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Pattern of antibiotic prescription and resistance profile of common bacterial isolates in the internal medicine wards of a tertiary referral centre in Nigeria

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ABSTRACT

Indiscriminate and excessive use of antibiotics is the major driver to the development of bacterial resistance, which is now a global challenge. Information regarding antibiotic use in Nigerian hospitals is lacking. This study examined the pattern of antibiotic prescription in a tertiary hospital in Nigeria. In a retrospective survey, case records of patients who were admitted into the medical wards over a 6-month period were reviewed. A pre-formed questionnaire was administered that sought information such as sociodemographic data, drug data, basis of prescription and other relevant information on all patients who received antibiotics. Data were analysed using SPSS for Windows v.16. Of 412 patients admitted into the internal medicine ward during the study period, 202 (49.0%) received antibiotics, of whom 125 (61.9%) received more than one antibiotic. Overall there were 334 antibiotic prescriptions. Community-acquired pneumonia (67/202; 33.2%) was the leading cause of antibiotic prescription, and ceftriaxone (132/334; 39.5%) was the most commonly prescribed antibiotic. The parenteral route was the commonest route of administration (270/334; 80.8%) and most of the prescriptions were empirical (323/334; 96.7%). Antimicrobial resistance among common bacterial isolates was noted. Inappropriate antibiotic prescription is common. There was frequent use of third-generation cephalosporins as empirical therapy, with de-escalation in only a handful of cases. This highlights the need for introduction of antibiotic guidelines.

1. Introduction

Antibiotics are the most frequently prescribed drugs among hospitalised patients and there are reported concerns about the continuous indiscriminate and excessive use of antimicrobial agents, which promotes the emergence of antimicrobial resistance [1,2]. Unfortunately, in a remarkably short time, resistance to antibiotics has undermined the idealistic hope that bacterial infection would cease to be an important cause of death and disease. Indeed, antibiotic resistance increasingly compromises the outcome of many infections that were, until recently, treatable and remain the most common diseases in Africa. Early and appropriate antibiotic administration reduces mortality rates [3–5], however it must be at the correct dose and for the appropriate duration in order to treat these infections without increasing the already rising problem of antimicrobial resistance associated with irrational antibiotic use. In a systematic review and meta-analysis, Costelloe et al. showed that following antibiotic prescription for respiratory and urinary tract infection, resistance to the antibiotic used mostly developed within 1 month of treatment, however the effect may persist for up to 12 months [6].

In Nigeria, fewer studies have been conducted that describe the prescribing pattern of antibiotics. To stem the tide of increasing antibiotic resistance, there is a pressing need to assess antibiotic use and to identify irrational use. Hence, clinicians and policy-makers may be advised appropriately in order to counteract waste of resources, inappropriate patient demand, antimicrobial

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resistance, and drug-related morbidity and mortality. We set out to describe the pattern of antibiotic prescription as seen in a tertiary referral centre in Nigeria.

2. Materials and methods

This was a retrospective study carried out at Aminu Kano Teaching Hospital (AKTH), a tertiary referral centre situated in the North-West geopolitical zone of Nigeria. The medical wards of the hospital have a bed capacity of 84. The hospital serves as a major referral centre for Kano State, surrounding states and even the neighbouring Republic of Niger.

Systematic random sampling was used to select case records of patients who were admitted into the medical wards between 1 February 2012 and 31 July 2012. A pre-formed questionnaire was administered retrospectively that sought information such as sociodemographic data, drug data, basis of prescription and other relevant information on all patients who were given antibiotics. Antibiotic sensitivity results of common bacterial isolates were also retrieved retrospectively. These included isolates from sputum, blood, cerebrospinal fluid, urine, knee aspirates, peritoneal fluids and wound swab/wound tissue.

Analysis was carried out using descriptive statistics. Continuous variables are summarised as the median and interquartile range (IQR) to make interpretation easier. SPSS for Windows v.16.0 (SPSS Inc., Chicago, IL) was used for data analysis.

Ethical clearance was received from the Ethics Committee of AKTH.

3. Results

Of the 412 patients admitted into the internal medicine ward during the study period, 202 (49.0%) received antibiotics, of whom 77 (38.1%) received only one antibiotic while 125 (61.9%) received two or more antibiotics. The median age was 51 years (IQR, 38.75–70 years), and 116 (57.4%) were male. The median duration of admission was 9.5 days (IQR, 5–16.25 days). Community-acquired pneumonia (CAP) was the commonest indication for antibiotic use (67/202; 33.2%), followed by urinary tract infection (UTI) (37/202; 18.3%), aspiration pneumonia (28/202; 13.9%) and bacteraemia (25/202; 12.4%) (Table 1).

There were 334 total antibiotic prescriptions, among which cephalosporins were the commonest prescribed class of antibiotic (135/334; 40.4%), followed by imidazole (metronidazole) (68/334; 20.4%), macrolides (53/334; 15.9%), penicillins (49/334; 14.7%) and quinolones (22/334; 6.6%). Ceftriaxone was the commonest (132/334; 39.5%) prescribed antibiotic (Table 2). Moreover, 207 (62.0%) of the prescriptions were in generic names. The parenteral route was the commonest route of administration. In 220 (65.9%) of the 334 prescriptions, the specific duration of therapy was not stated. The majority of prescriptions (323/334; 96.7%) were empirical.

Culture was requested in only 40 (19.8%) of the 202 patients, of which 36/40 (90.0%) were followed up with subsequent de-escalation of antibiotics. Of the 36 patients who were de-escalated, the initial empirical antibiotic choice was correct in only 21 cases (58.3%). Table 3 shows the resistance patterns of the common bacterial isolates. A high prevalence of resistance among the Enterobacteriaceae isolates to amoxicillin/clavulanic acid (AMC) and ceftriaxone was noted, with 80% of *Staphylococcus aureus* isolate also being resistant to cloxacillin.

Table 1
Indications for antibiotic prescription.

Disease condition	*n* (%)
CAP	67 (33.2)
UTI	37 (18.3)
Aspiration pneumonia	28 (13.9)
Bacteraemia	25 (12.4)
Spontaneous bacterial peritonitis	18 (8.9)
Bed sore	5 (2.5)
Enteric fever	4 (2.0)
Meningitis	3 (1.5)
Upper respiratory tract infection	1 (0.5)
Catheter-associated UTI	1 (0.5)
Septic arthritis	1 (0.5)
Pyomyositis	1 (0.5)
Others	11 (5.4)
Total	202 (100)

CAP, community-acquired pneumonia; UTI, urinary tract infection.

4. Discussion

Antimicrobial resistance among pathogens is a matter of global concern. Selective pressure by antimicrobials as a result of misuse and abuse has been described as the key driving force for the development of such resistance. In this study, a large number of hospitalised patients received antibiotics. Even though a much higher value (83.5%) was reported in a study in North-Central Nigeria that looked at the total hospital prescription [7], the results of the current study are in agreement with a report from Sudan [8]. This study is limited by short duration; hence, we were not able to capture the expected seasonal variations in antibiotic prescription.

The median age in this study (51 years) may have influenced the pattern of antibiotic prescription as older patients are more likely to be sick and to have more serious infections.

The median duration of hospitalisation in this study (9.5 days) was longer than that reported in Nepal where economic constraint was highlighted as a major reason for seeking an early discharge [9,10]. However, it was similar to the results observed in a Hungarian study [11].

CAP, UTI and aspiration pneumonia were the most frequent indications for antibiotic use in this study. This profile of antibiotic

Table 2
Antibiotics prescribed during the hospital stay.

Antibiotic	*n* (%)
Cephalosporins	
Ceftriaxone	132 (39.5)
Cefuroxime	2 (0.6)
Ceftazidime	1 (0.3)
Imidazoles	
Metronidazole	68 (20.4)
Macrolides	
Clarithromycin	29 (8.7)
Azithromycin	23 (6.9)
Erythromycin	1 (0.3)
Penicillins	
Amoxicillin/clavulanic acid	42 (12.6)
Flucloxacillin	4 (1.2)
Cloxacillin	2 (0.6)
Amoxicillin	1 (0.3)
Quinolones	
Ciprofloxacin	19 (5.7)
Levofloxacin	2 (0.6)
Ofloxacin	1 (0.3)
Aminoglycosides	
Neomycin	4 (1.2)
Gentamicin	1 (0.3)
Tetracyclines	
Doxycycline	2 (0.6)
Total	334 (100)