence among physicians remains inconsistent, particularly in tertiary care settings.

Objective: This study aimed to evaluate adherence to national (BSMMU) and international (WHO AWaRe) antibiotic prescribing guidelines and to assess patterns and influencing factors of antibiotic use among physicians in tertiary care institutions in Bangladesh.

Methods: A descriptive cross-sectional study was conducted among 232 physicians across three tertiary care hospitals in Dhaka. A total of 266 prescriptions were reviewed, of which 192 (72%) contained at least one antibiotic. Data were collected using structured questionnaires and WHO prescribing indicator checklists. Statistical analysis was performed using SPSS (version 26).

Results: The average number of drugs per prescription was 5.4, with antibiotics prescribed in 72% of encounters—significantly exceeding WHO recommendations. Generic prescribing was low (6.4%), while 96% of antibiotics were broad-spectrum. Watch or Reserve group antibiotics accounted for 48% of prescriptions, surpassing the WHO threshold (≤40%). Only 59% of prescriptions adhered to BSMMU's preferred guidelines. Physicians frequently considered clinical and pharmacologic factors but reported limited formal training in antibiotic prescribing (25%).

Conclusion: The findings reveal substantial deviations from recommended antibiotic prescribing standards, underscoring the need for improved stewardship interventions, continuous medical education, and enhanced regulatory oversight to promote rational antibiotic use in Bangladeshi tertiary care settings.

Keywords: Antibiotic Prescribing Patterns, Antimicrobial Stewardship, Guideline Adherence, Tertiary Care Hospitals, Bangladesh

Introduction

Antimicrobial resistance (AMR) remains a formidable threat to global health, development, and security. It endangers the efficacy of life-saving treatments and complicates the management of infectious diseases worldwide [1]. According to the Global Research on Antimicrobial Resistance (GRAM) study published in *The Lancet*, an estimated 4.95 million deaths in 2019 were associated

with bacterial AMR, with 1.27 million directly attributable to resistant bacterial infections [2]. These figures exceed mortality estimates for major global diseases such as HIV/AIDS and malaria, underscoring the severity of the AMR crisis.

A major contributor to this global burden is the irrational and inappropriate prescribing of antibiotics. Despite awareness campaigns and updated clinical guidelines, many healthcare providers continue to prescribe antibiotics without clear indications [3]. The U.S. Centers for Disease Control and Prevention (CDC) reported that approximately 30% of outpatient antibiotic prescriptions in the United States in 2017 were unnecessary—amounting to over 47 million unwarranted antibiotic courses annually [4, 5]. This pattern is even more pronounced in low- and middle-income countries (LMICs), where antibiotic misuse is widespread due to easy over-the-counter access, insufficient diagnostic support, and lack of regulatory enforcement [6, 7].

Bangladesh, like many LMICs, is experiencing an accelerated rise in AMR due to unregulated access to antibiotics and prescriber practices not aligned with current evidence-based standards. A study conducted in Bangladesh found that 83% of antibiotic prescriptions were issued without any supporting laboratory or clinical diagnostic tests, suggesting widespread empirical prescribing practices [8]. Moreover, a significant proportion of prescriptions involve broad-spectrum antibiotics or injectable formulations, frequently chosen due to patient expectations or promotional influences from pharmaceutical companies [9, 10].

To address this growing public health threat, the World Health Organization (WHO) introduced the AWaRe (Access, Watch, and Reserve) classification of antibiotics in 2017. This tool aims to optimize antibiotic use globally by categorizing antibiotics based on their potential to promote resistance and recommending stewardship actions accordingly [11]. Complementing this global initiative, Bangladesh's Directorate General of Health Services (DGHS), in collaboration with Bangabandhu Sheikh Mujib Medical University (BSMMU), developed the *National Antibiotic Guideline*. This guideline outlines preferred and alternative antibiotic regimens tailored to local microbial resistance patterns, promoting rational use in both outpatient and inpatient settings [12, 13].

However, adherence to these guidelines among physicians remains a major challenge. Tertiary care institutes—where physicians are assumed to have higher clinical acumen—are often faced with high patient loads, limited diagnostic tools, and inconsistent access to recommended antibiotics [14]. These constraints, coupled with variations in prescriber knowledge and attitudes, can lead to deviations from standard protocols, contributing to the proliferation of resistant organisms even in advanced healthcare facilities [15].

While prior studies in Bangladesh have examined antibiotic prescribing in outpatient and pediatric contexts, limited research has assessed physician-level adherence to national guidelines in high-volume tertiary hospitals. Understanding prescribing behavior in these referral and teaching institutions is critical, as their practices influence both patient outcomes and the prescribing habits of future clinicians. This study addresses this gap by combining physician surveys and prescription audits across multiple departments to evaluate real-world alignment with national and international guidelines.

Accordingly, this study aimed to assess the adherence of physicians in tertiary care institutes in Bangladesh to national (BSMMU) and international (WHO AWaRe) antibiotic guidelines. It also sought to identify patterns of antibiotic prescribing and examine the influence of demographic and institutional factors on physician behavior. The findings are expected to inform national strategies to improve antibiotic stewardship and mitigate the spread of AMR.

Materials and Methods

Study Design and Setting

This descriptive cross-sectional study was carried out over 12 months, from January to December 2022, at three tertiary care institutions in Dhaka, Bangladesh, including the National Institute of Traumatology and Orthopaedic Rehabilitation (NITOR), the National Institute of Diseases of the Chest and Hospital (NIDCH), and the National Institute of Ear, Nose and Throat (NIENT). These facilities were deliberately selected to encompass a range of clinical disciplines and patient profiles,

such as orthopaedics, pulmonology, and otolaryngology, offering a representative and multidimensional setting for assessing antibiotic prescribing practices among physicians in high-volume, government-funded healthcare environments.

Study Population and Sampling

The study enrolled physicians from selected institutions who were actively prescribing antibiotics. Eligible participants were registered medical practitioners actively engaged in clinical practice who provided informed consent. Physicians on administrative duty, on leave, or unwilling to participate were excluded. Prescriptions were eligible for analysis if they were issued by participating physicians during the study period, irrespective of whether they contained antibiotics or other medications, and regardless of the therapeutic class or route of administration.

In total, 232 physicians participated, and 266 antibiotic prescriptions were reviewed. Convenience sampling was used due to logistical constraints and the need for timely data collection. Physicians and prescriptions were selected based on availability and willingness during regular clinical hours. While this method may limit generalizability, it was deemed appropriate for the study's exploratory objectives.

Sample Size Calculation

Sample Size for Physicians

The required sample size for physicians was calculated based on an estimated 81.5% empirical antibiotic use, as reported in previous Bangladeshi study [16]. Using Cochran's formula with a 95% confidence level and 5% margin of error, the minimum required sample size was 232 physicians

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Sample Size for Prescriptions

For prescription analysis, we found a nearly identical prevalence of 83% regarding empirical antibiotic prescribing without diagnostic confirmation. Applying the same formula and maintaining a 95% confidence level with a 5% margin of error, the estimated sample size was 218 prescriptions. To accommodate a 15% non-response or data exclusion rate, the final target was increased to 266 prescriptions, ensuring adequate statistical power and data robustness.

Guideline Adherence Assessment and Data Collection Procedures

Prescriptions were systematically reviewed to evaluate their conformity with the Bangabandhu Sheikh Mujib Medical University (BSMMU) national antibiotic guidelines. The guideline outlines specific antimicrobial recommendations for various clinical conditions, classifying them into **'preferred' first-line regimens** and **'alternative' options** for cases involving drug allergies, resistance patterns, or other clinical considerations. In this study, adherence was assessed against both categories to determine the extent to which prescribing practices aligned with institutional standards in real-world settings.

Data collection employed a structured, pre-tested questionnaire to capture information on physician demographics, prescribing behaviors, and attitudes toward antibiotic use. Concurrently, prescription audits were conducted using the **World Health Organization (WHO) prescribing indicators checklist**, which included the following metrics:

- Average number of drugs per encounter
- Percentage of drugs prescribed by generic name
- Percentage of encounters with an antibiotic prescribed
- Percentage of encounters with an injection prescribed
- Percentage of drugs prescribed from the essential medicines list

These indicators are internationally validated tools used to assess rational medicine use and prescribing efficiency, particularly in low- and middle-income countries.

Data collection was carried out by trained research assistants over a defined period. A pilot study was conducted prior to full implementation to validate the instruments and ensure methodological consistency throughout the data gathering process.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 26. Descriptive statistics—including frequencies, percentages, means, and standard deviations—were used to summarize the findings. Associations between categorical variables (e.g., demographic characteristics and guideline adherence) were examined using chi-square tests, with a p-value <0.05 considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the Institutional Review Board (IRB) of the National Institute of Preventive and Social Medicine (NIPSOM) in Dhaka. Written informed consent was secured from all participating physicians, who were assured of confidentiality. All data were anonymized and used solely for research purposes. Prescription records were anonymized before analysis and contained no patient-identifiable information. The handling of prescription data complied with ethical standards to ensure confidentiality, and the data were used exclusively for research purposes. No patient consent was required, as the study involved secondary, de-identified data.

Results

Demographic and Professional Characteristics of Participating Physicians

The demographic and professional characteristics of the 232 participating physicians are summarized, and 266 prescriptions were reviewed. The respondents' ages ranged from 28 to 46 years, with a mean age was 33.4 ± 3.5 years. Most participants were aged between 31 and 35 years (43.0%), followed by those aged 36 to 50 years (30.0%) and 26 to 30 years (27.0%). The majority of participants were male (86.6%), while 13.4% were female. In terms of religion, 92.0% identified as Muslim and 8.0% as Hindu. Over half of the participants were married (55.0%), while 45.0% were unmarried.

In terms of educational qualifications, 40.5% held a diploma, 31.5% had an MS degree, 12.5% had either an MD or other qualifications, and 3.0% held an FCPS. The majority were enrolled in an ongoing course (66.0%), with others designated as medical officers (19.0%) or honorary medical officers (15.0%). The respondents had a mean working experience of 6.6 ± 3.7 years. Nearly half (48.3%) had 1–5 years of experience, 34.5% had 6–10 years, 16.8% had 11–15 years, and 0.4% had 16–20 years of experience. Their workplaces included NITOR (41.0%), NIDCH (35.0%), and NIENT (24.0%).

Concerning work schedules, 69.0% reported working 8 hours per day, 16.0% worked 7 hours, 13.0% worked 6 hours, and 2.0% worked more than 9 hours, with a mean (±SD) of 7.6 ±0.9 hours per day. The majority (84.0%) worked six days per week, and 16.0% worked seven days per week. In terms of patient load per shift, 72.8% managed 51–100 patients, 24.6% managed 0–50 patients, and 2.6% managed 101–150 patients.

Regarding infectious disease management, 41.0% reported having relevant experience, while 59.0% did not. Only 25.0% of respondents had received formal training on antibiotic prescribing. Among the 58 trained respondents, the duration of training was most commonly 4 weeks (41.0%), followed by 1 week (28.0%), 2 weeks (28.0%), and 8 weeks (3.0%). The time since last training varied, with 39.7% receiving training 1–2 years ago, 25.9% within 2–6 years, 20.7% over 6 years ago, and 13.8% within the past year.

Table 1: Demographic and Professional Characteristics of Participating Physicians (n = 232)

Variable	Category	Frequency (f)	Percentage (%)
Age Group (years)	26–30	63	27.0
	31–35	99	43.0
	36–50	70	30.0
Age (years)	**Mean ± SD**	–	**33.4 ± 3.5**
Age Range	Min–Max	–	28–46
Sex	Male	201	86.6
	Female	31	13.4
Religion	Islam	213	92.0
	Hinduism	19	8.0
Marital Status	Married	127	55.0
	Unmarried	104	45.0
Educational Qualification	Diploma	94	40.5
	MS	73	31.5
	MD	29	12.5
	FCPS	7	3.0
	Others	29	12.5
Designation	Ongoing course	154	66.0
	Medical Officer	44	19.0
	Honorary Medical Officer	34	15.0
Working Experience (years)	1–5	112	48.3
	6–10	80	34.5
	11–15	39	16.8
	16–20	1	0.4
Working Experience (years)	**Mean ± SD**	–	**6.6 ± 3.7**
Place of Work	NITOR	95	41.0
	NIDCH	82	35.0
	NIENT	55	24.0
Daily Working Hours	6	31	13.0
	7	37	16.0
	8	159	69.0
	>9	5	2.0
Daily Working Hours	**Mean ± SD**	–	**7.6 ± 0.9**
Weekly Workdays	6	195	84.0
	7	37	16.0
Patients per Shift	0–50	57	24.6
	51–100	169	72.8
	101–150	6	2.6
Experience Managing Infectious Diseases	Yes	95	41.0
	No	137	59.0
Training Received on Antibiotic Prescribing	Yes	58	25.0
	No	174	75.0
Training Duration (weeks) (n=58)	1	16	28.0
	2	16	28.0
	4	24	41.0
	8	2	3.0
Time Elapsed Since Last Training *(n=58)*	Less than 1 year	8	13.8
	1–2 years	23	39.7
	2–6 years	15	25.9
	6 years and above	12	20.7

Prescribing Behavior and Influencing Factors among Physicians

Table 2 illustrates the various patient-related and antibiotic-related factors influencing physicians' prescribing behavior. Universally cited determinants included patient's age, physical examination, diagnosis, disease severity, diagnostic test results, pregnancy status, effectiveness and side effects of antibiotics (all reported by 100% of respondents). Drug history (99%), recommended antibiotic dose (99%), allergic history (96%), and economic status (93%) were also prominently considered. In contrast, less frequently considered factors included the patient's gender (22%) and occupation (20%). Lactational status (67%) and hospital supply (63%) were variably reported as influential. The availability and cost of antibiotics remained substantial influencers (98% and 93%, respectively).

Table 2: Prescribing Behavior and Influencing Factors among Physicians (n = 232)

Influencing Factors to Prescription	Category	Frequency (f)	Percentage (%)
Patient's Age	Yes	232	100.0
Patient's Gender	Yes	52	22.0
	Sometimes	2	1.0
	No	178	77.0
Patient's Occupation	Yes	46	20.0
	Sometimes	14	6.0
	No	172	74.0
Patient's Physical Examination	Yes	232	100.0
Diagnosis of Patient	Yes	232	100.0
Severity of Disease	Yes	232	100.0
Diagnostic Test Results	Yes	232	100.0
Drug History of Patient	Yes	230	99.0
	Sometimes	2	1.0
Allergic History of Patient	Yes	222	96.0
	No/Sometimes	10	4.0
Pregnancy Status	Yes	232	100.0
Lactational Status	Yes	156	67.0
	Sometimes	50	22.0
	No	26	11.0
Patient's Economic Status	Yes	216	93.0
	Sometimes	10	4.0
	No	6	3.0
Availability of Antibiotics	Yes	228	98.0
	Sometimes	4	2.0
Supply in Hospital	Yes	146	63.0
	Sometimes	54	23.0
	No	32	14.0
Cost of antibiotic	Yes	216	93.0
	Sometimes	10	4.0
	No	6	3.0
Recommended dose of antibiotic	Yes	230	99.0
	No	0	0.0
	Sometimes	2	1.0
Effectiveness of antibiotic	Yes	232	100.0
Side effects of antibiotic	Yes	232	100.0

Adherence to WHO Prescribing Indicators and Local Guidelines

A total of 266 prescriptions were reviewed, encompassing 1,039 drugs. Of these, 192 prescriptions contained at least one antibiotic. In total, 222 antibiotics were recorded across the 192 prescriptions. The average number of drugs per encounter was 3.9, substantially exceeding the WHO-recommended range of 1.6–1.8. The average number of antibiotics per prescription was 1.15. Notably, only 6.4% of drugs were prescribed by generic name, falling far below the WHO benchmark of 100%.

Antibiotics were prescribed in 72% of encounters, which is significantly higher than the WHO standard of 20–26.8%. Injectable antibiotics were present in 6.25% of prescriptions, aligning favorably with the acceptable range of 13.8–24.1%. Moreover, 83% of antibiotics were from the WHO Essential Medicines List.

A concerning 96% of antibiotics prescribed were broad-spectrum, which is discouraged due to its contribution to antimicrobial resistance. Additionally, 48% of antibiotics were from the WHO Watch or Reserve list, exceeding the WHO AWaRe recommendation of ≤40%.

Adherence to the Bangabandhu Sheikh Mujib Medical University (BSMMU) guideline for antibiotic prescribing was assessed in 177 prescriptions. Among these, 59% adhered to the preferred guideline, and 74% adhered when both preferred and alternative guideline recommendations were considered.

Table 3: Antibiotic Prescribing WHO Indicators and Adherence to Guidelines (n = 192 prescriptions that included at least one antibiotic out of 266 prescriptions)

Indicator	Calculation	Value	WHO/Reference Standard
Average number of drugs per encounter	Total drugs (1039) / prescriptions (266)	3.9	1.6–1.8
Average number of antibiotics per prescription	Total antibiotics (222) / prescriptions (192)	1.2	Not specified
% of drugs prescribed by generic name	67 / 1039 × 100	6.4%	100.0%
% of encounters with antibiotic prescribed	192 / 266 × 100	72.0%	20.0–26.8%
% of prescriptions with injectable antibiotics	15 / 192 × 100	6.3%	13.8–24.1%
% of antibiotics from WHO Essential Medicines List	184 / 222 × 100	83.0%	100.0%
% of broad-spectrum antibiotics prescribed	185 / 192 × 100	96.0%	Lower preferred
% of antibiotics from WHO Watch/Reserve list	107 / 222 × 100	48.0%	≤ 40.0% (WHO AWaRe recommendation)
% adherence to BSMMU preferred guideline (assessable, n = 177)	104 / 177 × 100	59.0%	No formal threshold
Total % adherence to BSMMU (preferred + alternative)	131 / 177 × 100	74.0%	No formal threshold

Note: Indicators calculated from n = 192 prescriptions that included antibiotics.

Most Commonly Prescribed Antibiotics

Among the antibiotics reviewed, amoxicillin with clavulanic acid was the most commonly prescribed, representing 22% of all prescriptions, followed closely by flucloxacillin at 21%. Cefixime accounted for 18%, ranking third in frequency. Phenoxymethylpenicillin and azithromycin were each prescribed in 9% of cases. Ceftriaxone, prescribed in 7%, was the least frequently used among the six most commonly prescribed antibiotics.

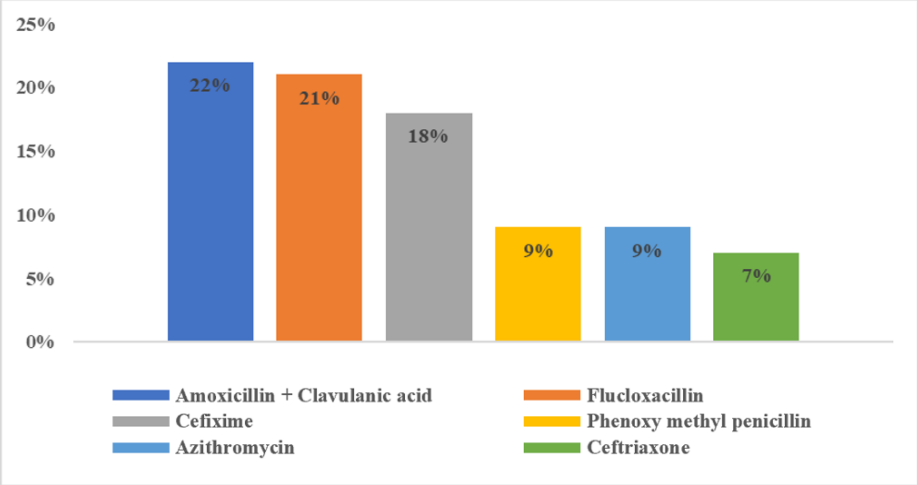

Figure 1: Most Commonly Prescribed Antibiotics

Discussion

The predominance of early- to mid-career physicians in tertiary care reflects the country's current workforce demographics. This trend is prevalent in tertiary care settings within low- and middle-income countries, where younger physicians frequently comprise a substantial part of the workforce. For instance, a study analyzing the health workforce in Bangladesh reported that over 57% of doctors were under the age of 40, highlighting the youthful composition of the medical workforce [17]. Despite an increasing number of female medical graduates, male physicians continue to dominate certain specialties and leadership roles in Bangladesh. A study conducted at Bangabandhu Sheikh Mujib Medical University (BSMMU) found that male dominance was particularly evident in the faculties of Surgery (61.2%) and Medicine (69.7%). This aligns with broader trends in the country where gender disparities persist in the medical profession [18].

The majority of physicians in Bangladesh pursue postgraduate qualifications, with a significant number enrolled in ongoing academic programs. The study found that a substantial portion of the medical workforce holds postgraduate degrees, including diplomas, MS, and MD. This aligns with a health labor market survey in Bangladesh, reflecting the academic orientation and career progression pathways prevalent in the country's health system [19].

High clinical workloads, as observed in this study, are characterized by extended working hours and high patient volumes. A study conducted at the country's Upazila Health Complexes reported that physicians worked an average of 9.4 hours per day and attended to approximately 40 patients daily, with each consultation lasting about 16 minutes [20]. Another study highlighted that outpatient consultation times in public sector health facilities ranged from 48 seconds to 4.04 minutes per patient, reflecting significant time constraints due to patient overload [21]. The high patient load and long working hours—typical of tertiary care physicians in this study, may contribute to rushed prescribing decisions and reduced compliance with antibiotic guidelines, especially when combined with diagnostic constraints.

Regarding the infectious disease experience of the physicians in this study, only 41% had experience managing infectious diseases, and just 25% had received formal training in antibiotic prescribing. This limited exposure to infectious disease management and prescribing training represents a critical vulnerability in the fight against antimicrobial resistance in Bangladesh. Studies indicate that a significant proportion of physicians in low- and middle-income countries (LMICs), including Bangladesh, have limited experience in managing infectious diseases [22]. This limitation is especially troubling given the high burden of infectious diseases and the critical role physicians play in antimicrobial stewardship.

The study's physicians commonly consider critical clinical parameters when prescribing antibiotics, including patient age, physical examination findings, disease severity, diagnostic test results, pregnancy status, drug effectiveness, and potential side effects. This level of clinical consideration is encouraging and reflects adherence to foundational principles of rational antimicrobial use, despite systemic constraints and clinical decision-making frameworks that emphasize individualized patient assessment and evidence-based antimicrobial use [22].

The high consideration for factors such as drug history, recommended dosage, and allergic history underscores the importance placed on patient safety and therapeutic appropriateness. These practices are consistent with antimicrobial stewardship principles that advocate for individualized and cautious prescribing to minimize resistance and adverse effects [22].

Cost-related factors, including the patient's economic status and antibiotic availability, significantly influence prescribing decisions. In Bangladesh, where out-of-pocket payments and medicine shortages are common challenges, these factors often shape physicians' choices, even when clinical indications suggest alternative therapies [22, 23].

As anticipated, non-clinical characteristics such as gender and occupation were seldom influential in antibiotic decision-making, consistent with guideline-based practice. This approach is appropriate, as these factors are not typically clinically relevant indicators unless linked to specific occupational exposures or risk profiles [22].

While pregnancy is universally acknowledged as a critical factor in antibiotic prescribing, lactational status receives variable attention. This may reflect uncertainty or gaps in knowledge regarding antibiotic safety during breastfeeding, a concern noted in other LMIC contexts [22].

The review of 266 prescriptions revealed notable deviations from the World Health Organization (WHO) core prescribing standards. WHO recommends an average of 1.6–1.8 drugs per patient encounter to minimize the risks of polypharmacy. However, studies have reported higher averages; for instance, one study found an average of 3.2 drugs per encounter [24]. In our study, the average number of drugs per encounter was 3.9, far exceeding the WHO-recommended limit. This indicates a tendency toward polypharmacy, which can lead to unnecessary medication use, increased risk of drug interactions, and higher treatment costs [24].

WHO advocates for 100% generic prescribing to enhance cost-effectiveness and accessibility. Nevertheless, adherence varies; some studies report generic prescribing rates as low as 83.1% [25]. However, in the present study, only 6.4% of drugs were prescribed by generic name, which is considerably below the WHO target. This suggests influences such as pharmaceutical branding and a lack of institutional enforcement of generic policies [25].

The extremely low rate of generic prescribing (6.4%) observed in this study is far below the WHO target of 100%, highlighting a serious gap in rational prescribing practices. Similar trends have been reported in other low- and middle-income countries, where brand-name prescribing is often driven by multiple systemic factors [25]. These include aggressive pharmaceutical marketing and brand promotion, lack of institutional policies mandating generic prescriptions, limited physician confidence in the efficacy or quality of generics, and patient preference for branded products [26, 27]. In Bangladesh, studies have identified poor enforcement of national generic policies and the widespread influence of pharmaceutical representatives on prescriber behavior [6, 28]. Addressing these challenges requires a multi-pronged approach, including continuous medical education, stricter procurement and prescribing regulations, and audit-feedback mechanisms to ensure compliance with WHO guidelines.

In our study, 72% of encounters involved antibiotic prescriptions, far exceeding the WHO threshold. Similar trends are seen in South Asia—studies from Ethiopia, India and Nepal report rates ranging from 35% to 50%, reflecting a regional pattern of empirical antibiotic use likely influenced by diagnostic limitations and patient expectations [29–31]. This overprescribing pattern is particularly concerning given the global urgency to curb antimicrobial resistance (AMR), especially in countries like Bangladesh, where antibiotic misuse is prevalent [9]. However, only 6.25% of prescriptions involved injectable antibiotics, within the WHO-recommended range (13.8–24.1%), indicating appropriate restraint in parenteral antibiotic use.

Encouragingly, 83% of antibiotics were from the WHO Essential Medicines List (EML), suggesting some alignment with priority medicine recommendations. This is consistent with previous findings in which 98.7% of medicines were prescribed from the WHO Essential Medicines List, indicating some alignment with standard formularies [29]. In the present study, however, 96% of antibiotics were broad-spectrum, which is consistent with existing reports. For instance, one study found that 72.9% of antibiotics prescribed were broad-spectrum [32]. This poses a major threat by accelerating antibiotic resistance when such antibiotics are used unnecessarily.

The finding that 48% of prescribed antibiotics belonged to the WHO Watch or Reserve groups—exceeding the recommended threshold of ≤40%—raises concerns about the rationality of antibiotic selection [33]. The AWaRe framework was specifically developed to promote judicious use of higher-risk antibiotics, with the Access group being preferred for common infections [11]. Overreliance on Watch and Reserve agents may indicate prescriber uncertainty, absence of microbiological guidance, or limited access to narrow-spectrum antibiotics [11, 22]. This trend underscores the need for institutional enforcement of AWaRe principles, integration of stewardship protocols into daily practice, and expanded CME programs focused on resistance risk and antibiotic selection

Adherence to local guidelines, such as those from Bangabandhu Sheikh Mujib Medical University (BSMMU), is crucial for standardized care. Assessments have indicated suboptimal compliance; for instance, this study found that only 59% of prescriptions adhered to preferred recommendations,

while 74% met either preferred or alternative categories. These findings indicate deficiencies in physicians' awareness of, access to, or confidence in the BSMMU national guidelines, highlighting the need for improved dissemination and education.

Amoxicillin with clavulanic acid (22%) and flucloxacillin (21%) were the most frequently prescribed antibiotics, likely targeting β-lactamase-producing pathogens in skin, soft tissue, or respiratory infections. This pattern reflects empirical treatment practices common in tertiary care settings where access to microbiological confirmation is limited. Cefixime (18%), a third-generation cephalosporin, was also widely used, suggesting a preference for broad-spectrum coverage in outpatient or transitional care [22].

Moderate use of phenoxymethylpenicillin and azithromycin (9% each) indicates underutilization of narrow-spectrum, WHO Access-group agents, despite recommendations to prioritize these for first-line treatment to mitigate resistance pressure [34]. The relatively lower use of ceftriaxone (7%), a parenteral broad-spectrum agent, may reflect some restraint in injectable antibiotic use, potentially due to guideline influence, limited supply, or administrative oversight.

These prescribing patterns align with trends observed in other LMICs, where broad-spectrum antibiotic use remains prevalent due to diagnostic limitations, patient expectations, and pharmaceutical marketing [6, 35]. However, the frequent use of Watch-group agents like amoxicillin-clavulanate and cefixime raises concern, as inappropriate use of these antibiotics can contribute to the acceleration of antimicrobial resistance. Strengthening antimicrobial stewardship programs—including improved diagnostic support, prescriber education, and prescription audits—will be essential to curb overuse and preserve antibiotic efficacy [34].

Conclusion

This study revealed suboptimal adherence to both national and international antibiotic prescribing guidelines among physicians in Bangladeshi tertiary care hospitals. High rates of empirical and broad-spectrum antibiotic use, along with limited formal training, emphasize the urgent need for enhanced antimicrobial stewardship. Targeted interventions—including prescriber education, institutional audits, and reinforcement of guidelines—are crucial to promote rational antibiotic use and combat antimicrobial resistance.

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