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Assessing Antibiotic Use and Antimicrobial Stewardship Practices in a Nigerian Tertiary Hospital

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ABSTRACT

Background: Antibiotics revolutionized the management of infections, but is also implicated in antimicrobial resistance (AMR) due to overuse and inappropriate prescribing. Prescription patterns vary across different healthcare settings, influenced by various factors. These patterns are essential to understanding and addressing the challenges of antimicrobial stewardship. This study assessed prescribing habits, AMS knowledge, and implementation challenges among Doctors at the University of Port Harcourt Teaching Hospital.

Methods: A cross-sectional survey using semi-structured questionnaires were administered to doctors.141 valid responses were analyzed using Statistical Package for the Social Sciences SPSS version 30.0. Chi-square test was used to test associations between categorical variables**.** Statistical significance was set at $p < 0.05$.

Results: Respondents were aged 35–44 years, with a male-to-female ratio of 1:1.3. Surgery and Family Medicine had the highest representation. While 78.7% were familiar with AMS, and 86.5% acknowledged its importance, only 36.4% had formal AMS training, and 39% were aware of AMS guidelines at UPTH. Antibiotic prescribing was mostly influenced by culture/sensitivity results and clinical judgment. Almost 80% of doctors prescribed antibiotics at least weekly without significant differences across cadres. Cephalosporins and Penicillins were most prescribed antibiotics. Only 39% regularly reviewed their prescribing practices.

Conclusion: Despite high levels of AMR and AMS awareness among doctors, a significant proportion lack formal training and knowledge of AMS guidelines. This underscores the need for structured AMS interventions, continuous training, development of institutional AMS guideline and strengthening of AMS practices to mitigate AMR at UPTH.

Keywords: Antibiotics, Antimicrobial resistance (AMR), Antimicrobial stewardship (AMS), Antimicrobial Stewardship Program (ASP), Doctors

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INTRODUCTION

Selman Waksman [1942] was the first to use the term antibiotics to describe drugs that inhibit bacteria growth. He defined them as natural substances (produced by micro-organisms) that either retard the growth of or kill other micro-organisms at high dilution.[1,2] However they have evolved to semisynthetic and synthetic substances that perform the same function.[1,2] The history of antibiotics is a tale of scientific breakthroughs that have significantly transformed modern medicine. From the discovery of the first antibiotics to the current challenges posed by antibiotic resistance, this field has evolved dramatically over the past century. The discovery of penicillin by Alexander Fleming in 1928[3,4,5,6] and the synthesis of the first sulfonamide (prontosil) in 1935 [3,4,5,6] marked the beginning of the modern antibiotic era, leading to significant advancements in the management of infections thus bridging the gap between ancient antibiotics.

These early antibiotics, revolutionized the treatment of diseases with high mortality rates.[3,4]However, over the years this discovery has been met with irrational prescription. This challenge has tilted the curve to the left of antimicrobial resistance. Antibiotic resistance has become a major public health issue, with resistance genes found in both clinical and environmental samples. When microbes do not respond to antimicrobial treatments in humans and animals, the microorganism within the host survives.[7] This is the concept of antibiotic resistance. The widespread use of antibiotics has accelerated the selection of resistant strains, posing significant challenges to modern medicine[8,9] With an estimated 1.2 million deaths worldwide annually attributable to AMR,[10] its burden necessitates prudent antibiotic use and has driven the development of antimicrobial stewardship initiatives. All nations were obligated to implement a National Action Plan for Antimicrobial Resistance (NAPAR) at the 68th World Health Assembly in May 2015.[11]

The concept of Antimicrobial Stewardship (AMS) is the optimal selection, dosing, and duration of antimicrobial treatment resulting in the best clinical outcome with minimal side effects to the patients and preserve its future effectiveness.[12]AMS strategies can be used to bring AMR under control. Complementary strategies developed to optimize the use of antimicrobial agents can also be used to describe antimicrobial stewardship.[13] Antibiotic prescription guidelines are developed for ensuring the appropriate use of antibiotics, minimizing the risk of antimicrobial resistance, and optimizing patient outcomes. The World Health Organization (WHO) provides a framework for antibiotic classification and prescription through its Access, Watch, Reserve (AWaRe) classification, which aims to guide the appropriate use of antibiotics globally.[14,15,16,17] Nigeria enrolled in the Global Antimicrobial Resistance Surveillance System (GLASS) in April 2017.[18] National stewardship effort is championed by Nigeria centre for Disease control and prevention through the National Action Plan on AMR[19].However, recent studies still indicates irrational use of antibiotics by clinicians at all levels of care.[16, 17]

MATERIALS AND METHODS

A descriptive cross-sectional survey employed questionnaire-based interviews of Doctors at the University of Port Harcourt Teaching Hospital regarding Antimicrobial stewardship, it's challenges as well as recommendations for improvement.

Inclusion criteria

- Medical Doctors or Dental Surgeons with MBBS and /or BDS Degrees.
- Doctors that work in the University of Port Harcourt Teaching Hospital.
- Doctors that have at least two years post qualification experience.
- Participants willing to provide informed verbal consent.
- Doctors in the Departments of Surgery, Ear Nose and Throat, Oral and Maxillofacial Surgery, Obstetrics & Gynaecology, Internal Medicine, Paediatrics and Family medicine.

Exclusion criteria

- Departments which are categorized as low-volume antibiotic prescribers due to the nature of their clinical roles, were excluded from the study to maintain focus on specialties with significant antibiotic prescribing activity.

Sample and sampling technique: The estimated mean population of doctors in these departments is 353. Sample size determination was done using formula described by Krejcie and Morgan 1970.[20]

$$S = \frac{X2\ NP(1-P)}{d2(N-1)+ X2P(1-P)}$$

To determine the sample size, the variables defined below were substituted with appropriate values in the equation

S = required sample size

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X =1.96 at confidence interval of 95% [the table value of chi-square for 1 degree of freedom at the desired confidence level]
P = Population portion 50%
d = degree of accuracy 0.05
N = estimated or number of population N=353

$$S = \frac{X^2.NP(1-P)}{d^2(N-1)+X^2P(1-P)} = \frac{1.96^2 \times 353 \times 0.5\ (1-0.5)}{0.05^2\ (353-1)+1.96^2 \times 0.5\ (1-0.5)}$$

$$S = 184.17 \approx 184$$

Sample size will be 184

To give allowance for 10% attrition, the adjusted sample size (Sa) was derived from:

$$Sa = \frac{S}{1-q}$$

q = the proportion of attrition allowed for

$$Sa = \frac{184}{1-0.1}$$

$$= 204.6 \approx 205$$

Hence, the targeted minimum sample size was 205. For proportionate allocation, the number of respondents from each department was gotten using the formula below.

$$\frac{\text{Population of a department}}{\text{Total population of target population}} \times \text{Study population}$$

Participants from each department were selected using convenience sampling to achieve the true representativeness of the study population. Due to a low response rate, only 141 respondents were successfully recruited within the study period.

Ethical Considerations: Approval for the study was obtained from the Health Research Ethics committee of the University of Port Harcourt Teaching Hospital on the of 4th of April 2025. Protocol no.: UPTH/ADM/90/S.11/VOL.XI/1889. Participation was voluntary, and informed consent was obtained from all respondents. Data were anonymized to ensure confidentiality.

Instrument for data collection: The data collection method was adapted from the following validated questionnaires: WHO "Antimicrobial Stewardship Program Core Elements" and Related Surveys, COM-B Based Questionnaires (Capability, Opportunity, Motivation- Behaviour), Knowledge, Attitude and Practice (KAP) Questionnaires, Global Point Prevalence Survey (Global-PPS) Questionnaires and Nigerian AMR National Action Plan Monitoring Tools.[21,22,23]

A semi-structured questionnaire with four sections was used for data collection.

Section A: Contains sociodemographic variables.

Section B: Clinical practices and antimicrobial use-reflects questions on baseline knowledge of the doctors on antibiotics.

Section C: Antimicrobial stewardship (AMS) knowledge and practice

Section D: Challenges and barriers encountered in practice of AMS

***Data analysis*:** Data obtained from questionnaires were analyzed using SPSS Version 30.0 for IBM Corp, USA. Descriptive statistics were used to summarize respondents' demographics, knowledge of antimicrobial stewardship, and antibiotic prescribing practices using frequencies and percentages. Summary of descriptive statistics were presented in tables and charts. Associations between categorical variables were assessed using the Chi-square test. The level of significance of $p < 0.05$ was used for all the inferential statistical tests.

RESULT

The sociodemographic data (Table I) shows that the participants were distributed across departments as follows Surgery: 22.0%, Family Medicine: 21.3%, Paediatrics: 19.1%, Obstetrics and Gynaecology: 18.4%, Internal Medicine: 11.3%, Oral & Maxillofacial Surgery: 5.7% and Otolaryngology: 2.1%. Surgery and Family Medicine departments were the most represented, each contributing more than a quarter of all responses[p=0.001]

Most respondents were aged 35–44 years across both genders. [Chi-square = 3.21, p = 0.523]. No statistically significant difference in age distribution between females and males. Only a small fraction of respondents, 1.4% is above 55 years. This indicates that the respondents are primarily in the early to mid-career stages. Respondents are fairly evenly distributed by gender, with male to female ratio of 1:1.3. The majority of participants are trainee doctors, comprising 57.4% Senior Registrars, 27.0% Registrars, and 15.6% Consultants. Trainee doctors (registrars/senior registrars) form the majority of respondents. Cephalosporins ranked highest in prescription frequency, followed sequentially by penicillins, fluoroquinolones, macrolides, and aminoglycosides. Other antibiotic classes were prescribed infrequently.

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Table I: Sociodemographic characteristics of respondents

Characteristic	Variable	n (%)
Department	Surgery	31 (22.0)
	Family Medicine	30 (21.3)
	Obstetrics & Gynaecology	26 (18.4)
	Internal Medicine	16 (11.3)
	Paediatrics	27 (19.1)
	Oral & Maxillofacial Surgery	8 (5.7)
	Otolaryngology	3 (2.1)
TOTAL		**141(100)**
Age Group (years)	25–34	33 (23.4)
	35–44	77 (54.6)
	45–54	29 (20.6)
	≥55	2 (1.4)
TOTAL		**141(100)**
Cadre	Registrar	38 (27.0)
	Senior Registrar	81 (57.4)
	Consultant	22 (15.6)
TOTAL		**141(100)**
Gender	Female	80 (51.2)
	Male	61 (48.8)
TOTAL		**141(100)**

Majority of the respondents (39.0%) prescribe antibiotics multiple times per day; followed by a few times per week [Table II]. Over 80% of respondents prescribe antibiotics at least several times weekly with over one-third prescribing multiple times daily. There is no statistical difference in frequency of prescription across the various cadre (p = 0.458) Table II

Table II: Frequency of antibiotic prescription among doctors

How often do you prescribe antibiotics for patients?	Cadre						Total	Chi-square	p-value
	Consultant		**Senior Registrar**		**Registrar**				
	N	(%)	N	(%)	N	(%)	**N (%)**		
Multiple times per day	6	(27.3)	36	(44.4)	13	(34.2)	**55 (39.0%)**		
Daily	4	(18.2)	14	(17.3)	7	(18.4)	**25(17.7%)**		
A few times per week	7	(31.8)	21	(25.9)	12	(31.6)	**40(28.4%)**	7.75	0.458
A few times per month	3	(13.6)	2	(2.5)	1	(2.6)	**6(4.3%)**		
Rarely	2	(9.1)	8	(9.9)	5	(13.2)	**15(10.6%)**		

Laboratory data (culture and sensitivity) and clinical presentation/judgment are the most cited influences on prescribing Table III. 45.4% report using local or national guidelines, and just 40% consider comorbidities. Empirical clinical judgment and laboratory results are the most common influencers. Official guidelines and comorbidities are less frequently used. However, there's a statistically significant difference in use of culture and sensitivity amongst the various cadre (p=0.004). The Senior Doctors i.e Senior registrars and Consultants tend to use culture and sensitivity results to guide their antibiotic prescribing practice. Local and national guidelines are also highly followed by consultants (59.1%) and Senior registrars (55.6%), but very low among Registrars (15.8%) p = 0.001

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Table III: Key factors influencing prescribing practices among doctors

		Cadre							Chi-square	p-value
		Consultant		Senior Registrar		Registrar		Total		
		N	(%)	N	(%)	N	(%)	N (%)		
Patient's presentation	No	5	(22.7)	24	(29.6)	16	(42.1)	45(31.9)	2.86	0.239
	Yes	17	(77.3)	57	(70.4)	22	(57.9)	96 (68.1)		
Culture and sensitivity results	No	4	(18.2)	14	(17.3)	17	(44.7)	35(24.8)	11.06	0.004
	Yes	18	(81.8)	67	(82.7)	21	(55.3)	106(75.2)		
Patient's comorbidities	No	12	(54.5)	44	(54.3)	28	(73.7)	84(59.6)	4.301	0.116
	Yes	10	(45.5)	37	(45.7)	10	(26.3)	57(40.4)		
Clinical experience/judgment	No	10	(45.5)	24	(29.6)	19	(50.0)	53(37.6)	5.26	0.072
	Yes	12	(54.5)	57	(70.4)	19	(50.0)	88(62.4)		
Local or national guidelines	No	9	(40.9)	36	(44.4)	32	(84.2)	77(54.6)	18.47	0.001
	Yes	13	(59.1)	45	(55.6)	6	(15.8)	64(45.4)		
Other	No							135(95.7)		
	Cost & availability							5(3.5%)		
	Age of patient							1(0.7%)		

Though familiarity with AMS is relatively high (78.7%), only 37.4% have received any formal training, and fewer than 40% are aware of national guidelines.

Table IV: Knowledge of antibiotic stewardship amongst Doctors at the University of Port Harcourt Teaching Hospital

Question	Consultant N (%)		Senior Registrar N (%)		Registrar N (%)		Total N (%)	Chi-square	P-value
Are you familiar with the concept of antimicrobial stewardship AMS?									
Yes	21	(95.5)	64	(79.0)	26	(68.4)	111(78.7)		
No	1	(4.5)	17	(21.0)	12	(31.6)	30(21.3)	6.09	0.049
Total	22	(100)	81	(100)	38	(100)			
Have you received any formal training or education on AMS?									
Yes	12	(54.5)	31	(38.3)	10	(26.3)	53(37.6)		
No	10	(45.5)	50	(61.7)	28	(73.7)	88(62.4)	4.77	0.092
Total	22	(100)	81	(100)	38	(100)			
Are you aware of policies and guidelines for antimicrobial prescribing in UPTH?									
Yes	8	(36.4)	32	(39.5)	15	(39.5)	53(39.0)		
No	6	(27.2)	22	(27.2)	17	(44.7)	45(31.9)	5.94	0.204
Unsure	8	(36.4)	27	(33.3)	6	(15.8)	41(29.1)		
Total	22	(100)	81	(100)	38	(100)			
Do you believe antimicrobial stewardship is important in reducing antibiotic resistance?									
Yes	21	(95.5)	71	(87.6)	30	(78.9)	122 (86.5)		
No		(0)	2	(2.5)	2	(5.3)	4 (2.8)		
Unsure	1	(4.5)	8	(9.9)	6	(15.8)	15 (10.6)	3.67	0.451
Total	22	(100)	81	(100)	38	(100)			

Roughly 39.0% of respondents regularly review their prescribing practices, while 37.6% do so occasionally. 23.4% rarely or never review antibiotic use. Consultants demonstrated the highest level of regular prescription pattern review. Figure

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1.The most commonly cited barriers to AMS were cost issues (75.2%) and limited access to laboratory results (68.8%). (Table V)

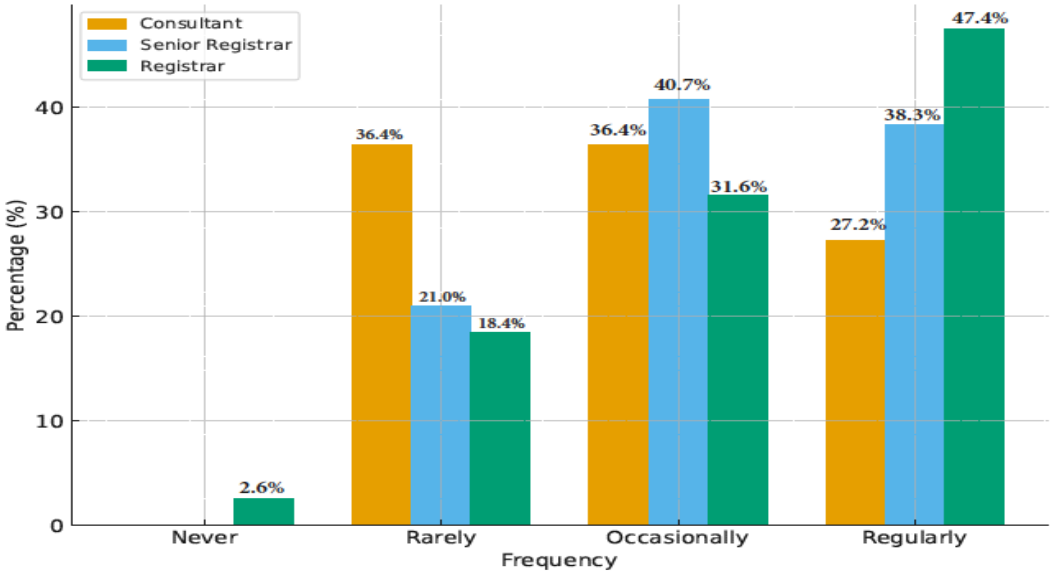

Figure 1: Frequency of reviewing prescribing practice

Table V: Challenges and barriers

Challenges		Cadre								Chi-square	p-value
		Consultant		Senior Registrar		Registrar		Total			
		N	(%)	N	(%)	N	(%)	N	(%)		
Limited access to laboratory results	No	5	(22.7)	24	(29.6)	15	(39.5)	44	(31.2)	2.04	0.361
	Yes	17	(77.3)	57	(70.4)	23	(60.5)	97	(68.8)		
Patient demand for antibiotics	No	18	(81.8)	63	(77.8)	33	(86.8)	114	(80.9)	1.38	0.499
	Yes	4	(18.2)	18	(22.2)	5	(13.2)	27	(19.1)		
Lack of knowledge on antibiotic resistance patterns	No	16	(72.7)	67	(82.7)	26	(68.4)	109	(77.3)	3.32	0.190
	Yes	6	(27.3)	14	(17.3)	12	(31.6)	32	(22.7)		
Inadequate hospital policies and guidelines	No	11	(50.0)	54	(66.7)	30	(78.9)	95	(67.4)	5.53	0.69
	Yes	11	(50.0)	27	(33.3)	8	(21.1)	46	(32.6)		
Cost issue for patient	No	6	(27.3)	17	(21.0)	12	(31.6)	35	(24.8)	1.63	0.441
	Yes	16	(72.7)	64	(79.0)	26	(68.4)	106	(75.2)		
Influence of Pharmaceutical sales representatives	No	18	(81.8)	67	(82.7)	27	(71.1)	112	(79.4)	2.24	0.326
	Yes	4	(18.2)	14	(17.3)	11	(28.9)	29	(20.6)		

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DISCUSSION

Antimicrobial resistance (AMR) represents an escalating global health challenge, resulting in millions of fatalities annually and contributing to heightened healthcare expenditures, prolonged hospitalizations , and increased mortality.[10,24,25] It accounts for an excess of 1.2 million deaths per year and is anticipated to worsen, especially in resource-limited environments and among susceptible demographic cohorts.[10,25] In the year 2019, it was estimated that approximately 4.95 million fatalities were linked to bacterial AMR, with 1.27 million deaths directly attributable to AMR on a global scale; low and middle income countries LMIC were most affected.[10,24,25]

The rise of antimicrobial resistance (AMR) is driven by bacteria's talent to bypass the therapeutic impacts of antibiotics through multiple molecular and genetic approaches. The principal mechanisms underlying resistance encompass drug inactivation, modification of drug targets, diminished drug uptake, and the active efflux of drugs. These mechanisms may be classified as either intrinsic or acquired, and they are frequently augmented by genetic mutations or the process of horizontal gene transfer.[26-30]

Environmental exposure to antibiotics and genetic plasticity drive the ongoing evolution and persistence of resistance mechanisms. [27,28,31,32]

The concept of antimicrobial stewardship AMS, is a global strategy developed to ensure responsible antibiotic use. The primary goal of AMS is to optimize the use of antimicrobials to combat resistance hence preserve future effectiveness, improve patient outcomes, and reduce healthcare costs.[33]

The level of awareness and knowledge about antimicrobial resistance (AMR) among health care professionals, including doctors, varies significantly across different regions and institutions. In a study[34]conducted in Alexandria, Egypt, physicians showed fair knowledge of antimicrobials, although there was a notable lack of awareness regarding local AMR patterns. In Pakistan, 92% of clinicians recognized AMR as a global issue, yet only 66% disagreed with the unnecessary use of antibiotics for cold and flu symptoms, indicating gaps in specific knowledge areas.[35]

Our results found very high self-reported awareness of antimicrobial resistance (AMR) and stewardship (AMS) among UPTH doctors: 78.7% reported familiarity with AMS and 86.5% believed AMS is important. This may suggest that most clinicians recognize AMR as a pressing issue. This result aligns with some Nigerian studies[36] reporting generally fair-to-good AMR knowledge among physicians. Chukwu et al.[37] reported that 85% of Nigerian health-care workers considered AMR highly relevant. The high awareness at UPTH may partly reflect the predominance of trainees (senior registrars, registrars) who have been recently educated on AMR. Compared to the literature, UPTH doctors also appear slightly more aware of AMS than some national averages.[38]National surveys report that <50% of Nigerian Health care workers have "good" AMR knowledge, and many still prescribe antibiotics for viral illnesses. The discrepancy may reflect UPTH's tertiary status or recent AMS initiatives. The high awareness nonetheless did not fully prevent high prescribing, consistent with Wood et al.'s[39] finding that knowledge alone does not always change practice.

Chen et al. [25] found that outpatient antibiotic prescribing was highest in sub-Saharan Africa and inpatient prescribing highest in South Asia, whereas Europe and Central Asia had the lowest prevalence in both settings.

UPTH doctors reported very frequent antibiotic use. As shown in Table II. 85.1% prescribe several times weekly, and more than one-third do so multiple times daily. This high frequency underscores an environment of substantial antibiotic use. These findings mirror broader Nigerian data. Ogunleye et al.[40] found 68.2% of Nigerian doctors prescribe antibiotics ≥1 per day. Similarly, Ogoina et al[38] reported virtually all Nigerian physicians had prescribed antibiotics in the prior months, often broad-spectrum agents.

The most prescribed antibiotics in our study were the Cephalosporins, penicillins and fluoroquinolones, similar to other findings in Nigerian studies.[36,38,41,42] These antibiotics considered first line for empiric therapy in severe infections have been said to account for more than 70% of deaths associated with AMR across pathogens.[10,24]

The result identified the most cited influences on antibiotic choice. "Culture and sensitivity results" (75.2%) and "patient presentation" (68.1%) were the top factors. "Clinical judgment" was also prominent (62.4%). In contrast, "local/national guidelines" were used by only 45.4%, and "patient comorbidities" by 40.4%. This suggests doctors rely chiefly on clinical and laboratory cues rather than standardized guidelines or patient-specific risk factors.

These patterns are consistent with other Nigerian studies.[40] Our finding that only 45.4% follow guidelines echoes this: doctors depend on personal expertise and

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immediate data. Or are not aware of the National or State guideline. The strong emphasis on lab results is encouraging, although it may reflect easy laboratory access at a tertiary centre; other reports have noted that LMIC settings sometimes lack timely diagnostics, leading to empiric therapy. A study[39] found that Nigerian surgeons knew guidelines existed, but environmental barriers and fear of Surgical Site Infection limited their use. The results similarly point to an opportunity barrier: either guidelines are not accessible or perceived as irrelevant.

A 2020 study[16] in University of Port Harcourt Teaching Hospital UPTH found a high reliance on empirical prescribing, with most of the isolated pathogens not susceptible to the frequently prescribed antibiotics.

While 78.7% of doctors at UPTH reported familiarity with AMS (Table IV), only 37.6% had received formal AMS training and just 39.0% were aware of any AMS policy or guidelines. Nearly one-third (29.1%) were unsure if such policies exist. This gap between general awareness and specific training/policy awareness shows doctors are aware of AMS but lack actionable guidance.

Fewer than half of respondents reported routinely reviewing institutional policies. Findings from comparable work reinforce this observation. Ogoina et al.[38] noted that Nigerian tertiary hospitals generally lacked structured antimicrobial stewardship programmes ASP or formal antibiotic-restriction systems, and only about half routinely tracked antimicrobial resistance trends. At UPTH, the limited exposure to formal ASP training likely mirrors the broader national landscape, where stewardship initiatives remain in the early stages of development.

Only 39.0% of doctors at UPTH reported that they consistently adhere to clinical guidelines. The result suggests that over three-quarter of the doctors make some effort to keep their prescribing practices up to date, which may reflect partial or consistent adherence to available guidelines. However, a concerning 23.4% reported rarely or never reviewing their prescribing practices, implying possible non-adherence and a lack of engagement with current antibiotic stewardship practices.

The frequency of review of antibiotic prescribing practice which is supported by literature that identifies regular review and self-audit as behaviours associated with compliance to guidelines is an approximate of adherence to guidelines.[43,44]

Chukwu et al.[37] noted <10% guideline-compliant prescriptions in Nigeria. The limited formal ASP structure further contributes to this issue, with few existing or enforced policies diminishing adherence motivation. Ogunleye et al.[40] similarly found only 8.2% followed hospital guidelines, underlining that lack of guideline use is ingrained. Cost constraints for patients were identified by 75.2% of doctors in UPTH as the major barrier to implementing antimicrobial stewardship (AMS) in our institution. This appear to be a common challenge in LMICs. In Lahore, Pakistan, physicians' choice of antibiotics was influenced by patients' socio-economic status and demands, a challenge exacerbated by gaps in knowledge and the limited introduction of antimicrobial stewardship programs (ASPs).[45]

Limitations

Our study had some limitations. First, we did not evaluate all aspects of AMS in healthcare facilities as defined by the WHO. Secondly, Self-administered questionnaire can introduce bias. Participants represent more of the trainees because they were chosen based on availability.

In addition, comparisons with the literature are constrained by differing survey instruments and definitions across studies. Furthermore, this study did not objectively measure level of adherence to antibiotic prescribing guidelines so inferences about adherence are approximated from frequency of review of antibiotic prescribing practice.

CONCLUSION

A significant proportion of Doctors in UPTH lack formal training and knowledge of hospital AMS guidelines. The strong awareness of AMR indicates a foundation for stewardship interventions. Efforts should focus on transforming awareness into motivation and action. At UPTH, reinforcing the value of guidelines may reshape beliefs about consequences and enhance adherence. This could be supported by development of institutional guideline for antibiotic use including formulation of hospital antibiotic formulary; not just dependence on WHO and National guidelines. Training and retraining on antimicrobial stewardship (AMS), supported by continuing medical education (CME) programmes, is recommended. Future work should include prescription audits and qualitative interviews to validate these findings. Point of prevalence (PPS) could

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be incorporated to complement the survey findings and enhance the overall robustness of the study.

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