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Towards an Antimicrobial Stewardship Program in a Young Tertiary Hospital in Southern Nigeria: A Point Prevalence Survey of Antimicrobial Usage

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Abstract

Background: Antimicrobial resistance (AMR) is one of the top 10 global public health threats facing humanity and this burden is borne largely by low and middle-income countries. As part of efforts to combat AMR, the World Health Organization has identified Antimicrobial Stewardship as one of the strategic objectives of its global action plan on antimicrobial resistance. This survey aimed to observe antimicrobial prescribing and usage patterns in the Rivers State University Teaching Hospital with the purpose of identifying gaps to inform the specific antimicrobial stewardship interventions necessary to address our specific needs. **Methodology**: A point prevalence survey was conducted using the protocol and web-based automated data management system designed by the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance, University of Antwerp, Belgium, in November 2021. **Results**: A total of 69 adult medical and surgical patients were surveyed; 27 males and 18 females. Antimicrobial prevalence was 65.2%. Third generation cephalosporins (24.4%; 33.3%), fluoroquinolones (17.8%; 22.2%) and imidazole derivatives (20%; 36.1%) were most prescribed on the medical and surgical wards. Antimicrobial guidelines were completely unavailable, most antimicrobials (93.8%) were prescribed empirically and 64.4% of these remained empirical after 72 hours of commencement. **Conclusion**: Antimicrobial stewardship interventions are necessary to minimize sub-optimal an-

timicrobial prescribing practices in our facility. Most critical are education on appropriate use of antimicrobials, support for development of antimicrobial guidelines, diagnostic stewardship, and the drive for improved use of the laboratory to guide antimicrobial prescriptions. The antimicrobial stewardship committee and team must drive this, having the requisite support from the management and prescribers, with the primary outcomes being reduced antimicrobial prevalence and improved antimicrobial prescription patterns.

Keywords

Antimicrobial Stewardship, Antimicrobial Resistance, Point Prevalence Survey, Rivers State University Teaching Hospital

1. Introduction

Antimicrobials are the most widely prescribed medications in and outside healthcare facilities, however, a high proportion of these antibiotic prescriptions is unnecessary [1] [2]. The adverse consequences of unnecessary antibiotic use include antibiotic failure, increased mortality, greatly increased healthcare costs, adverse drug reactions or interactions, development of opportunistic infections and the emergence of multi-drug resistant organisms [1].

Antimicrobial resistance (AMR) is a major global challenge, being one of the top 10 global public health threats facing humanity and this burden is borne largely by low-income countries. More than one million deaths are attributable to bacterial AMR globally, this being highest in western sub-Saharan Africa, at 27×3 deaths per 100,000 and it is estimated that 10 million deaths from AMR could occur by the year 2050 [3]. Antimicrobial misuse and abuse, such as unnecessary prescriptions by clinicians are believed to be the primary contributors, no wonder healthcare facilities are increasingly recognized as reservoirs of antibiotic-resistant bacteria [1].

An Antimicrobial Stewardship (AMS) program is one of the strategic objectives of the World Health Organization's (WHO) global action plan on antimicrobial resistance [4]. It is defined as "coordinated interventions designed to improve and measure the appropriate use of [antibiotic] agents by promoting the selection of the optimal [antibiotic] drug regimen including dosing, duration of therapy, and route of administration" with the aim to optimize antimicrobial use [5] [6]. Benefits of the Antimicrobial Stewardship program (ASP) include improved clinical outcomes, increased infection cure rates, minimized drug toxicity as well as reduced treatment failures, adverse effects, antibiotic resistance, health care costs, length of stay, as well as opportunistic infections [6].

To implement an effective ASP, stewardship interventions must be customized to local needs, therefore, a point prevalence survey was conducted to observe antimicrobial prescribing and usage patterns in the Rivers State University Teaching Hospital (RSUTH) prior to antimicrobial stewardship interventions.

2. Methodology

The point prevalence survey (PPS) was conducted at Rivers State University Teaching Hospital (RSUTH), one of the two tertiary public hospitals in Rivers State, Southern Nigeria, in November 2021. RSUTH is a 350-bed hospital that caters for patients from within Rivers state and surrounding states and offers acute care services including pediatrics, surgery, internal medicine, obstetrics and gynecology, psychiatry, radiology and pathology services. All adult inpatients (≥18 years) in the adult female and male medical and surgical wards who were on at least one antimicrobial at 8 am of the day of the survey, were included.

Patients' data were collected using the protocol and data collection forms designed by the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance, of the University of Antwerp, Belgium. Information collected from patients' case notes and antibiotic charts include age, sex, details of all antimicrobials each patient was currently taking and laboratory evidence of infection as basis for prescription. Quality indicators for antibiotic prescriptions which were sought for in patients' notes include availability of antimicrobial guidelines, compliance with guidelines, documented indications for antimicrobials, and documented stop/review dates. These were entered into and analysed by the web-based automated data management system on the Global Point Prevalence Survey website (available at https://www.global-pps.com). No contact with patients was necessary. Ethical approval was obtained from the Research ethics committee of the hospital (RSUTH/REC/2021120).

3. Results

A total of 69 adult patients were surveyed, 36 admitted in medical and 33 in surgical wards.

About two-thirds of patients (45) were on at least one antimicrobial agent, giving an overall antimicrobial prevalence of 65.2%. Among these, were twenty-seven (27) males and eighteen (18) females. Their age ranged from 18 - 88 years with the majority in the 18 - 28 years age group (**Table 1**).

Based on ward distribution, 24 (66.7%) and 21 (63.6%) of those who were on at least one antimicrobial were admitted in the medical and surgical wards respectively (**Figure 1**).

All forty-five patients were on a total of eighty-one (81) prescriptions. Patients on the medical ward (24) were on a total of forty-five prescriptions (**Figure 2**) while those on the surgical wards (21) were on a total of thirty-six prescriptions (**Figure 3**).

Third generation cephalosporins, imidazole derivatives and fluoroquinolones were most prescribed and accounted for 24.4%, 17.8% and 20% of all prescriptions on the medical wards (**Figure 2**).

The same combination of third generation cephalosporins, fluoroquinolones and imidazole derivatives were most prescribed on the surgical wards (**Figure 3**),

Table 1. Biodata of patients on antimicrobials (N = 45).

	Frequency (n)	Percentage (%)
Age (years)		
18 - 28	9	20.0
29 - 38	6	13.3
39 - 48	7	15.6
49 - 58	7	15.6
59 - 68	7	15.6
69 - 78	6	13.3
79 - 88	3	6.7
Gender		
Male	27	60.0
Female	18	40.0
Ward type		
Female medical	15	33.3
Male medical	12	26.7
Female surgical	6	13.3
Male surgical	12	26.7
Duration of antibiotic treatment (hours)		
<48	8	17.8
48 - 72	8	17.8
>72	29	64.4

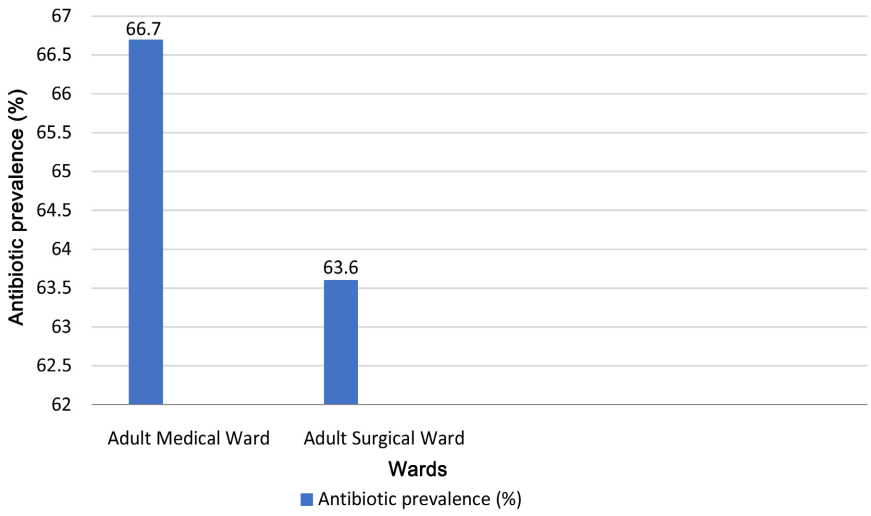

Figure 1. Antibiotic prevalence by ward type.

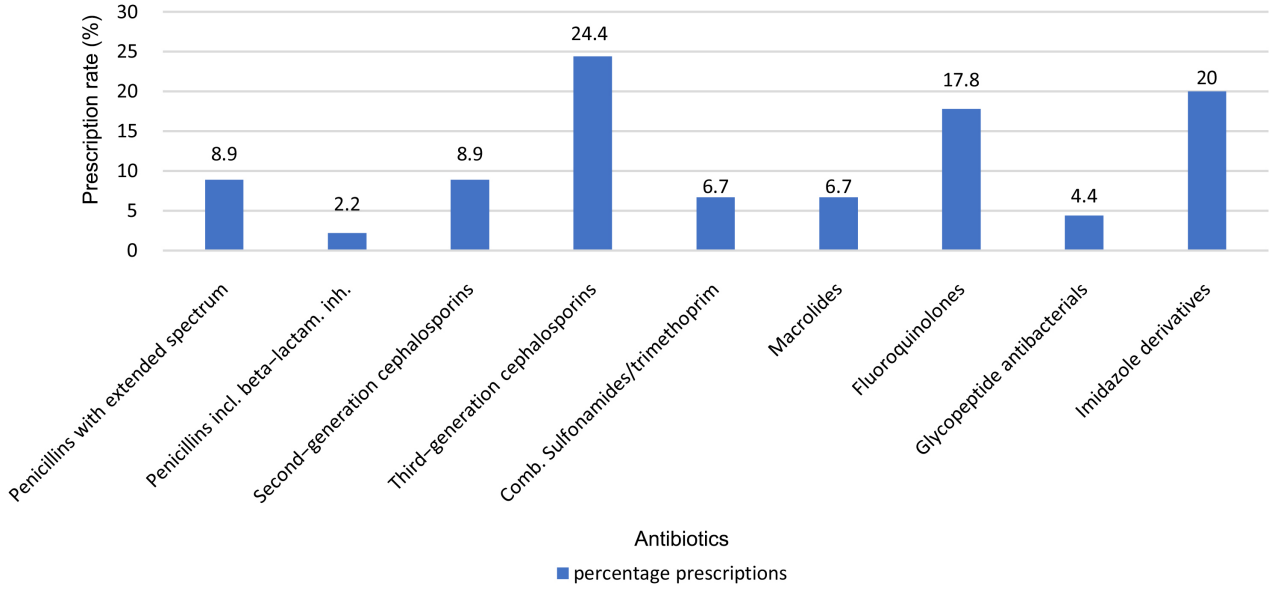

Figure 2. Proportional antibiotic use in medical ward.

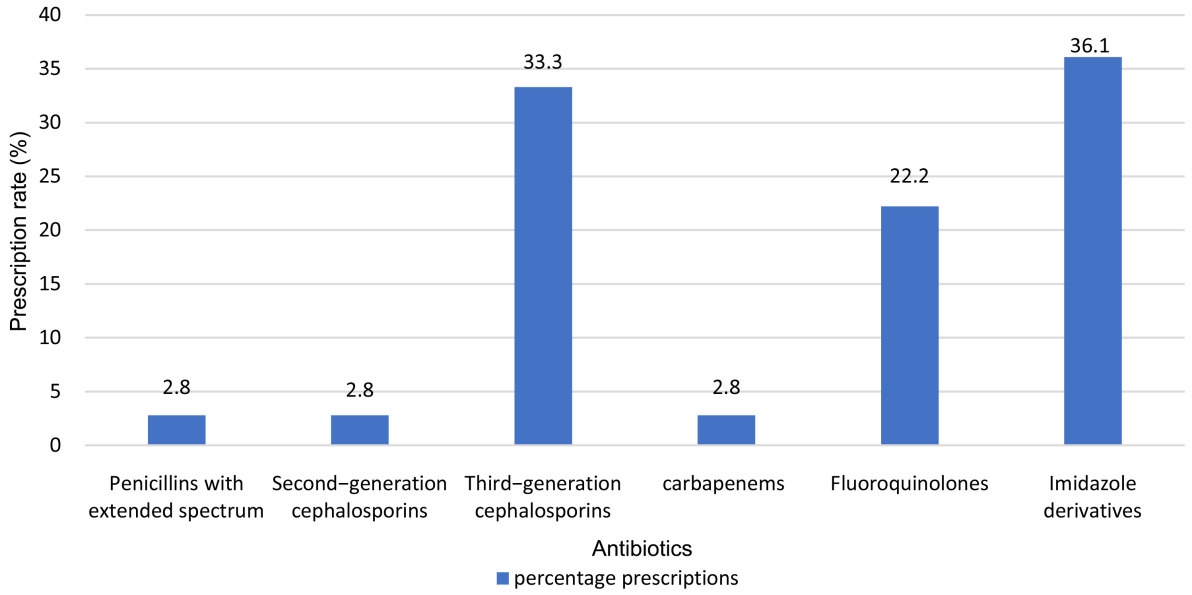

Figure 3. Proportional antibiotic use in surgical ward.

just as on the medical wards. They respectively accounted for 33.3%, 22.2% and 36.1% of all prescriptions.

With regards to the quality indicators for antimicrobial prescriptions, antimicrobial guidelines were completely unavailable on both surgical and medical wards and so compliance was zero (**Figure 4**). Prescribers' documentation of reasons for prescriptions (indications) and stop/review dates for the prescribed antimicrobials in patient case notes were also not optimal (**Figure 4**).

Most antibiotics 76 (93.8%) were still being administered empirically at the point of the survey (**Figure 5**).

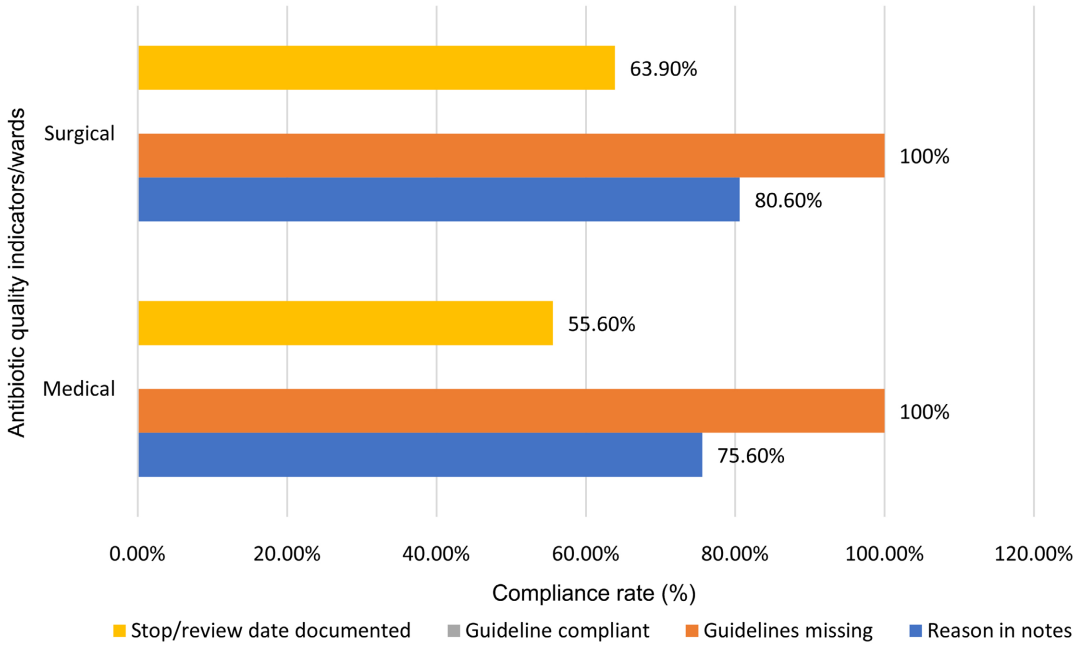

Figure 4. Antibiotic quality indicators by ward type.

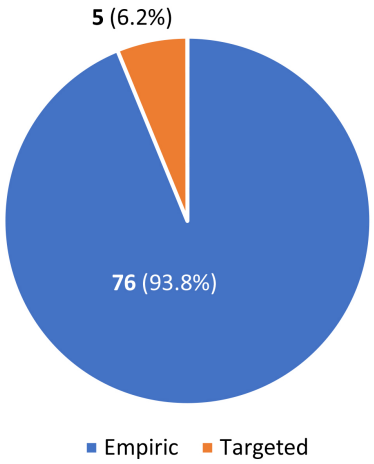

Figure 5. Antimicrobial prescription based on biomarkers/evidence of infection.

4. Discussion

Antimicrobial resistance has been reported to be largely human-driven and prescribers in healthcare facilities are not absolved, more so in developing countries such as Nigeria, where inappropriate prescribing practices by clinicians have been recognized contributors [2] [4] [7]. Inappropriate prescription practices which occur at both in-patient and outpatient settings include the use of wrong dosages, dosing intervals and duration of treatment, use of antibiotics when there is no bacterial infection, and overuse of newer, broad-spectrum antibiotics when either no antibiotic or an older narrow-spectrum drug would be sufficient as well as use of ineffective antimicrobials. Clinicians have also been observed to succumb to pressure from patients to prescribe antibiotics where not necessary.

The high patient to doctor ratio in Nigeria, particularly in public health institutions also is a contributory factor, in that, the clinicians are usually overwhelmed and so unable to take the time to properly counsel patients on appropriate antimicrobial usage [7] [8] [9]. Physicians' attitudes of self-approval, lack of information, apathy, fear of adverse treatment outcomes (including losing patronage and litigation), autonomy of practice and refusal to accept responsibility to prescribe antibiotics appropriately have also been well noted to promote inappropriate prescribing patterns among clinicians [10].

The negative consequences of antimicrobial resistance are far-reaching; therefore, different approaches to control this rapidly increasing scourge have been explored. We are of the opinion that one approach which rests largely on the shoulders of prescribers in healthcare facilities and whose major thrust is behavioral change, is an institutional Antimicrobial Stewardship Program (ASP). The benefits of an ASP, (applying the core and supplemental strategies) have been well documented and these include reduced number of antimicrobial prescriptions, more appropriate use of antimicrobials, development and compliance with antimicrobial guidelines, as well as improved use of the laboratory to guide treatment. Also, prescribers are more conscious about the need or otherwise for antimicrobials, antimicrobial guidelines and the need to comply with the latter [11] [12] [13]. ASPs are largely still evolving in Nigeria and not without challenges in terms of management commitment, financial resources, prescriber buy-in and information technology support [7] [12] [14].

In our survey, antibiotic prevalence was high (65.6%), more so in the medical than surgical wards. High rates of antibiotic prescriptions have also been reported from other healthcare institutions in Port Harcourt and other parts of Nigeria thus the need to consolidate on antimicrobial stewardship activities in Nigerian healthcare institutions [14] [15] [16]. The majority of antimicrobial prescriptions (>64%) were empirical, *i.e.*, they were not based on any laboratory evidence of infection, even well over 72 hours after being commenced. This highlights gross prescribers' underutilization of diagnostic services in their management of patients with infections in Nigeria. This trend has been reported by other researchers, and been attributed to a variety of factors [17], notable among which are the poor perceptions of prescribers; that is, their belief in the sufficiency of clinical diagnosis, their sufficient knowledge of "potent" antibiotics, perceived irrelevance of the laboratory and observed challenges with medical microbiology laboratories including lack of access, prolonged turnaround time, and absence of pathologists to assure quality of tests [17] [18] [19]. To reverse this trend and improve the use of the laboratory and by extension, antimicrobial prescription practices, education of prescribers, patients, their caregivers and indeed the general community is vital. Education is one strategy of the ASP that has proven to be very effective [20]. Following antimicrobial stewardship interventions, improved use of laboratory evidence to guide antimicrobial usage has been recognized [11] [21]. Poor healthcare funding and the relative inaccessibility of majority of Nigerians to health insurance, thus necessitating out-of-pocket

payments for health care services and laboratory tests is also a major contributor to underutilization of diagnostic services in Nigeria [22]. Many patients are unable to afford required investigations and so prefer to purchase drugs instead.

Considering the far-reaching impact of proper diagnostics and expertise across the diagnostic pathway, from pre-analytic through post-analytic stages on patient care, it is crucial that diagnostic stewardship (DS) should be prioritized in clinical laboratories. With proper diagnosis, better targeted and effective antimicrobial therapy can be commenced promptly [23]. Diagnostic stewardship is defined as: "coordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions. It should promote appropriate, timely diagnostic testing, including specimen collection, and pathogen identification and accurate, timely reporting of results to guide patient treatment". The main objective of microbiological diagnostic stewardship is therefore the provision of appropriate patient care guided by quality microbiologic data and accurate AMR surveillance data, to inform antimicrobial treatment guidelines and control strategies for AMR [24], where laboratory reports are of poor quality (inaccurate, delayed, or erroneous), it would be akin to garbage in, garbage out, misleading users of those laboratory reports. This would constitute a clog in the wheel of the institutional AMS program, making it a continuous struggle or even impossible. Clinical microbiology laboratories must therefore embrace DS as a core activity towards continuous quality improvement [25].

The spectrum of commonly prescribed antibiotics is similar to those used in other parts of Nigeria [15] [16]. Perhaps this represents an informal agreement based on local susceptibility patterns, scientific reports or probably shared experiences. It is important that these be developed to formal antimicrobial guidelines; documents which should guide every member of the healthcare team in their antimicrobial choices and prescription patterns, with the aim to optimize the use of antimicrobials and avoid their misuse. Irrational antimicrobial prescriptions are bound to occur in their absence! Collaboration with the Clinical Microbiology laboratory is also necessary to generate and review local antibiograms to inform the institutional antimicrobial guidelines [26]. It is vital that antimicrobial guidelines are made available and readily accessible to all prescribers within the healthcare setting for reference. This can be facilitated using information technology (for example, as android or mobile phone apps) as is being practiced in many other settings and sectors globally [10]. The complete absence of antimicrobial guidelines in our adult surgical and medical units, portends poor-quality antimicrobial practices and this sadly, has also been observed in other Nigerian healthcare facilities [7].

5. Conclusion

Antimicrobial stewardship interventions are necessary to optimize antimicrobial prescribing practices. Most critical are education on appropriate use of antimi-

crobials, support for development of antimicrobial guidelines, diagnostic stewardship, and the drive for improved use of the laboratory to guide antimicrobial prescriptions. The antimicrobial stewardship committee and team must drive this, having the requisite support from the management and prescribers, with the primary intended outcomes being reduced antimicrobial prevalence and improved prescription patterns.

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Limitation

The study is a point prevalence survey and therefore may not accurately represent the antibiotic prescription patterns and practices over time.

Funding

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Conflicts of Interest

Authors declare no conflicts of interest.

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