Original Article

A Point Prevalence Survey of Antimicrobial Prescribing in Four Nigerian Tertiary Hospitals

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Abstract

Introduction: Antimicrobial resistance has become a global challenge in health care. Its emergence in previously sensitive bacteria is usually associated with poor antibiotic-prescribing patterns. **Methodology:** A point prevalence survey was carried out in four tertiary hospitals in Nigeria in 2015 to determine the rate and characteristics of antibiotic prescription. **Results:** Of 828 patients eligible for the study, 69.7% received antibiotics, with highest rates in the adult Intensive Care Unit. There were therapeutic indications in 51.2% of the prescriptions, of which 89.5% were for community-acquired infections. Third-generation cephalosporins were the most prescribed antibiotics. On the evaluation of surgical prophylaxis, only 4.1% were compliant with institutional guidelines and 39.2% gave a reason for prescribing in patient case notes. Less than 1% of the prescriptions were based on the use of biomarkers. **Conclusion:** The prevalence of antibiotic prescription in Nigerian hospitals is high with only about 50% of prescriptions based on clear therapeutic indications. We provide evidence that the country needs to institute a cohesive antimicrobial stewardship intervention program.

Keywords: Antimicrobial stewardship, Nigeria, point prevalence, surveillance

Introduction

Antimicrobial resistance (AMR) is currently of global significance, with increasing number of microorganisms exhibiting resistance to available antimicrobial agents.[1-4] It involves both the Gram-positive and Gram-negative bacteria, with global prevalence rates as high as 60% or more.[5-10] This resistance is particularly higher in hospital-acquired strains.[11]

To combat this rise in AMR, the World Health Organization (WHO) advocates the adoption of antimicrobial stewardship by health-care providers to check and reduce the burden of antibiotic resistance.[12,13] This strategy involves the application of objective interventions to influence prescribing practices, thereby promoting rationale and appropriate antimicrobial use.[14,15]

This intervention is vital in the developing countries which usually have a combination of poor antimicrobial-prescribing practices, unregulated over-the-counter sale of antibiotics, and increasing rates of AMR.[16-22] However, before any antimicrobial stewardship program can be implemented, antimicrobial prescribing information is required; this information is currently scanty in Nigeria.[16,23-25] To obtain objective and reproducible information on antimicrobial prescription, a uniform and standardized method of data collection needs to be applied. Point prevalence survey (PPS) has been a popular and widely accepted method for over 20 years[26-29] because it is less expensive, less time-consuming, and easier to conduct than incidence studies[28,30] and can be used to identify and assess quality indicators[31-33] to evaluate problems of antibiotic use and resolve prescribing issues.

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To acquire baseline information on antimicrobial-prescribing practices in Nigeria, four tertiary hospitals were assessed on antimicrobial prescribing practices in the north-central, northwest, and southwest regions of the country using uniform and standardized PPS methods.

Methods

This survey was carried out across all wards of the Ahmadu Bello University Teaching Hospital, Zaria, Lagos University Teaching Hospital, Lagos, National Hospital, Abuja, and the Obafemi Awolowo University Teaching Hospital Complex, Ile-Ife.

From April to June 2015, a PPS was conducted across all clinical departments of the participating hospitals by teams of clinical microbiologists. Data were collected in each center within 2 weeks.

All hospitalized patients receiving at least an antimicrobial agent on the day of PPS were included. Eligibility criteria required that patients would have been admitted to the ward at least 24 h before the survey and still be present at 8 am on the day of the survey. In addition, for surgical patients, the dosage and time of administration of prophylactic antimicrobials before or at surgery were obtained to determine the duration and frequency of prophylaxis.

The total number of patients in each ward was used as the denominator. The survey for all beds in each ward had to be completed in a single day. For each patient treated with systemic antimicrobials, information was collected using a standardized form on age, sex, antimicrobial agents, number of doses per day, route of administration, indications for treatment, whether the indication was actually documented in notes, microbiological data, compliance with prescribing information/guidelines, and documentation of stop/review date of prescription.

Definitions and rates used in this study

- Therapy: "The use of one antibiotic using one route of administration"
- Antimicrobial prevalence (%) was calculated as the "number of treated patients/number of registered patients × 100.

From the data collected, quality indicators were calculated as follows:

- For percentage of patients with reason for antibiotic use in notes and stop/review date documented: Reason in notes and stop/review date documented for each antibiotic level over total scores for this indicator
- For % guideline compliance: Guideline compliance was counted at each patient level over total scores for this indicator. Guideline compliance was counted at each patient level and diagnosis for compliance and recorded as yes or no only.
- For combination therapy with more than one antibiotic: If one antibiotic by diagnosis is not compliant, then this combination therapy as a whole for this diagnosis was counted as noncompliant.

Results

The survey included 828 inpatients on 72 wards, of which 577 (69.7%) received at least one antimicrobial on the day of the point prevalence study.

The highest prevalence for antimicrobial use was in the adult Intensive Care Units (ICUs) (88.9%), followed by pediatric medical wards (84.6%) and neonatal ICU (76.7%) [Figure 1]."

Of 523 therapeutic antibiotic prescriptions, 89.5% were issued for community-acquired infections while 397 (38.8%) prescriptions were issued for prophylaxis, of which 277 (69.9%) were issued for surgical prophylaxis [Table 1].

Third-generation cephalosporins constituted 21.4% of the prescriptions for therapeutic use mainly ceftriaxone (18.9%), followed by metronidazole (18.0%) and quinolones (14.1%); especially ciprofloxacin (9.9%). Ceftriaxone was the most common antibiotic in both surgical (28.0%) and medical (13.0%) prophylaxis [Table 2].

Prescriptions for surgical prophylaxis were given for >1 day in 95.0% of cases [Table 3]. Parenteral antibiotics were prescribed in 74.8% of the time. Indication for antibiotic prescription was documented in 61.8% of cases, and a stop or review date was documented for 27.8% of the prescriptions. Compliance with local antibiotic guidelines was 7.1% for medical and 4.1% for surgical indications. A biomarker result was utilized in 0.5% of all antibiotic

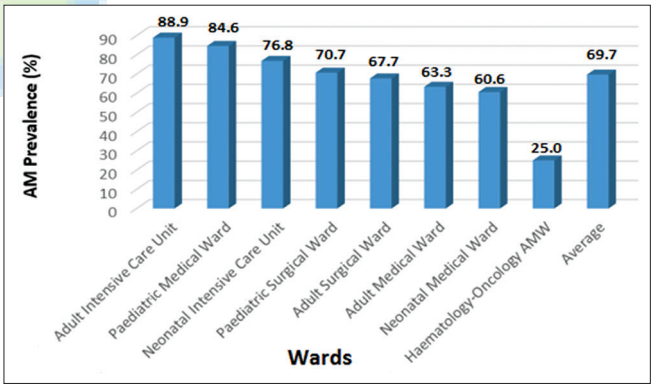

Figure 1: Antimicrobial prevalence rates by wards

Table 1: Indications for antibiotic prescriptions

Indication	*n*	Total (%)
Therapeutic		
CAI	468	523 (51.2)
HAI	55	
Prophylaxis		
Surgical	277	397 (38.8)
Medical	120	
Indication not specified	102	102 (10.0)
Total	1022 (100)	

CAI: Community-acquired infection, HAI: Healthcare-associated infection

Table 2: Top 5 most prescribed antibiotics for therapeutic and prophylactic uses

Therapeutic prescriptions	Proportion (%)	Prophylactic prescriptions			
		Medical	Proportion (%)	Surgical	Proportion (%)
Ceftriaxone	18.9	Ceftriaxone	13.0	Ceftriaxone	28.0
Metronidazole	18.0	Co-trimoxazole	12.0	Metronidazole	20.0
Ciprofloxacin	9.9	Metronidazole	12.0	Cefuroxime	17.0
Cefuroxime	7.3	Ciprofloxacin	8.0	Ciprofloxacin	13.0
Gentamicin	4.6	Clindamycin	4.0	Amoxicillin/clavulanate	7.0
Others	41.3	Others	51.0	Others	15.0
Total	100.0		100.0		100.0

Table 3: Quality indicators of antibiotic prescribing

	Medical (%)	Surgical (%)	Intensive care (%)
Reason in notes	32.2	27.2	2.4
Guidelines compliant	7.1	4.1	0.3
Stop/review date	12.2	15.1	0.5
Targeted therapy	14.9	11.3	4.5
Parenteral use	68.1	57.4	92.5
Biomarkers	0.6	0.4	0

prescriptions, of which C-reactive protein was used in 80% of those cases.

Discussion

Antimicrobial-prescribing surveillance aids in identifying problematic areas for intervention, accessing the success of such interventions, and planning future interventions.[34-37] This PPS for the collection of antimicrobial data is, to our knowledge, the first of its kind in Nigeria.

Majority (69.7%) of patients were found to have had at least a single antimicrobial exposure. This value, though much higher than the worldwide average of 34.7%,[38] obtained from similar PPS, is within the established range in Africa.[4,39-41] It compares poorly with the lower rates in the European Union (EU) and the US.[27,42] This may be related to the poor use of diagnostic tools in guiding antimicrobial prescriptions with the associated high level of unguided therapy in Africa compared with Europe and the US, as well as the general lack of antimicrobial stewardship.[18,43] This poor use of the laboratory to guide therapy has been recorded across Africa and is a reflection of the weak laboratory infrastructure as well as inadequate human capacity in its laboratories.[44]

Adult ICU wards had the highest rates of antimicrobial prescriptions, similar to reports from other studies.[27,42,45] However, the observed rate of 88.9% in this study was higher than the 29%, 34%, 59.3%, and 60.6% in Europe,[27] Canada,[27] US,[46] and Turkey, respectively,[45] A WHO fact sheet publication shows that the frequency of acquisition of infection in the ICU in low- and middle-income countries is at least 2-3 folds higher than in high-income countries.[47] This combined with the higher level of general local immunosuppression as well as other comorbidities in ICU patients may account for the higher rate antimicrobial prescription.[48,49] The rates in the pediatric and neonatal units were the next highest. Similar high rates were reported in Egypt[40] and Ethiopia[50] though some other studies reported lower rates.[29,51]

The picture of poor-prescribing practice is further reinforced by the dominance of broad-spectrum antimicrobials, particularly cephalosporins. Other studies from Egypt, Turkey, and the EU show similar cephalosporin usage rates.[28,40,45] This prescription pattern, which is associated with the tendency to use broad-spectrum antibiotics, is usually due to poor or absent diagnostic tools or failure to utilize them properly where available.[22] Unfortunately, the broad spectrum of actions of these drugs contributes to the emergence of AMR.[40] This is compounded by the rate of quinolones usage, which was among the most commonly prescribed systemic antimicrobials. Excessive quinolone has been shown to promote AMR[52] and is a reflection of poor antimicrobial stewardship.[27] The high level (74.8%) of the use of intravenous route of administration is likely related to the high cephalosporin use which is mainly intravenous. However, there was a high rate of parenteral antimicrobial use across all hospital and wards, reflecting the earlier stated poor use of laboratories to guide therapy.[18,22,43] The high dependency nature of ICU patients combined with the predominance of prescriptions from ICUs would certainly enhance high parenteral administration as seen in this study.

The extended duration of surgical prophylaxis which was >24 hours in most of the cases, was contrary to accepted international best practices. This further emphasizes the need for evidence-based guidelines to guide our practices.[53] Other studies have shown similar poor compliance to set guidelines.[22,27,45,53,54]

Other poor-prescribing practices such as a lack of indications for therapy in 38.2% and the low rate of documentation of stop or review dates to guide the course of antimicrobials prescribed, resulted in healthcare staff leaving patients on these medications for inappropriate durations. These could be due to lack of justification of therapy and/or failure of documentation that shows the need for more quality-assured procedures and guidelines.[17] This, however, is not peculiar to Nigeria[28] and there appears to be a consensus that under this kind of conditions, it will be difficult to carry out an effective

antimicrobial stewardship program without first correcting the deficiencies.[24,34,35] In addition, there was a very high rate of parenteral use of antimicrobials in all the hospitals, contrary to the advocated practices in antimicrobial stewardship program.[18,43]

There was very little utilization of biomarkers (0.5%) such as procalcitonin across study hospitals because they are still rather novel in most parts of the country and are relatively expensive. However, they are a viable adjunct to guide therapy in select patients such as those in whom sepsis is suspected.[55] Biomarkers are no longer novel agents and are included in the current infection management guidelines.[56,57] They are particularly useful to guide empiric antimicrobial therapy and for follow-up of antibiotic therapy of severe bacterial infections where it is desirable to achieve eradication of pathogens.[58,59]

There is clearly a need to improve prescribing practices in the country by developing evidence-based guidelines, improving laboratories, and retraining prescribers on the importance of definitive or targeted therapy. This will require administrative will to ensure the use of culture and sensitivity results as the basis for antimicrobial therapy.

Conclusions

This study represents the first objective pan-hospital antimicrobial prescription evaluation in Nigeria. Areas of concern identified include high antibiotic prevalence rates in ICU, pediatric and neonatal wards combined with the absence of guidelines, low reporting of a stop/review date, and prolonged surgical prophylaxis. There is need to create awareness at the national level for targeted prescribing of antimicrobials and use of evidence-based antibiotic guidelines.

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Conflicts of interest

There are no conflicts of interest.

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