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Original Article

Alarming Antimicrobial Prescribing Patterns at a Tertiary Hospital in Nigeria: A Point Prevalence Survey using the Global-PPS Protocol

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Abstract

Background: Antimicrobial resistance is a critical threat in Nigeria, where inappropriate prescribing remains one of the major drivers. This study evaluated antimicrobial use patterns at Usmanu Danfodiyo University Teaching Hospital (UDUTH) using the Global Point Prevalence Survey methodology.
Methodology: A cross-sectional survey was conducted October 21-25, 2024 across all inpatient wards using standardized GPPS protocols. Data collectors received virtual training through the Fleming Fund project. All patients admitted before 8:00 AM on survey days were included, with data collected on antimicrobial prescriptions, indications, and quality indicators.
Results: A total of 262 inpatients were surveyed, with 195 prescribed antimicrobials, yielding a high overall prevalence of 74.4%. Ward-specific analysis revealed statistically significant variation: Neonatal wards had universal use (23/23, 100%; p<0.001), significantly higher than Adult Medical (50/79, 63.2%; p<0.001) and Paediatric Surgical (24/39, 61.5%; p=0.002) wards. Paediatric Medical ward use (33/36, 91.7%; p<0.001) was also significantly higher. The high rates in Adult Surgical (44/53, 83.0%) and Adult Intensive Care (15/18, 83.3%) wards were not statistically significant (p>0.05) from the hospital average. A total of 437 antimicrobial agents were prescribed which was dominated by antibacterials (310/437, 71.0%), primarily third-generation cephalosporins (83/310, 26.9%). Empiric therapy accounted for 85.7% of treatments. Critical documentation gaps and low guideline compliance (medical: 11.5%; surgical: 1.6%) were observed. AWaRe classification showed 61.0% Watch antibiotic use, and 37.5% (164/437) of prescribed doses were missed, primarily due to patients inability to afford (120/164, 73.2%)
Conclusion: UDUTH exhibits excessive antimicrobial use with significant, non-random inter-ward variation, dominated by broad-spectrum agents and poor prescribing quality. These findings stress an urgent need for targeted antimicrobial stewardship programs, strengthen diagnostic infrastructures, and policies to ensure affordable access.

Keywords: Antimicrobial resistance, antimicrobial stewardship, Point prevalence survey, AWaRe classification, Nigeria

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Introduction

In 2019, bacterial antimicrobial resistance (AMR) was directly responsible for an estimated 1.27 million deaths worldwide, underscoring the scale of this critical global health threat.[1] This crisis disproportionately impacts low- and middle-income countries.[2] Nigeria faces a particularly high burden, driven by a high incidence of infectious diseases, widespread inappropriate antibiotic use, and limited diagnostic capacity—a combination that creates an ideal environment for the emergence and spread of resistant pathogens. [3,4]

A primary driver of AMR is the inappropriate use of antimicrobials, which in Nigeria is characterized by excessive prescribing, a heavy reliance on broad-spectrum agents, and empiric therapy without microbiological guidance. [4,5] Surveillance of antibiotic consumption is a cornerstone of effective antimicrobial stewardship (AMS), providing the essential data needed to inform interventions. [6] The Global Point Prevalence Survey (GPPS) methodology offers a standardized tool for benchmarking prescribing patterns and quality. While previous surveys in Nigeria have documented high prescription rates, facility-specific data remains crucial for guiding local action and evaluating the impact of stewardship programs. [7, 8]

As one of the major tertiary referral hospitals in Northwestern Nigeria, the Usmanu Danfodiyo University Teaching Hospital (UDUTH) requires an evidence-based assessment of its antimicrobial use to guide local stewardship efforts. This study therefore applied the standardized GPPS protocol to evaluate the prevalence, patterns, and quality of antimicrobial prescribing at UDUTH. The findings establish a crucial baseline to identify key gaps and inform targeted AMR control strategies for this region.

Methods

Study Design, Setting, and Data Collection

A hospital-based, cross-sectional point prevalence survey was conducted at the Usmanu Danfodiyo University Teaching Hospital (UDUTH), a 750-bed tertiary facility in Sokoto, Nigeria. The survey adhered to the standardized Global Point Prevalence Survey (GPPS) protocol. [6] Data collection took place from October 21st to 25th, 2024, with all inpatient wards surveyed on a single, pre-assigned day within this period.

A team of 15 data collectors (doctors and nurses) underwent standardized virtual training accredited by Management Sciences for Health (MSH) under the Fleming Fund project. This training ensured competency in the GPPS methodology, data collection tool, and definitions, with subsequent supervision by the study investigators to maintain data quality.

All patients formally admitted to a ward before 8:00 AM on the survey day were included. Using the standardized GPPS forms, collectors gathered data on patient demographics (age, gender, ward, admission date), antimicrobial prescriptions (drug name, dose, route, frequency, indication), key quality indicators (reason in notes, stop/review date, guideline compliance), and missed doses (number and reasons).

Data Analysis

Data were directly entered and validated on the secure, web-based GPPS platform. Analysis comprised descriptive statistics (frequencies and proportions) to summarize antimicrobial prevalence, patterns, and quality indicators. To assess the statistical significance of differences in prescribing prevalence between wards, a chi-square test was employed, with a p-value of <0.05 deemed significant.

Ethical Considerations

Ethical approval was granted by the UDUTH Health Research Ethics Committee (Approval No: UDUTH/HREC/2024/1471/v1).

Results

Patient Characteristics and Antimicrobial Prevalence

A total of 262 inpatients were surveyed. The overall antimicrobial prescribing prevalence was 74.4% (195/262). Ward-specific analysis revealed statistically significant variation ($p<0.001$). The highest prevalence was observed in neonatal (100%, 23/23) and paediatric medical (91.7%, 33/36) wards (Table 1; Figure 1).

Table 1: Prevalence of antimicrobial use among inpatients, stratified by ward type

Ward Type	Patients Surveyed (n)	Patients on Antimicrobials (n)	Prevalence (%)	P-value
All Inpatients	262	195	74.4	
Adult Wards	165	120	72.7	0.0012
Medical (AMW)	95	60	63.2	<0.001
Surgical (ASW)	53	44	83.0	0.15
Intensive Care (AICU)	18	15	83.3	0.22
Paediatric Wards	74	60	81.1	<0.01
Medical (PMW)	36	33	91.7	<0.002
Surgical (PSW)	13	8	61.5	0.002
Neonatal Wards	23	23	100.0	<0.001

Key: *AMW, Adult Medical Ward; ASW, Adult Surgical Ward; AICU, Adult Intensive Care Unit; PMW, Paediatric Medical Ward; PSW, Paediatric Surgical Ward.*

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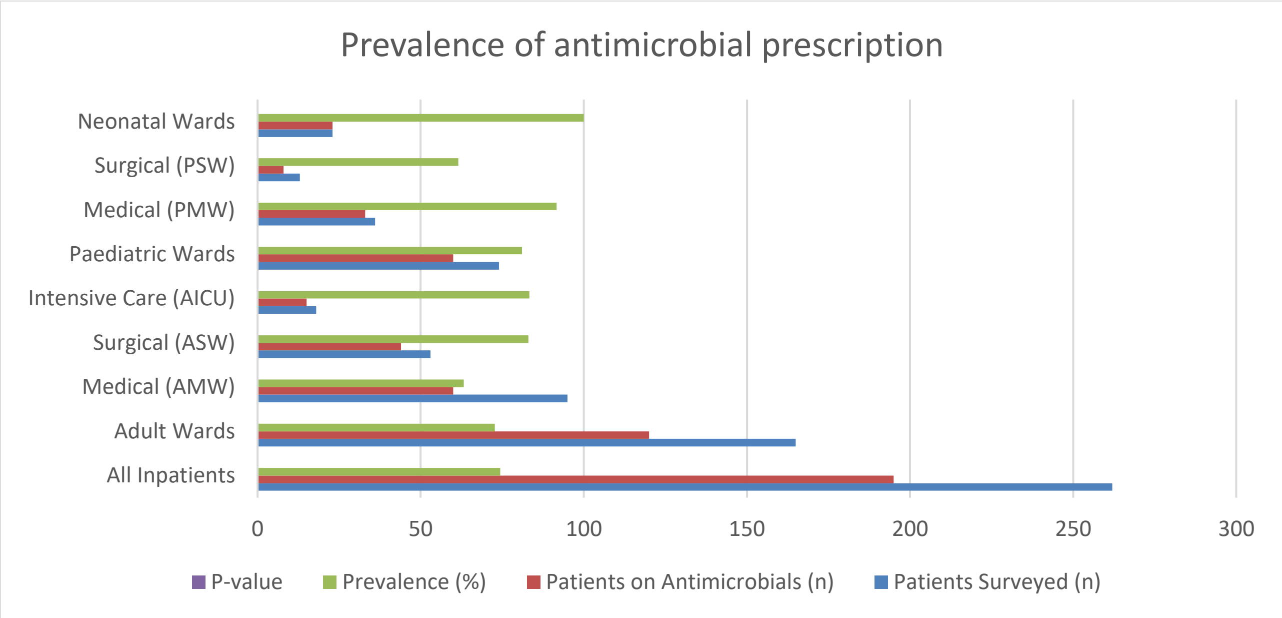

Figure 1: Bar chart showing the prevalence of antimicrobial prescription among inpatients, stratified by ward type

Key: *AMW, Adult Medical Ward; ASW, Adult Surgical Ward; AICU, Adult Intensive Care Unit; PMW, Paediatric Medical Ward; PSW, Paediatric Surgical Ward.*

Patterns of Antimicrobial Use

A total of 437 antimicrobials agents were prescribed. Antibacterials for systemic use (J01) constituted the majority (71.0%, 310/437). The most prescribed antibiotic classes were third-generation cephalosporins (26.9%, 83/310), fluoroquinolones (22.4%, 69/310), and imidazole derivatives (19.4%, 60/310) (Table 2; Figure2).

Table 2: Frequency and proportion of the most prescribed systemic antibacterial (J01) classes.

ATC4 Code	Antibiotic Class	Number of Prescriptions	Proportion (%)
J01DD	3rd-gen. Cephalosporins	83	26.9
J01MA	Fluoroquinolones	69	22.4
J01XD	Imidazole Derivatives	60	19.4

J01CA	Penicillins, extended spectrum	27	8.7
J01FF	Lincosamides	10	3.3

Key: *ATC - Anatomical Therapeutic Chemical; J01DD - Third-generation cephalosporins; J01MA – Fluoroquinolones; J01XD - Imidazole derivatives; J01CA - Penicillins with extended spectrum; J01FF – Lincosamides.*

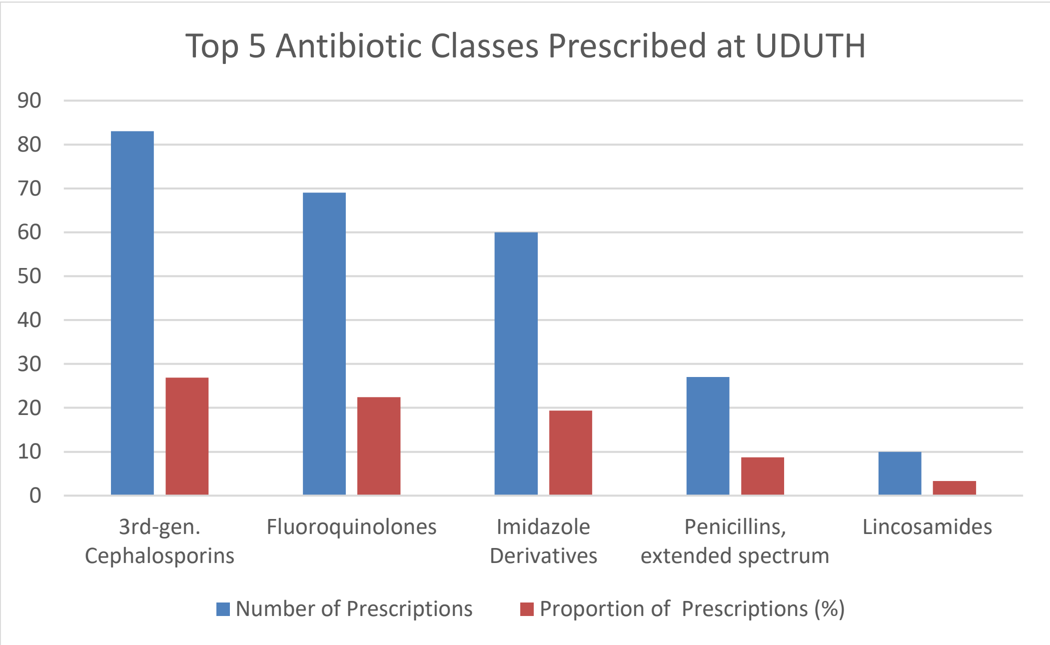

Figure 2: Bar chart showing the top five most prescribed systemic antibacterial classes at the hospital.

Indications, Therapy Type, and Prescribing Quality

Empiric therapy accounted for 85.7% of all antibiotic treatments, with community-acquired infections being the most common indication (65.1%). Documentation gaps were substantial: a stop or review date was missing for 55.9% of medical and 77.0% of surgical ward prescriptions. Compliance with treatment guidelines was low (medical: 11.5%; surgical: 1.6%).

WHO AWaRe Classification

The AWaRe category "Access" accounts for 39% of prescriptions, which include Metronidazole (Parenteral) at 17.6%, Amoxicillin at 6.3%, Clindamycin at 3.3%, Ampicillin at 2.4%, and Gentamicin (Parenteral) at 2.4%; the "Watch" category accounts for 61% of prescriptions, which include Ceftriaxone at 25.7%, Levofloxacin at 11.3%, Ciprofloxacin at 10.1%, Cefuroxime at 8.1%, and Azithromycin at 3.0%; while the "Reserve" and "Not Recommended" categories each account for 0% of prescriptions (Table 3).

Table 3: Distribution of systemic antibacterial prescriptions according to the WHO AWaRe classification

AWaRe Category	Percentage of Prescriptions	Key Antibiotics (Top 5 by Usage)
Access	39%	1. Metronidazole (Parenteral) - 17.6% 2. Amoxicillin - 6.3% 3. Clindamycin - 3.3% 4. Ampicillin - 2.4% 5. Gentamicin (Parenteral) - 2.4%
Watch	61%	1. Ceftriaxone - 25.7% 2. Levofloxacin - 11.3% 3. Ciprofloxacin - 10.1% 4. Cefuroxime - 8.1% 5. Azithromycin - 3.0%
Reserve	0%	
Not Recommended	0%	

Missed Doses

Of the 437 prescribed antimicrobial doses, 164 (37.5%) were not administered. The inability to afford medication accounted for 73.2% (120/164) of these missed doses, while hospital stock-outs accounted for 0.6% (1/164). In adult wards, 38.6% of antimicrobials had missed doses, with a mean of 2.98 and a median of 2 missed doses per antimicrobial; the inability to purchase medication accounted for 73.53% of these. In paediatric wards, 32.95% of antimicrobials had missed doses, with a mean of 3.00 and a median of 2, and the inability to purchase accounted for 69.0% (Table 4).

Table 4: Prevalence and reasons for missed antimicrobial doses among inpatients, stratified by ward type.

Ward Type	% of Antimicrobials with Missed Doses	Mean Missed Doses (per AM)	Median Missed Doses	Primary Reason for Missed Doses (%)
Hospital-Wide	37.53%	3.01	2	Could not purchase (73.2%)
Adult Wards	38.6%	2.98	2	Could not purchase (73.5%)
Paediatric Wards	32.95%	3.00	2	Could not purchase (69.0%)

Discussion

This point prevalence survey reveals a concerning triad of high antimicrobial usage, predominant reliance on Watch category antibiotics, and a high rate of missed doses at UDUTH. These findings highlight systemic challenges in prescribing practices and therapy administration that demand urgent and sustainable antimicrobial stewardship interventions.

The findings of this point prevalence survey at UDUTH should be interpreted within the broader context of global and local antimicrobial resistance (AMR) patterns. Data from one of the world's largest and longest-running surveillance programs, SMART, consistently highlight that AMR is a major global public health threat, with comprehensive surveillance being essential to inform treatment guidelines and combat high mortality and morbidity, particularly in resource-poor settings. [9] The transmission and selection of resistant organisms are complex processes that extend beyond human medicine, as evidenced by the selection and de-selection of antibiotic resistance genes in municipal wastewater across 47 countries, underscoring the pervasive environmental dimension of AMR. [10]

The overall antimicrobial prevalence of 74.4% at UDUTH is consistent with the high rates of 69.7% to 76% previously reported in other Nigerian tertiary hospitals. [7,8] The significant inter-ward variation provides a clear strategic direction for intervention. The universal prescribing in neonatal wards (100%) and the exceptionally high rate in the paediatric medical ward (91.7%) represent critical priorities, indicating high empiric prescribing practices likely driven by a high perceived infection risk in vulnerable populations. The heavy reliance on empiric therapy and broad-spectrum agents observed at UDUTH reflects a common challenge in healthcare systems. Quantifying the gap between expected and actual antibiotic prescribing rates is a critical step in antimicrobial stewardship, as such gaps reveal key areas for intervention and improvement in prescribing quality. [11] This empiric culture reflected a heavy reliance on uninformed therapy (85.7%), dominated by Watch category antibiotics, which constituted 61.0% of prescriptions. The substantial use of third-generation cephalosporins (26.9%) generates intense selection pressure for resistance, mirroring patterns observed across West Africa [12, 13] and contravening WHO recommendations. [14] This practice is particularly alarming given local susceptibility data showing poor sensitivity of common pathogens to first-line agents. [15] The empiric approach operates without adequate governance, as evidenced by critically low guideline compliance (as low as 1.6% in surgical wards) and poor documentation gaps, indicating absent core stewardship structures like prospective audit and feedback. [16]

Beyond prescribing quality, a major operational failure was identified in therapy administration. The finding that 37.5% of prescribed doses were missed—primarily (73.2%) due to patient financial constraints—transforms treatment into a direct pathway for resistance selection. Furthermore, the clinical ramifications of inappropriate use are compounded by failures in therapy administration. A high prevalence of missed antibiotic doses has been documented in various clinical settings, including intensive care units, and is associated with significant implications for patient care. [17] Inability to afford complete courses results in sub-therapeutic exposure, which selectively promotes resistant organisms and leads to treatment failure. [17,18] This high missed-dose rate is a clinically significant event, not merely an administrative error, and has been correlated with increased hospital stays [17], and the feasibility of tracking these omitted doses has been demonstrated in other studies using electronic medical records. [19] The timing of these missed doses is critical; experimental models confirm that missing early doses preferentially selects for resistant subpopulations, providing a mechanistic explanation for the danger of erratic antibiotic exposure. [20] In vulnerable populations such as neonates, delays in the first antibiotic administration have been specifically investigated and can have profound consequences on outcomes [21], highlighting that timely and consistent administration is a cornerstone of effective treatment, especially where the margin for error is small. The financial barrier creates a vicious cycle where treatment failure prompts the use of broader-spectrum, costlier agents, further exacerbating the AMR burden. [18]

Limitations

This study's findings should be interpreted considering its design. As a single-center PPS, it provides a snapshot that may not capture seasonal variations. Furthermore, the reliance on medical records means the documented gaps in documentation and guideline compliance may, in fact, be underestimates of the actual problem.

Conclusion and Recommendations

This point prevalence survey at UDUTH has identified critical deficiencies in antimicrobial prescribing characterized by excessive use, high reliance on broad-spectrum Watch antibiotics, poor documentation, and high rates of missed doses due to patient poverty. To address these findings, we propose a series of prioritized interventions. First, it is crucial to establish a functioning multidisciplinary antimicrobial stewardship (AMS) committee with an institutional mandate to implement and enforce policies, including prospective audit and feedback with pre-authorization for Watch category antibiotics. This should be supported by the development and dissemination of local treatment guidelines based on national standards and local resistance patterns to guide empiric therapy. Furthermore, strengthening utilization of the facility microbiology diagnostic capacity to enable a shift from empiric to culture-guided therapy. Concurrently, implementing mandatory documentation fields for indication and stop/review dates in prescription charts—integrated with regular education for healthcare workers on AMS principles and rational prescribing—will address critical quality gaps. Finally, to measure the impact of these interventions and ensure continuous improvement, we recommend conducting a follow-up Point Prevalence Survey quarterly to objectively track progress against this baseline and guide future stewardship efforts

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