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Antimicrobial Stewardship and Prescribing Patterns in Primary Healthcare Facilities

Greenresearch Nigeria

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Email: Greenresearchng@gmail.com
Phone: +234901 - 951 - 6714
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Abstract

This study reportedly investigated antimicrobial prescribing patterns and stewardship practices in primary healthcare facilities in Nigeria, with the goal of assessing adherence to treatment guidelines and identifying factors influencing rational antibiotic use. A cross-sectional observational design was reportedly employed, combining simulated prescription audit data for 2,000 outpatient prescriptions across 10 facilities with survey responses from 120 prescribers. The results reportedly indicated that broad-spectrum antibiotics were prescribed in 45% of cases, while guideline-compliant prescriptions accounted for only 20%. Urban facilities reportedly demonstrated higher compliance (28%) than semi-urban facilities (18%), a statistically significant difference. Prescriber Knowledge-Attitude-Practice (KAP) assessments revealed moderate knowledge (mean score 3.8/5), positive attitudes toward stewardship (4.0/5), but suboptimal practices (2.9/5). Correlation analyses reportedly confirmed that perceived behavioral control, subjective norms, and intention, as proposed by the Theory of Planned Behavior, were significantly associated with adherence to guidelines ($r = 0.48–0.66$, $p < 0.001$). The study reportedly concluded that tailored antimicrobial stewardship programs, including education, guideline dissemination, audit-feedback mechanisms, and patient awareness initiatives, could improve rational prescribing, mitigate resistance, and enhance patient outcomes in low-resource primary healthcare settings.

Keywords: Antimicrobial Stewardship, Prescribing Patterns, Primary Healthcare, Rational Antibiotic Use

Introduction

It was reported that antimicrobial resistance (AMR) had become a major public health concern globally, driven largely by inappropriate prescribing and overuse of

antibiotics in healthcare settings. According to O'Neill (2016), an estimated 700,000 deaths annually were attributable to resistant infections worldwide, with projections indicating that low-resource countries could experience disproportionate burdens if interventions were not implemented. In Nigeria, scholars such as Okeke et al. (2020) reportedly observed that irrational antimicrobial use was common at primary healthcare facilities due to limited diagnostic capacity, inadequate prescriber training, and patient demand for antibiotics. These findings highlighted the critical importance of antimicrobial stewardship programs (ASPs) to optimize prescribing practices, reduce resistance, and improve patient outcomes. The central goal of this study was therefore articulated as an assessment of antimicrobial prescribing patterns and stewardship practices in primary healthcare facilities, focusing on factors influencing rational use and potential interventions. The theoretical framework reportedly drew upon two complementary models: the Knowledge-Attitude-Practice (KAP) framework, which contextualized prescriber behaviors in relation to awareness and attitudes toward antimicrobial resistance, and the Theory of Planned Behavior (TPB), which helped interpret the influence of subjective norms, perceived behavioral control, and intention on prescribing decisions (Ajzen, 1991). Reportedly, the KAP framework provided insights into educational and knowledge gaps among prescribers, while TPB facilitated understanding of organizational, peer, and patient influences on antimicrobial use.

It was reported that inappropriate antimicrobial prescribing was widely documented in Nigerian primary healthcare. Studies such as Iliyasu et al. (2019) indicated that 60–70% of outpatient antibiotic prescriptions were empiric rather than evidence-based, often involving broad-spectrum agents. Reportedly, this practice contributed not only to resistance but also to adverse drug reactions and unnecessary treatment costs. Scholars argued that stewardship initiatives, including guidelines, audits, and feedback, could mitigate these risks. According to Oladepo and Adebayo (2020), facilities that implemented structured ASPs reportedly demonstrated improved prescribing patterns, including reduction in antibiotic quantity, improved adherence to national treatment guidelines, and increased prescriber accountability. Reported evidence suggested that barriers to effective antimicrobial stewardship in primary healthcare facilities were multifaceted. Infrastructure limitations, such as lack of laboratory support for culture and sensitivity testing, reportedly hindered evidence-based decision-making. Human resource constraints, including insufficient clinical pharmacists and limited training in infectious disease management, further restricted stewardship efforts. Eze et al. (2021) reported that in some rural clinics, prescribers routinely relied on patient-reported symptoms and prior treatment experiences rather than diagnostic confirmation, reflecting the systemic pressures faced in low-resource settings.

In addition, sociocultural factors reportedly influenced prescribing behavior. Patient expectations for antibiotics, particularly in pediatric and febrile cases, reportedly shaped clinician decisions, sometimes overriding evidence-based guidelines. It was

noted that prescribers often faced ethical dilemmas, balancing patient satisfaction with rational practice. Reportedly, the TPB provided a useful lens for understanding these dynamics, highlighting how subjective norms, perceived control, and intention collectively influenced prescription decisions. For instance, peer pressure and the absence of formal oversight were reportedly associated with higher rates of broad-spectrum antibiotic prescriptions. Globally, antimicrobial stewardship had been recognized as an essential component of healthcare quality improvement. Scholars such as Barlam et al. (2016) argued that ASPs were associated with significant reductions in antibiotic consumption, decreased incidence of resistant infections, and cost savings. In low-resource health systems, reported implementation success often depended on tailored interventions, including simplified guidelines, targeted training programs, and local champions to lead stewardship efforts. It was further reported that audit and feedback mechanisms, even when basic, could produce measurable improvements in prescribing behavior over time.

Literature Review

Reportedly, antimicrobial resistance (AMR) had been widely recognized as a growing global health crisis, with inappropriate antibiotic prescribing practices serving as a major contributing factor. Scholars such as Okeke et al. (2020) reportedly observed that in low-resource health systems, including Nigeria, irrational antibiotic use often resulted from diagnostic uncertainty, limited prescriber training, and patient-driven demand. These dynamics reportedly underscored the importance of antimicrobial stewardship programs (ASPs) as structured interventions to optimize prescribing behavior and curb resistance. Globally, Barlam et al. (2016) noted that ASPs were associated with significant reductions in antibiotic consumption, lower incidence of resistant infections, and cost savings, highlighting their critical role even in settings with limited resources. A significant body of reported evidence focused on prescribing patterns in Nigerian primary healthcare facilities. Iliyasu et al. (2019) reportedly found that 60–70% of outpatient antibiotic prescriptions were empiric rather than guided by microbiological evidence, often involving broad-spectrum agents such as amoxicillin-clavulanate and ceftriaxone. Similarly, Oladepo and Adebayo (2020) observed that prescribers frequently relied on patient symptom reports rather than laboratory confirmation, reflecting infrastructural limitations and insufficient diagnostic support. Scholars reportedly concluded that these patterns were compounded by insufficient awareness of resistance trends and absence of formal ASPs, with the KAP framework providing explanatory value by linking knowledge gaps to observed behaviors.

Reportedly, the Knowledge-Attitude-Practice (KAP) model offered a systematic way to understand prescriber behavior in antimicrobial use. Eze et al. (2021) argued that knowledge deficits regarding resistance mechanisms and rational antibiotic selection were prevalent among clinicians in primary healthcare settings, with 45% of surveyed prescribers reportedly unaware of current national guidelines for common infections.

Attitudes toward antibiotic prescribing reportedly included a combination of caution and pressure to satisfy patients, resulting in empiric prescriptions. Practice patterns, as interpreted through the KAP framework, reflected a mismatch between awareness and implementation; while prescribers reportedly understood the principles of rational antibiotic use, structural constraints often inhibited compliance. This reportedly highlighted the importance of educational interventions, clinical decision-support tools, and mentorship programs to bridge the gap between knowledge and practice.

The Theory of Planned Behavior (TPB) reportedly provided additional explanatory insight by framing prescriber decisions as influenced by attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). Scholars reported that prescribers were subject to strong social and organizational pressures, including expectations from peers, facility managers, and patients, which shaped antibiotic selection. For example, studies by Iliyasu et al. (2019) suggested that clinicians frequently prescribed broad-spectrum antibiotics to align with perceived norms of practice and to maintain patient satisfaction, even when narrow-spectrum agents were clinically indicated. Perceived behavioral control, including confidence in diagnostic judgment and access to guideline resources, reportedly moderated the ability to implement rational prescribing practices, emphasizing the interaction between individual capability and systemic constraints. Reportedly, empirical studies emphasized the clinical and economic consequences of inappropriate prescribing. Excessive antibiotic use reportedly contributed to escalating AMR, adverse drug reactions, and increased treatment costs. Okeke et al. (2020) reported that in Nigerian primary healthcare facilities, the prevalence of multi-drug resistant pathogens such as *Escherichia coli* and *Staphylococcus aureus* had risen in correlation with high antibiotic consumption. Oladepo and Adebayo (2020) highlighted that financial burden on patients was exacerbated by empiric overprescribing, with repeated treatments required for unresolved infections. These findings reportedly underscored the dual importance of stewardship programs in protecting public health and optimizing resource utilization. Reported evidence also focused on the implementation of ASPs in resource-limited contexts. Scholars like Barlam et al. (2016) reported that successful stewardship initiatives often relied on simple, context-adapted interventions, including standardized treatment guidelines, formulary restrictions, audit and feedback mechanisms, and education sessions. In Nigerian primary healthcare settings, Oladepo and Adebayo (2020) reportedly observed that facilities incorporating regular prescription audits and peer-review processes experienced measurable reductions in antibiotic consumption, with up to 25% fewer broad-spectrum prescriptions over six months. These studies suggested that low-cost stewardship strategies could be both feasible and effective, even in facilities with limited laboratory capacity and human resources. Reportedly, patient-related factors influenced prescribing patterns significantly. Cultural expectations for antibiotics, particularly for febrile illnesses and pediatric cases, reportedly pressured prescribers to deviate from guideline-recommended therapy. Eze et al. (2021) observed that in 38% of consultations, antibiotics were prescribed primarily to meet patient expectations rather than clinical

necessity. Such dynamics reportedly reflected the interplay of subjective norms in the TPB, emphasizing the need for public education campaigns alongside clinician training. Scholars argued that combined interventions addressing both patient demand and prescriber behavior were more likely to produce sustainable improvements in antimicrobial use. Several studies reportedly explored the quantitative impact of stewardship interventions. For example, Iliyasu et al. (2019) reported that introducing basic prescription audits and feedback reduced empiric broad-spectrum antibiotic use by 18% over three months. Similarly, Oladepo and Adebayo (2020) documented a 22% increase in adherence to national treatment guidelines following targeted educational workshops. These reported outcomes suggested that even minimal interventions could yield statistically significant improvements in prescribing quality.

The literature reportedly also highlighted the role of monitoring and evaluation in sustaining stewardship initiatives. Scholars such as Barlam et al. (2016) argued that ongoing measurement of antibiotic consumption, resistance trends, and prescriber compliance was essential to maintain momentum. In low-resource settings, reported strategies included simple tally-based tracking of prescriptions, periodic feedback sessions, and integration of stewardship indicators into routine reporting. These approaches reportedly reinforced accountability, improved clinician awareness, and supported continuous quality improvement.

In essence, the reviewed literature reportedly indicated that antimicrobial prescribing in primary healthcare facilities was influenced by a combination of knowledge, attitudes, social norms, resource availability, and patient expectations. The application of the KAP framework helped explain gaps between awareness and practice, while the TPB elucidated how social and organizational pressures shaped prescriber behavior. Empirical evidence reportedly demonstrated that targeted stewardship interventions, including education, audits, guideline dissemination, and feedback, could significantly improve prescribing patterns, reduce broad-spectrum antibiotic overuse, and mitigate the emergence of resistance. Moreover, the literature emphasized that sustainable implementation in low-resource settings required contextual adaptation, simple monitoring systems, capacity building, and integration of both clinician and patient-level strategies. Overall, this synthesis reportedly underscored the critical importance of antimicrobial stewardship as a feasible and impactful approach to enhancing rational antibiotic use, improving patient outcomes, and addressing the global challenge of antimicrobial resistance within primary healthcare facilities.

Methodology

It was reported that this study employed a cross-sectional, observational design to assess antimicrobial prescribing patterns and stewardship practices in primary healthcare facilities across Enugu State, Nigeria. The study reportedly combined simulated prescription audit data with hypothetical survey responses from healthcare

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providers to capture both prescribing behavior and perceptions related to antimicrobial stewardship. The rationale for this approach was reportedly to generate quantifiable metrics of antibiotic use, while also understanding the cognitive and social factors influencing prescriber behavior.

In the quantitative component, it was reportedly assumed that 10 primary healthcare facilities, each with an average of 50 outpatient prescriptions per week, were included, resulting in a total hypothetical sample of 2,000 prescriptions over a one-month period. Antibiotics were categorized into broad-spectrum, narrow-spectrum, and guideline-recommended agents, following the Nigerian Standard Treatment Guidelines (Federal Ministry of Health, 2016). The frequency of each antibiotic category was reportedly calculated using the formula $fi=niN \times 100$, where ni represented the number of prescriptions in a specific category, and N was the total number of prescriptions audited. For instance, if 900 of 2,000 prescriptions were broad-spectrum, the relative frequency would be $f=9002000 \times 100=45\%$.

Additionally, the study reportedly assessed the appropriateness of prescriptions by comparing them against guideline recommendations, generating a hypothetical "compliance score" for each facility. Mean compliance rates and standard deviations were reportedly computed to indicate overall adherence, and a chi-square test was planned to determine the statistical association between facility characteristics (urban vs. semi-urban) and guideline adherence.

In the qualitative dimension, hypothetical survey data were reportedly collected from 120 prescribers using a structured questionnaire informed by the Knowledge-Attitude-Practice (KAP) framework and Theory of Planned Behavior (TPB). Responses on a five-point Likert scale measured knowledge of AMR, attitudes toward stewardship, perceived social norms, and self-reported prescribing practices. Mean scores, standard deviations, and correlations were reportedly computed to examine relationships between knowledge, attitudes, perceived norms, and guideline adherence. For example, Pearson correlation was used to test the association between perceived behavioral control and reported adherence to guidelines.

Sampling considerations were reportedly addressed through stratification of facilities by geographic location (urban vs. semi-urban) and patient load. The study reportedly assumed that missing prescription data were random and applied proportional imputation to maintain dataset integrity. Descriptive statistics, including frequencies, percentages, and measures of central tendency, were generated to summarize prescribing patterns. Inferential statistics, including chi-square and correlation analyses, were reportedly conducted to test hypothesized relationships between prescriber perceptions, facility type, and guideline adherence.

It was further reported that data analysis was performed using SPSS version 28 and Microsoft Excel. Tables and graphs were planned to represent antibiotic category

distributions, guideline adherence rates, and prescriber perception scores. Ethical considerations were reportedly addressed by simulating data with no identifiable patient information, ensuring compliance with principles of beneficence, non-maleficence, and confidentiality. This methodology was therefore positioned to provide a robust framework for evaluating both the quantitative and behavioral aspects of antimicrobial prescribing, while allowing for meaningful statistical interpretation and hypothesis testing in low-resource primary healthcare settings.

Results

Table 1: Distribution of Antibiotic Prescriptions (N = 2,000)

Antibiotic Category	Number of Prescriptions (n)	Percentage (%)
Broad-spectrum antibiotics	900	45
Narrow-spectrum antibiotics	700	35
Guideline-recommended agents	400	20

It was reported that broad-spectrum antibiotics accounted for 45% of prescriptions, while narrow-spectrum agents were 35%, and prescriptions fully aligned with national guidelines comprised only 20%. These findings reportedly indicated a high prevalence of empiric prescribing and low adherence to standard treatment recommendations.

Table 2: Guideline Adherence by Facility Type

Facility Type	Mean Compliance (%) ± SD	Chi-square Test (χ^2)	p-value
Urban	28 ± 7	15.42	<0.001
Semi-urban	18 ± 5		

Reportedly, urban facilities demonstrated higher guideline adherence (28%) than semi-urban facilities (18%), and a chi-square test confirmed this difference as statistically significant ($\chi^2 = 15.42$, $p < 0.001$). This suggested that infrastructure and resource availability influenced prescribing behavior.

Table 3: Prescriber Knowledge, Attitude, and Practice (KAP) Scores (N = 120)

KAP Domain	Mean Score ± SD (1–5)	Interpretation
Knowledge of AMR	3.8 ± 0.7	Moderate knowledge

KAP Domain	Mean Score ± SD (1–5)	Interpretation
Attitude toward stewardship	4.0 ± 0.6	Positive attitude
Reported practice	2.9 ± 0.8	Suboptimal prescribing behavior

Reportedly, prescribers demonstrated moderate knowledge and positive attitudes toward antimicrobial stewardship; however, actual prescribing practices were suboptimal, reflecting a gap between awareness and behavior, consistent with the KAP framework.

Table 4: Correlation Between TPB Variables and Guideline Adherence

TPB Variable	Pearson r	p-value
Perceived behavioral control	0.61	<0.001
Subjective norms	0.48	<0.001
Intention to adhere	0.66	<0.001

Reportedly, guideline adherence was positively correlated with perceived behavioral control, subjective norms, and intention, with all correlations statistically significant. These findings supported the TPB framework, demonstrating that both individual and social factors influenced prescribing behavior.

Table 5: Commonly Prescribed Antibiotics and Appropriateness

Antibiotic	Number Prescribed (n)	Appropriateness (%)
Amoxicillin-clavulanate	500	30
Ceftriaxone	250	25
Ciprofloxacin	200	20
Metronidazole	150	35
Other antibiotics	900	15

Reportedly, broad-spectrum antibiotics such as amoxicillin-clavulanate and ceftriaxone dominated prescriptions, but appropriateness was low, ranging from 15% to 35%. This suggested frequent empiric prescribing without full adherence to guidelines, potentially contributing to antimicrobial resistance.

Summary of Results

It was reported that antimicrobial prescribing in primary healthcare facilities was predominantly empiric, with broad-spectrum antibiotics overused and guideline-recommended prescriptions limited to 20%. Urban facilities reportedly performed better than semi-urban facilities in adherence to treatment guidelines. Prescriber KAP analysis revealed moderate knowledge and positive attitudes but suboptimal practices, indicating a gap between awareness and implementation. Correlation analyses confirmed that perceived behavioral control, subjective norms, and intention significantly influenced adherence, validating the Theory of Planned Behavior. The combined results reportedly highlighted the critical role of structured antimicrobial stewardship programs, targeted training, guideline dissemination, and audit-feedback mechanisms in improving rational prescribing and mitigating resistance in low-resource settings.

Conclusion

The study reportedly revealed that antimicrobial prescribing practices in primary healthcare facilities were heavily influenced by both systemic and individual factors, resulting in a predominance of empiric and broad-spectrum antibiotic use, while adherence to national guidelines remained low. Hypothetical prescription audits indicated that only 20% of prescriptions fully complied with recommended protocols, with urban facilities exhibiting higher compliance rates than semi-urban ones, a difference that was statistically significant. Prescriber KAP assessments reportedly showed moderate knowledge and positive attitudes toward antimicrobial stewardship; however, actual prescribing behavior was suboptimal, highlighting a gap between awareness and practice. Correlation analyses reportedly confirmed that perceived behavioral control, subjective norms, and intention, as conceptualized by the Theory of Planned Behavior, were strongly associated with adherence to guideline-recommended prescriptions. These findings reportedly suggested that both individual cognition and social pressures shaped antibiotic prescribing behavior, with patient expectations and peer influence driving empiric therapy. Furthermore, the study reportedly underscored the role of low-resource constraints, such as limited diagnostic capacity, lack of laboratory support, and insufficient access to up-to-date treatment guidelines, in perpetuating inappropriate antimicrobial use. The implications of these findings reportedly extended to policy, clinical practice, and healthcare system planning, emphasizing the necessity for context-specific antimicrobial stewardship interventions, including prescriber training, simplified guidelines, audit-feedback mechanisms, and patient education programs. The study also reportedly highlighted that sustainable improvements required integration of behavioral frameworks, such as KAP and TPB, to guide both prescriber education and organizational strategies. In essence, the findings were interpreted to indicate that the implementation of tailored antimicrobial stewardship programs could optimize prescribing behavior, reduce the overuse of broad-spectrum antibiotics, mitigate the emergence of resistance, and enhance patient safety, even in resource-limited primary healthcare settings, provided

that systemic, social, and cognitive factors were addressed in a coordinated manner, combining education, monitoring, and policy support.

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